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POPULAR Computing WEEKLY

THIS WEEK'S SOFTWARE SEE PAGE 78

35p 24-30 November 1983 Vol 2 No 47

This Week

Sord M5

The Japanese contender in the ferocious under-£200 computer market — Andy Pennell sees how it measures up. See page 46.

Spectrum interrupts

Alan Went shows how simple it is to use Z80 interrupts to improve your own programs. See page 20.

Casio keyboards

These electronic keyboards are flooding the shops — Graham Taylor wonders whether they are computers in disguise. See page 13.

New releases

All the latest software programs including *Four Gates to Freedom* by Phoenix and *Pub Crawl* from B & H Software. See page 76.

★STAR
Amoeba's Playtime on 48K Spectrum.
See page 10.
GAME★

News Desk

Acorn contract shoot-out

SINCLAIR Research has announced its intention to challenge Acorn for the BBC computer contract when it comes up for renewal next summer.

"We would be most interested in competing for that contract if it is feasible for us to do so," said a Sinclair spokesman.

As a first step, Sinclair has written to the BBC to discover if the contract is to be offered on open tender. "We want to state our interest openly, well in advance and find out how the BBC wants to handle it.

"So far they have acknowledged our letter and confirmed that they are looking into it," added the Sinclair spokesman.

Acorn remains unruffled by the Sinclair action. "Acorn is not at all worried — there is no reason why it should be — Sinclair tendered for the original contract and lost," explained an Acorn spokesman.

"We would be surprised if

Continued on page 5

Ted revealed at Las Vegas

COMMODORE is expected to show a prototype of its new computer, the Commodore 444, for the first time at the Consumer Electronics Show in Las Vegas in January.

The machine will be the first to use Commodore's new TED chip. The TED is a multi-purpose device, designed to reduce the number of components on the circuit board and thereby reduce manufacturing costs. The TED combines the functions of system controller, video controller, display processor and voice generator all in one chip. The Commodore 444 will also be the first Commodore machine to use a new updated 6500-family central processor with optimised access to external memory.

The Commodore 444 will be a more advanced machine than the existing Commodore 64 computer with sophisticated cursor control and built-in word processing.

Commodore is also considering a new low-cost machine. Commodore (UK)

Continued on page 5

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VIC20 OWNERS. Test your IQ. Unexpanded Vic20 assesses your intelligence level plus free space duel, only £3.75. Spall, 26 Melford Way, Felixstowe, Suffolk.

VALHALLA

Continued on page 69

MR CHIP SOFTWARE

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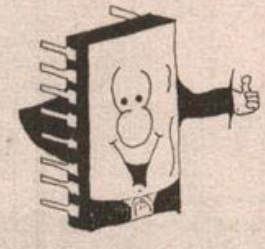

POPULAR Computing WEEKLY

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Duncan Scot
Publishing Director
Jenny Ireland

Popular Computing Weekly,
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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

Acorn's contract to produce the BBC micro comes up for renewal next year.

Although there is little likelihood of the BBC taking the contract away from Acorn — despite initial production problems, the BBC micro has lived up to most expectations — other micro manufacturers, notably Sinclair, Dragon, Oric and Camputers, are itching to tender for the contract. Sinclair, in particular, is eager to prove that the BBC made the wrong decision in selecting Acorn for the original contract.

Whatever the outcome of the BBC contract, there is also the intriguing possibility of a rival micro being launched by the independent television companies. The ITV networks are all too well aware of the lucrative spin-offs which the BBC has derived from its association with micros. It would be a natural move, though there is a lot of leeway to be made up, for the ITV companies to launch their own computer.

The ITV micro is not a new idea — Commodore has already had informal talks with at least one commercial station on the feasibility of producing just such a machine. However, any ITV micro would face problems unbeknownst to its BBC sibling.

For an ITV micro to have any hope of success, it would need to be embraced by all the independent tv companies, not just a proportion of them. This, in turn, would necessitate all the companies agreeing to common specifications for the micro.

Next Thursday

Can you find the hidden treasure in Diver — next week's Star Game for the Spectrum by John Durst.

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Rival Oric disc drive from ITL

ITL, in Chatham, hopes to do for Oric what Premier Microsystems did for Dragon.

This week the company will launch a rival disc drive system to Oric's own, before the official Oric product has even appeared.

Like the Oric Products disc unit, the ITL system — called the Byte Drive 500 — is based on the Hitachi 3 inch drive. It is a 40-track single unit giving a formatted memory capacity of about 440K. A double-sided 80-track version is also on the way.

The Byte Drive 500 comes with its own power supply, capable of handling up to two disc units. The interface to connect the system to the Oric 1 computer takes the form of a custom chip that has been built into the connecting cable linking the disc drive and computer.

ITL's own disc operating system is supplied on disc and works as an extension to the existing Oric Basic. Connecting the drive simply adds a number of new commands to the Basic vocabulary.

Peter Halford

The system has been designed for ITL by Tyrell Computer Systems. The design work of the ULA custom chip and DOS has been undertaken for Tyrell by Peter Halford, one of the original team of four which designed the Oric 1. He left Oric earlier this year.

The ULA for the disc system is being manufactured for ITL by California Devices, the Company which manufactures the ULA in the Oric 1.

The Byte Drive 500, plus power lead, is priced at £167.28. The power supply unit is £25.93 and the connecting cable, interface and operating system disc are £86.45.

ITL is currently looking for high-street distribution for the Byte Drive 500.

The first systems should go on sale by mail-order in early December. More details from ITL, The Old Courthouse, New Road, Chatham, Kent.

● The first batch of Oric's own 3 inch disc drives, originally planned for delivery in the summer, are not expected until mid-December. Bulk deliveries are not scheduled until 1984.

Keyboard for 64

A NEW company, Silynn, has announced a full-size music keyboard for the Commodore 64 which will be priced under £150.

Called the Microsound 64, it is a four-octave keyboard which simply plugs into the cartridge port on the Commodore 64. Software, initially available only on disc, then converts keys depressed on the Microsound 64 into musical notes played through the tv loudspeaker.

The device also features two slider controls which operate a simple music synthesiser. Using these it is possible to alter not just the pitch of a note, but also its character.

Notes played on the unit can be stored in the memory of the computer, or saved out either to tape or disc, and recalled.

The software which accompanies the Microsound 64 — on disc — is the first of a series of programs to be produced by Silynn. Future packages will allow more complex musical effects, such as a sequencer using the different voices of the 64 and a hardware/software combination capable of digital sampling.

The Silynn Microsound 64 will be available in mid-December, priced at £125 Details from Autographics, 3a Reading Road, Henley-on-Thames.

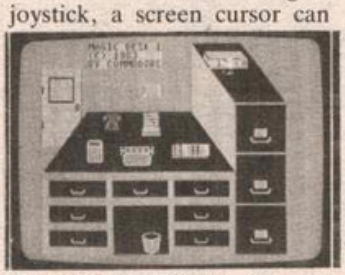
Magic Desk delayed

COMMODORE'S *Magic Desk* software for the Commodore 64 computer has been delayed again. The first package is not expected to go on sale in the UK until early next year.

When Apple first announced its Lisa machine in January this year, complete with 'mouse' graphics, Commodore was one of the first companies to announce software packages offering similar facilities.

Commodore announced *Magic Desk*, a series of 32K Rom software cartridges for the Commodore 64.

Magic Desk provides, on-screen, a pictorial representation of an office. Using a joystick, a screen cursor can



be directed around the picture. By pointing at different parts of the office display and pressing the joystick 'fire' button, different options can be selected: pointing to the filing cabinet gives file handling, pointing to the typewriter gives word-processing.

The first *Magic Desk* cartridge, *Magic Desk 1 – Type and File* has recently gone on sale in the US, priced under $100. It contains the word-processing and information filing software.

However, *Magic Desk 1* has not been greeted very enthusiastically by Commodore UK.

"We will probably go ahead with *Magic Desk 2* rather than *Magic Desk 1* — it's a better program," explained Commodore UK's marketing manager John Baxter.

Magic Desk 2 is similar to *Magic Desk 1* except it offers additional calculator and home budget software facilities. *Magic Desk 2* is unlikely to appear in the UK until early in 1984.

Ted

Continued from page 1

would like to see a Spectrum-basher manufactured at Corby, which would be a cut-down version of the 64 without sprite graphics and advanced sound handling.

Acorn shoot-out

Continued from page 1

Sinclair had a product that would match up to the Acorn BBC machine.

"From Acorn's point of view the renewal is a formality — simply because of the relationship we have with the BBC. If there were going to be any problems we would know by now anyway."

● Since Acorn was awarded the BBC contract in April, 1981, its turnover has increased more than 30-fold. In the year ended June, 1981, turnover amounted to £1.36m., considerably less than the £42.355m. recorded in the year ended June, 1983.

Software incompatibility

ALTHOUGH IBM claims that the majority of programs available for the PC will run directly on its new low-cost PCjr, only a small proportion will run directly on the entry model ($669) version of the machine.

Most of the programs for the PCjr require the more advanced operating system offered by the 2.1 disc operating system of the expanded model ($1,269).

Of the programs that will run on the entry model, a proportion will only work in conjunction with a Basic extension cartridge which itself costs $75. The so-called Cassette Basic in Rom on the entry model is not sufficient.

IBM itself suggests that the enhanced discette version of the PCjr will prove the more popular option. A configuration including the expanded model, tv connector, DOS 2.1 and cartridge Basic will cost over $1,400. Of the five new software programs announced by IBM specifically for the PCjr, only one will work directly on the entry model, and two of the others require the Basic cartridge to work on the expanded model.

The PCjr, is only on sale at present in the US and Canada. No European launch date is yet available.

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Name
Address
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LETTERS

Antescher rescue

Just a note to put in my claim for the title of 'First person to rescue all 10 victims from Antescher'.

I bought *3D Ant Attack* on 12 November and had completed it by 13 November. Rescuing each victim becomes harder as the game progresses, and as you are up against time as well as the guardian ants, each life saved is a great relief as well as a step nearer to your goal.

My score on completion was 33,106, as well as the gold medal I was presented with at the end of the game. I now throw out the challenge for someone to rescue the 10 prisoners in Antescher in a shorter time than it took me and with a higher score.

I hope Sandy White produces more software of this quality and originality.

Well, must go now as Ant Attack has just finished loading.

D Claypole
6 Helpsion Road
Glinton
Peterborough PE6 7JT

Strategy column

I read your magazine regularly and find it quite entertaining. I have therefore noted with interest the idea of an 'arcade corner'.

I would like to propose something different. A strategy/simulation column. I realise many disillusioned Neanderthal alien zappers turn to quests and gold for their entertainment — hence the success of Tony Bridge's page — but another medium from brain to computer is the 'you are in control' idea, ie, strategy/simulation.

The format of such a column would be much the same as Tony's corner — a review, comments and miscellaneous items. Although a subdivision of mind game, software houses do cater for us not-so-rare breed — DK'Tronics, Lothlorien, Psion, Severn, CCS and Hewson, to name but a few. Please think about it.

D Mitchell
36 The Moorlands
Hanley Road
Malvern Wells
Worcestershire WR14 4PS

PS. Is New Releases a review or not? If not, then kindly refrain from making criticisms.

As with adventure games, there seems to be a growing interest in strategy and simulation games of all types. Flight simulation programs are particularly popular at the moment.

We would be very interested to hear the views of other strategist/simulators towards such a column.

As for New Releases, it is not intended as a review so much as a round-up of some of the software produced each week (the remainder you can find in our This Week column). But if a program has a feature which is particularly praise/blameworthy, obviously we will mention it.

Commodore roasting

Can you explain why reviewers such as Andy Pennell need to abuse their position by making snide remarks about other computers whilst reviewing? I don't think that his remarks about the Commodore machines were complementary to a review on the Memotech micro.

So the Commodore needs add-ons, so do a lot of micros. You need about £60+ spent on the hallowed Spectrum to bring it anywhere near the Vic for keyboard and sound. Leave off, Mr P — the beloved ZX81 had to go through a roasting, now it looks as though it's the turn of Commodore.

One fed-up ZX81 and Vic owner.

I Boulton
7 Courtney Way
Kingswood
Bristol
BS15 2RX

Ego booster

I would like to reply to Craig Mitchell's 'Waste of space' letter (*PCW* 10-16 November).

My first point is that he himself wasted space by trying to boost his ego with his amazing high scores. 'Hey man, I've survived 5.3 centillion waves and saved the world's population after consuming a cruise missile, while playing Warfare.'

Point two is that it's *Tranz am* — note the weird shape after the *n*.

My last point is that if he understood what *Vetpac* and *Trantam* were, why did he bother to complain? If he understood, then everybody will be able to work it out.

PS. Please keep a few mistaks in the clasifide pages and perhaps put sum in on purpos. Well done, Diane.

Lance Rock
(address withheld by request)

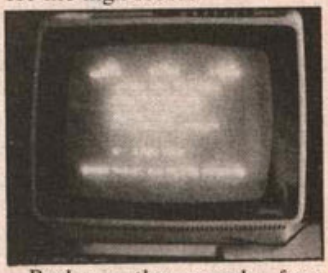
Competitive urge

Arcade games are certainly the most popular use of home computers, but is it really necessary to fill the valuable space of your letters page with claims of highest scores?

These claims seem particularly futile when you have also published letters describing bugs in some of the games which enable high scores to be achieved easily.

Recently, there was a letter describing the bug in *Jetpac* where, by standing on the middle platform on the fourth screen, the Jetman can, given time, achieve infinitely high scores without being shot. This week (10-16 November) you published a letter describing a *Jetpac* score of over a million which can be achieved by anyone capable of reaching the fourth screen.

The printer dump or photograph method of validating high scores is easily forged. I enclose a photograph (of poor quality) showing a high score of 999760 on *Jetpac*. In fact, I simply wrote a program to produce the screen display (about 10 minutes work) and could have inserted any value for the high score.



Perhaps the arcade fans could organise some events where the competitive urge could be satisfied. Hire a hall, set up a couple of Spectrums, load them with a popular program and let the alien zappers fight it out live. By charging an entry fee, the organisers could probably make a reasonable profit. This would leave the letters page free for some more thoughtful letters.

Simon Cross
Boland House
Guy's Hospital
London SE1 9RT

Fascinating patterns

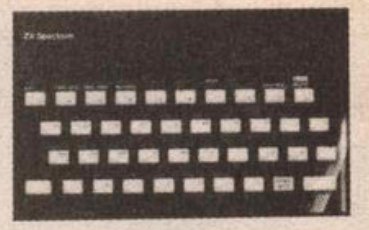
Re Pete Gerrard's item on CBM 64 (Vol 2, No 44, page 35). Herewith a small alteration, producing fascinating patterns.

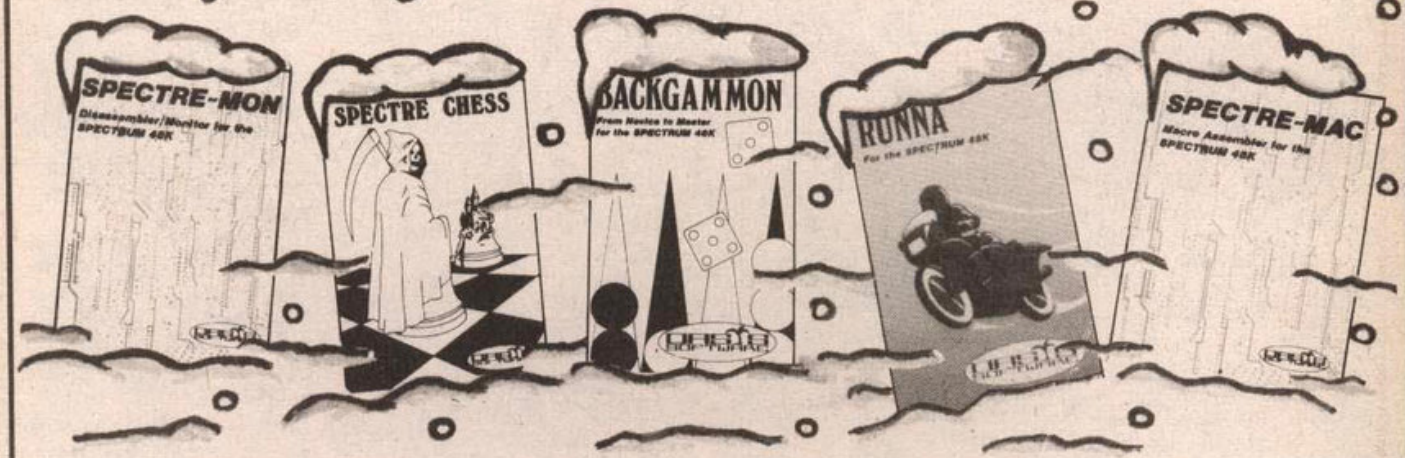
Muck about with *Z* increments (line 70) and *FNA* (line 14) for further fun. You've got to wait and wait.

N Leigh
7 The Handbridge
Fulwood
Preston PR2 4LE

```
5 POKE53272,PEEK(53272)OR8
7 POKE53265,PEEK(53265)OR32
10 FORI=8192TO8192+7999:POKEI,0:NEXT
12 FORI=1024TO2023:POKEI,1:NEXT
13 Z=0.1
14 DEFFNA(X)=COS(X/Z)
15 FORX=0TO319
20 Y=INT(100+100*FNA(X/10))
25 C=INT(X/8):R=INT(Y/8):L=YAND7
30 BYTE=8192+R*320+8*C+L
40 B=7-(XAND7)
50 POKEBYTE,PEEK(BYTE)OR(2↑B)
55 IFY=<2THEN70
60 NEXT
70 Z=Z+0.3:GOTO15
```

If you have one of these you'll need some of these -





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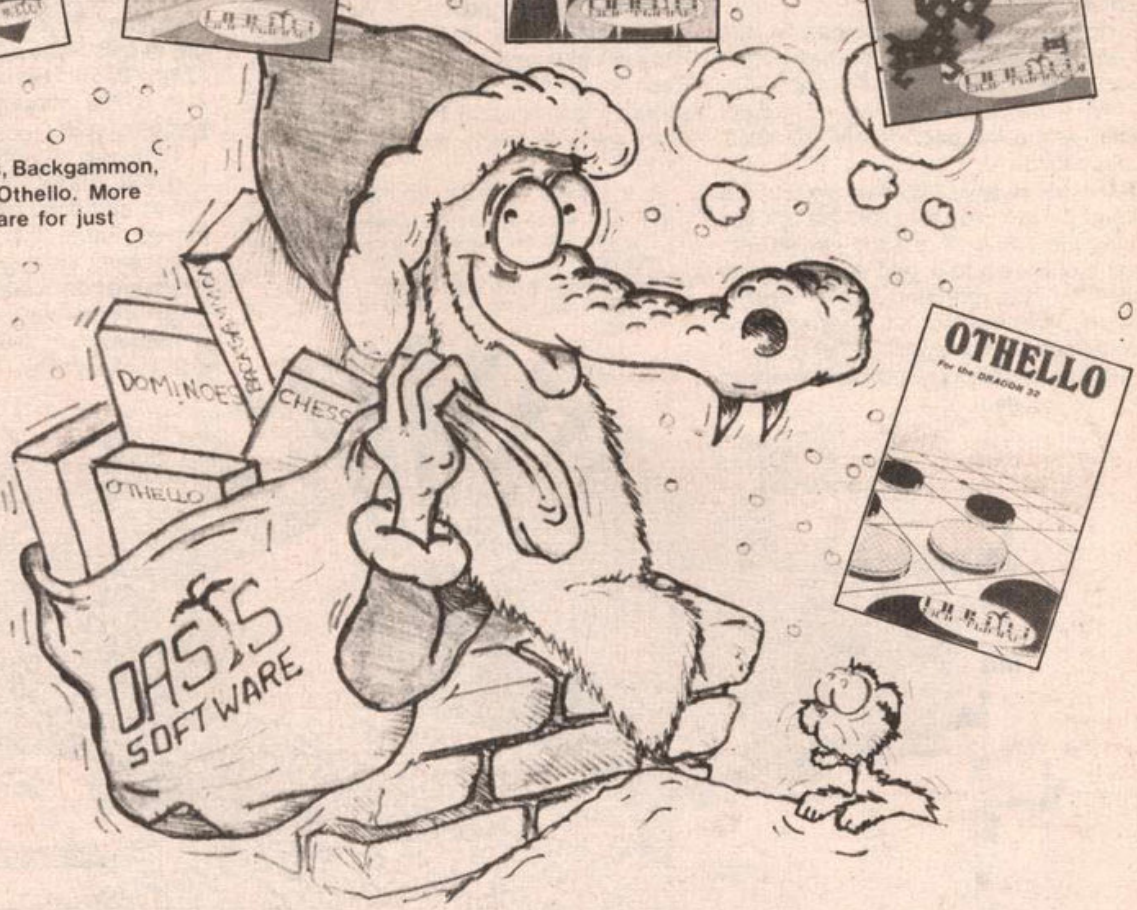

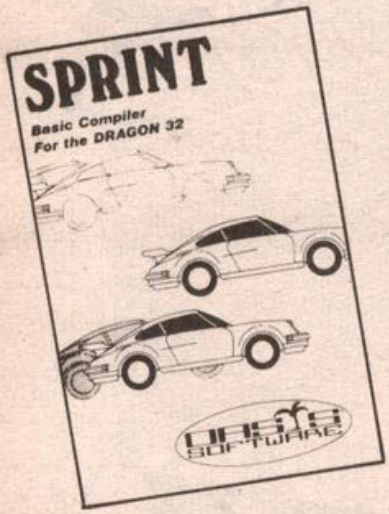

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Amoeba's Playtime

A new game for 48K Spectrum by Terry Wiley

Down at the Microscopic Zoo, Fang the Killer Amoeba is happily squishing around the deserted Bacteria Compound. But playtime is over, and it's time to put the bacteria back.

Fang is annoyed at this interruption, and will eat the bacteria if they are left unprotected, so you must attempt to enclose bits of the compound with amoeba-proof fences, where the bacteria can be safely re-introduced.

The fence-layer (a little blue block at the bottom of the screen) can be moved around the edges of existing fences with the cursor keys 5 to 8, and can draw new fences by also pressing CAPS SHIFT. However, be warned that uncompleted (red) fences are vulnerable to Fang, and if he hits one you become his next meal and the game will end.

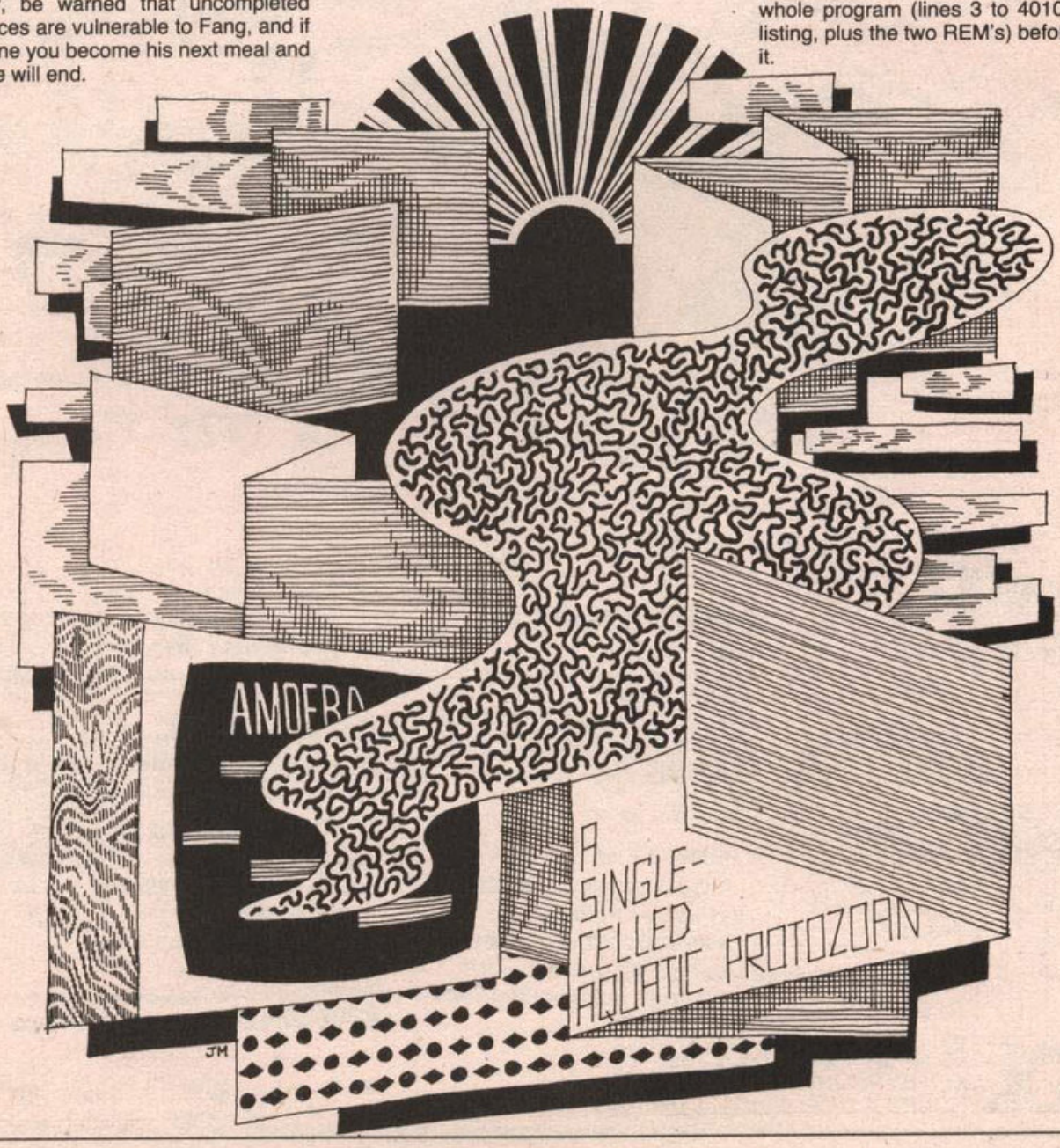
To safely complete a fence, join it to the compound wall or to another completed region, and the empty pen will fill with bacteria. One point is obtained for every bacterium introduced, and if you manage to introduce more than 6,000 bacteria, Fang will give up and go back to his cage. Each bacterium above this threshold scores 2 points; note that you need 100 extra bacteria each screen to subdue Fang.

To enter the program, do the following:

(1) Produce, as line one, a REM followed by 230 'x's
(2) Edit the REM line number to 2 to make another REM-ful of 'x's
(3) Type in this machine code loader:
3 INPUT A,B: FOR N = A TO B: INPUT;" ";Z: POKE N,Z: PRINT N,Z: NEXT N
(4) Run the program twice with the following INPUT:
(i) 23762, 23987, then the code in fig. 1
(ii) 24000, 24203, then fig. 2

Save the program if you wish to test the code; *Usr 24000* should turn the screen black; *Plot 100,0 : Draw 255,0 : Plot 120,0 : Draw 255,0 : Randomize 28270 : Let Z = Usr 23762* should produce a band of bacteria (dots).

There are two other routines, *Usr 24024* and *Usr 23954*, which require numerous *Poke*s and don't have a fixed effect (one moves Fang, the other creeps around boundaries looking for a specified point) which are best tested by the program itself, so check the code carefully and *Save* the whole program (lines 3 to 4010 from the listing, plus the two REM's) before running it. ■



```
   3>GO TO ▲● 9
   4 OVER 1: PLOT x-1,y-1: DRAW
2,0: DRAW 0,2: DRAW -2,0: DRAW 0
,-1: OVER 0: RETURN
   6 DATA 112,138,69,150,154,85,
141,162
   7 DATA 102,153,130,154,69,141
,83,50
   8 DATA 0,4,4,0,0,-4,-4,0
   9 POKE 23675,86
  10 RESTORE 6: FOR c=USR "a" TO
 USR "c"-1: READ a: POKE c,a: NE
XT c
  11 LET sc=0: LET thr=6000
  12 DIM x(4): DIM y(4): FOR c=1
TO 4: READ x(c),y(c): NEXT c
  14 LET x=0: LET w=0: LET g=60:
 POKE 24007,5
  15 BORDER 0: INK 5: PAPER 0: C
LS
  16 POKE 23760,0: POKE 23761,0
  20 GO SUB 1000
  40 LET a=USR 24024
  42 IF a<>255 THEN GO TO 4000
  50 GO TO 100>CODE INKEY$
 107 FOR o=1 TO 20: NEXT o: GO T
O 600
 108 LET d=4: LET r=1: LET l=3:
GO TO 540
 109 LET d=2: LET r=3: LET l=1:
GO TO 540
 110 LET d=3: LET r=4: LET l=2:
GO TO 540
 111 LET d=1: LET r=2: LET l=4:
GO TO 540
 152 GO TO 107
 153 LET xr=-2: LET xl=-2: LET y
r=2: LET yl=-2: GO TO 570
 154 LET xr=-2: LET xl=2: LET yr
=-2: LET yl=-2: GO TO 570
 155 LET xr=2: LET xl=-2: LET yr
=2: LET yl=2: GO TO 570
 156 LET xr=2: LET xl=2: LET yr=
-2: LET yl=2: GO TO 570
 555 GO TO 107
 510 IF POINT (x+x(d),y+y(d))=0
THEN INK 2: GO SUB 4: PLOT x,y:
LET x=x+x(d): LET y=y+y(d): DRAW
 x-PEEK 23677,y-PEEK 23678: GO S
UB 4: INK 5: GO TO 600
 541 IF POINT (x+.5*x(d),y+.5*y(
d)) THEN GO TO 600
 542 LET xx=x+x(d)+.5*x(d): LET
yy=y+y(d)+.5*y(d)
 543 IF POINT (xx+.5*x(r),yy+.5*
y(r)) OR POINT (xx+.5*x(l),yy+.5
*y(l)) THEN INK 2: GO SUB 4: PLO
T x,y: LET x=x+x(d): LET y=y+y(d
): DRAW x-PEEK 23677,y-PEEK 2367
8: INK 5: GO SUB 2000: GO SUB 4
 545 GO TO 600
 570 GO SUB 4: IF POINT (x+xl,y+
yl)<>POINT (x+xr,y+yr) THEN LET
x=x+xl+xr: LET y=y+yl+yr
 571 GO SUB 4
 600 LET k=NOT k: POKE 23675,g+k
*8
 800 GO TO 40
```

```
1000 FOR c=1 TO 6: PLOT c,c: DRA
W 256-2*c,0: DRAW 0,176-2*c: DRA
W 2*c-256,0: DRAW 0,2*c-176: NEX
T c
1050 PLOT 93,170: DRAW 0,-12: DR
AW 44,0: DRAW 0,12
1070 PRINT AT 1,13; INK 7;w
1100 LET qx=INT (RND*28+1): LET
qy=INT (RND*19+1)
1104 IF SCREEN$ (qy,qx)<>"" THEN
GO TO 1100
1105 LET qdx=1-2*(RND>.5)
1110 LET qdy=1-2*(RND>.5)
1112 POKE 24016,qy: POKE 24017,q
x
1113 POKE 24018,qdy: POKE 24019,
qdx
1120 LET x=126: LET y=6: GO SUB
4
1130 RETURN
2000 POKE 23816,x-SGN x(d)+SGN x
(r)
2001 POKE 23817,y-SGN y(d)+SGN y
(r)
2002 LET p=PEEK 24017*8+4: FOR n
=178-8*PEEK 24016 TO 170 STEP 4:
 IF POINT (p,n) THEN GO TO 2004
2003 NEXT n: STOP
2004 POKE 23814,p: POKE 23815,n-
1: LET z=USR 23954
2005 IF z=0 THEN RANDOMIZE x-.5*
x(d)+.5*x(r)+256*(y-.5*y(d)+.5*y
(r)): GO SUB 2050: RETURN
2006 IF z=1 THEN RANDOMIZE x-.5*
x(d)+.5*x(l)+256*(y-.5*y(d)+.5*y
(l)): GO SUB 2050: RETURN
2008 IF z=2 THEN PRINT "error":
STOP
2050 POKE 23695,5: LET o=USR 237
52
2051 LET o=USR 24000
2052 LET w=PEEK 23760+256*PEEK 2
3761
2053 PRINT AT 1,13; INK 7;w
2054 IF w>thr THEN GO TO 3000
2055 RETURN
3000 FOR n=0 TO 64: POKE 24007,n
: LET o=USR 24000: NEXT n
3010 CLS : PRINT AT 5,6; INK 7;"
SCORE "; FLASH 1;sc+w; FLASH 0;"
 POINTS"
3012 PRINT AT 7,5; INK 7;"BONUS
"; FLASH 1;w-thr; FLASH 0;" POIN
TS"
3015 PRINT AT 10,6; INK 7;"TOTAL
"; FLASH 1;sc+w*2-thr; FLASH 0;
" POINTS"
3020 LET sc=sc+w*2-thr: LET thr=
thr+100
3030 PRINT AT 14,6; INK 7;" THRE
SHOLD is NOW "; TAB 12; FLASH 1;t
hr; FLASH 0;" TAB 10;" POINTS ":
PAUSE 200: GO TO 10
4000 FOR n=0 TO 64: POKE 24007,n
: LET o=USR 24000: NEXT n
4010 CLS : PRINT AT 10,7; INK 7;
"SCORE "; FLASH 1;sc+w; FLASH 0;
" POINTS"
```

```
23760 0   0   237 75  118
23765 90  197 205 206 34
23770 205 20  35  193 254
23775 1   200 197 205 172
23780 90  205 20  34  193
23785 197 8   5   205 214
23790 90  192 197 4   4
23795 205 214 92  193 197
23800 13  13  205 214 92
23805 193 197 12  12  205
23810 214 92  193 201 146
23815 169 173 7   148 169
23820 0   1   0   255 0
23825 0   0   17  0   0
23830 0   205 132 93  0
23835 40  10  205 132 254
23840 1   32  4   1   0
23845 0   201 237 66  237
23850 66  48  3   24  1
23855 35  19  35  237 66
23860 237 175 237 66  124
23865 181 32  4   1   0
23870 0   201 42  6   93
23875 175 237 66  124 181
23880 32  4   1   0   0
23885 0   201 213 205 50
23890 0   8   0   0   0
23895 0   0   0   0   0
23900 0   0   0   0   0
23905 0   0   0   0   0
23910 0   0   0   0   0
23915 62  3   163 95  205
23920 133 237 75  100 92
23925 33  13  90  229 205
23930 205 205 126 71  205
23935 205 126 120 79  201
23940 205 205 126 213 205
23945 205 205 34  205 205
23950 205 205 205 205 205
23955 205 205 205 34  100
23960 125 10  93  1200 1200
23965 1200 1200 1200 1200 1200
23970 1200 1200 1200 1200 1200
23975 1200 1200 1200 1200 1200
23980 1200 1200 1200 1200 1200
23985 200 92  201 120 120
```

Fig 1

```
24000 1   0   3   33  0
24005 86  54  64  35  11
24010 120 177 32  248 201
24015 129 17  22  255 255
24020 160 120 160 120 255
24025 75  208 90  42  210
24030 90  120 102 71  121
24035 133 79  197 205 131
24040 37  205 20  35  193
24045 254 2   200 197 205
24050 128 94  87  193 197
24055 58  211 93  237 68
24060 128 71  213 205 128
24065 94  111 209 193 58
24070 210 93  237 68  129
24075 79  229 213 205 128
24080 94  209 225 103 122
24085 254 0   32  10  124
24090 168 40  6   205 100
24095 94  205 109 94  124
24100 254 0   204 100 94
24105 125 254 0   204 109
24110 94  42  208 93  34
24115 119 94  237 91  210
24120 93  124 130 103 125
24125 131 111 34  208 93
24130 94  123 94  237 95
24135 200 7   246 4   0
24140 0   0   0   0   50
24145 126 94  33  116 94
24150 6   10  126 197 229
24155 215 225 193 35  16
24160 247 14  255 201 58
24165 211 93  237 66  50
24170 211 93  201 58  210
24175 93  237 66  50  210
24180 93  201 22  18  83
24185 32  22  17  22  18
24190 6   144 205 56  37
24195 205 241 43  120 177
24200 40  1   26  201 120
```

Fig 2

WANTED

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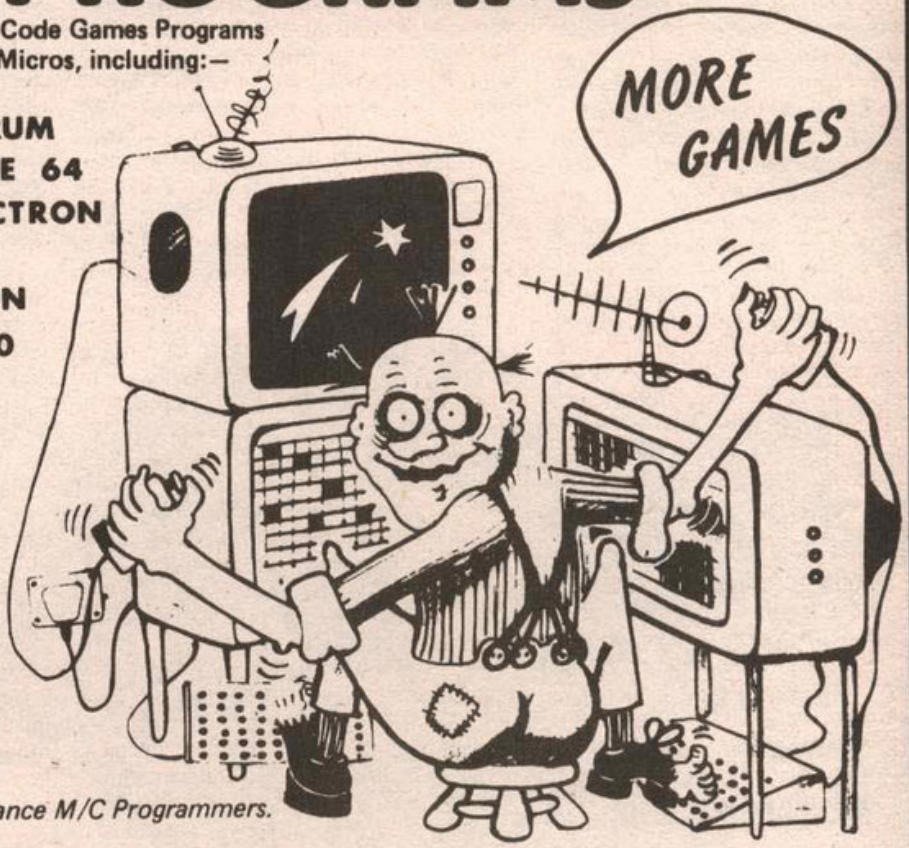

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Games from the Gods

HUGE REWARD

Budding superstars

***Graham Taylor** looks at the growing links between electronic keyboards and micros*

What costs between £40 and £500, has a memory, is programmable, and can be used with add-ons like light pens? It's a Casio keyboard.

Just as microcomputers have moved out of the specialist shops and now flourish in toy stores, book shops and supermarkets, so electronic keyboards have moved out from the specialist music shops.

A Casio electronic keyboard is a bit like an organ, but is capable of very unorgan-like sounds. It's a bit like a synthesizer, but is very easy to program. In some respects, it's even a bit like a computer . . .

Casio Electronics is a Japanese company whose pre-tax profits rose by 13.4 percent to around £20m (Y7bn) in the half year ending in September. Although Casio is involved in a number of electrical products, all of which have grown in sales, the really startling growth is found in their office computers and their electronic musical instruments — up by an enormous 50 per cent.

Britain has taken the Casio keyboard to its heart; the basic model, the *VL-1*, has sold nearly half a million since its release in May 1981.

Dave Caulfield is the National Sales Manager for Casiotone UK. Even he is surprised by their success: "We've tried to do an analysis of our market, but it's really impossible to come to any specific conclusions — there seems to be almost no type of consumer who couldn't be a prospective purchaser.

"Britain has always been full of weekend musicians — people who play for their own amusement at the weekend — no musical instrument manufacturers could manage on the sales to the big name groups, but Casio has gone beyond that."

As with computers, the technology is getting relatively cheaper and much more widely available. "With a four-track cassette machine and a mid-range Casio, you have about as much equipment in your home as the Beatles had for their early records," explained Dave.

The instruments are, inevitably, the result of microchip technology. The internal workings, complete with sound and rhythm chips, memory, and input/output ports would be familiar territory to computer buffs.

Just as computers have an international standard for connecting one to the other — RS232 — so the latest generation of electronic keyboards have a similar standard interface called MIDI, or musical instrument digital interface. This enables one keyboard to be played from another set to different sound styles; eg, brass on one and strings on another. "You could also slightly de-tune one of the keyboards to get a very full, spacey sound," explained Dave.

To complement the new Casio keyboards, the company will be selling interfaces for the best selling micros — this will almost certainly include Commodore, Acorn and Sinclair.

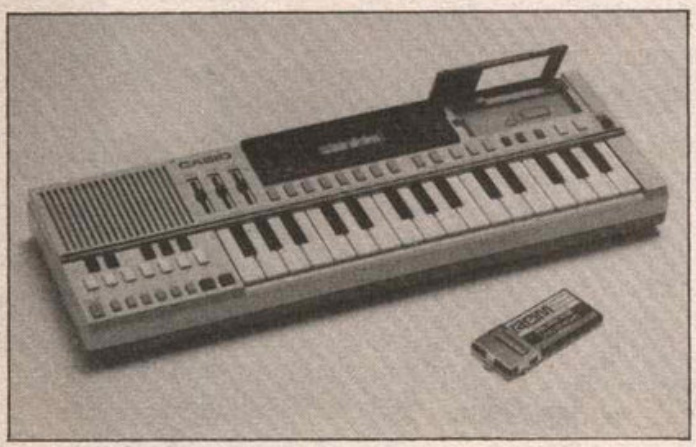
Surprisingly, perhaps, Dave does not see the computer adding much to the quality and range of sounds available from the micro: "If that were the only point of the interface, why bother? Even the *VL-1* has more sound facilities than most of the micros — certainly for practical musical purposes."

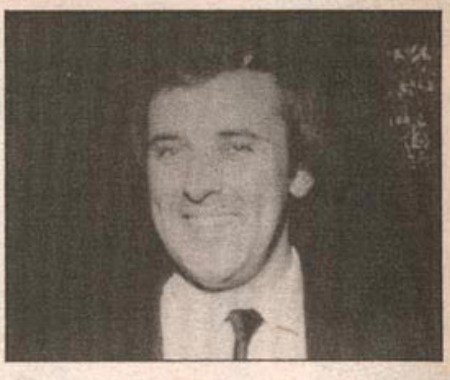
The real point of the computer link Dave sees as educational: "As much as anything else, we're trying to make it easy to learn music and it's important to give people visual references — it's something we've tried to do using the LEDs that light up each note as it's played, but obviously with a tv screen we could do much better."

To this end, Casio are starting to look at software houses as potential independent suppliers of educational material. "I see us consulting with a software house in terms of technical information, but it's the visual display that will be really important — there are so many different ways the two things could be tied together."

Whatever the future of the keyboard/micro linkup, one thing seems clear from even a cursory glance at the latest machines — some fundamental computing concepts are being incorporated. Perhaps the most interesting of these is the idea of Rom and Ram cartridges.

Two machines, the *MT 800* and the *PT 50*, include cartridge slots very much like those on computers.





Rom cartridges contain groups of popular pieces of music which the Casio will play automatically. Budding superstars and egomaniacs everywhere can even connect a microphone to the machine and mix in their voice to sing along with the music.

The *PT 50* can also accept Ram cartridges, which is perhaps the most important new development. The Ram cartridges are used, rather like a tape recorder with computers, to store your own creations for retrieval at a later stage.

The idea of Ram is likely to be extended further, using it to store actual sound types for example. "If you wanted, you could have no sounds built into the keyboards at all — just cartridges containing various sound building blocks whose parameters you can change using the instrument."

A similar idea is already found in some of the Casios including the *VL-1* using the ADSR function which stands for attack, decay, sustain, release. This gives the main features of the preset sounds a numerical code consisting of feet, envelope and modulation. These can then be mixed in any combination to give a wide range of sounds different to, but derived from, the presets.

In principle, this idea could be extended to give virtually limitless ranges of sounds. The Casio *1000P*, for example, is capable of most things an expensive synthesizer can produce, merely by manipulating 10 presets in exactly this way.

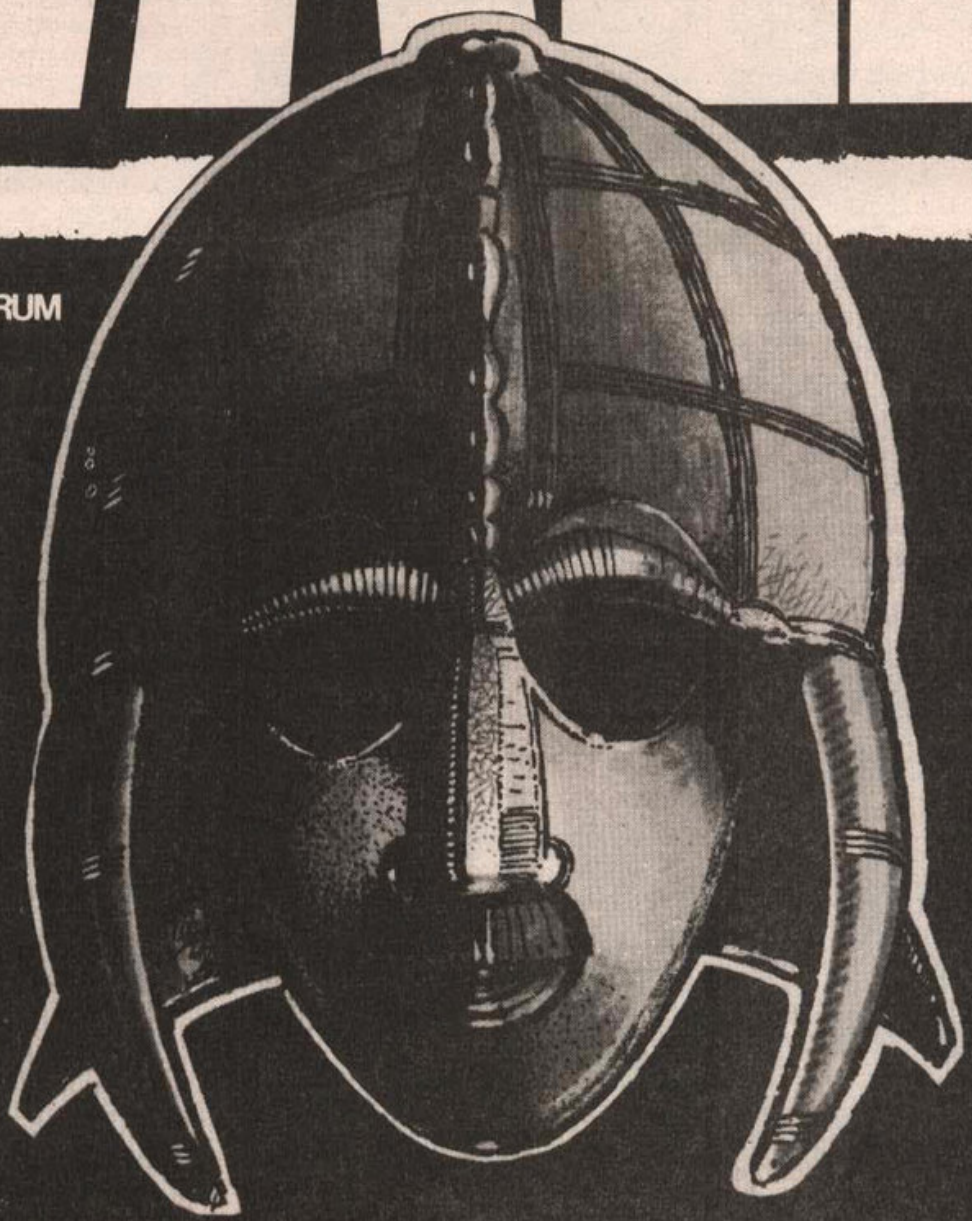
Casio has plenty of competitors, including Seiko and the mighty Yamaha, but Dave is confident. "Casio won't produce anything unless we are sure there is a big market for it. We've been aware of the computer market for a long time, but basically we've made a decision not to get involved either with the keyboards or by, say, issuing our own home computer."

Next year will see the demise of many well-known computer companies, predicts Dave. "It's a good job we've kept on the sidelines. Look at the big names who are in trouble — the shakeout has already started.

"By the middle of next year, we'll have keyboards with interfaces built in and we'll cover the major micros by providing appropriate connectors. But, with the Casio keyboard I think we've discovered a genuine consumer product — something that appeals to all sorts of people for all sorts of reasons. I sometimes wonder if that's really true of home computers." ■

VALH

48K SPECTRUM



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POP.W.47

The expanding Dragon

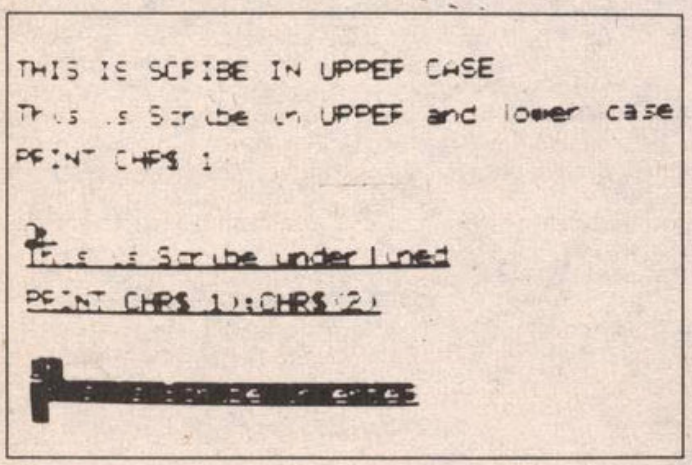
***Keith and Steven Brain** take a look at the range of enhancements now on the market for the Dragon*

No home micro is initially capable of everything the user might want to do with it and therefore it is usual for a range of enhancements to come on to the market from independent suppliers. The Dragon is well supported by the independents who offer a wide range of products on cassette, cartridge, and now disc.

These offer a wide range of facilities, but it is often difficult to compare their capabilities with the advertising claims. This review takes a look at many of the products now available and evaluates the potential benefits to the user.

One of the main criticisms of the Dragon centres on the text display. Many people feel that 32 columns is not enough, and that true lower case characters are really essential. There are several ways of remedying this problem by generating high-resolution characters within a Basic program, but several companies are now offering machine code programs providing text on the hi-res screen. Below are details of four of these which differ somewhat in their capabilities and price; two of these are "Hybrid" products offering "high-res text" and "tool kit" functions at the same time.

Scribe (Premier Software) is available on tape and the Delta disc system. It produces upper and lower case on a 42★24 display in *Pmode 4* only. The size matrix was apparently selected as the largest which can be guaranteed to be clearly legible on most domestic tv's and it



was certainly very clear on the three sets tried.

Automatic underlining and inverse characters are available using *Print chr$(n)* and the *Print @* command uses the 42★24 grid. Another extremely useful command is *Put @ X,Y,n* which allows you to place a character anywhere on the screen to within one screen point, allowing you to produce subscripts, superscripts and 'sprites'. The *Print 1* command allows you to redefine characters, but you have to calculate these as a series of binary numbers, although this procedure is clearly explained and instructions are given for saving your redefined character set.

Scribe is compatible with the other Premier utilities and will often be used in conjunction with them. At £13.95 on cassette or £14.95 on disc, *Scribe* offers reasonable value for money, if you only want to produce a relatively straightforward 'true text' display.

Rainbow-Writer (Microdeal) was originally written for the Tandy CoCo by Rainbow Connection Software and it is the only commercial software we have seen so far on a Dragon Disc, although apparently Microdeal plan to sell discs configured for the Premier/Cumana Delta system.

There are two versions of *Rainbow-Writer* provided, which give 32/42 characters a line or 50/64 characters a line. In each case you can alter the distance between each character by specifying a low-density (32 or 50) or a high-density (42 or 64) mode. You can also enlarge characters up to a massive 16★8 which is good for titles and educational purposes.

The character sets can be redefined and if you want to save memory you can load in only a partial set. The program locates itself at the top of memory and it therefore does not interfere with many other enhancements. You can produce legible text in any *Pmode* as well as different size, width and colour characters, subscripts, superscripts, inverse video and underlining.

You can also produce artefacted colours in *Pmode 4*, protect parts of the screen from scrolling, and mix the facilities on the screen at the same time. At any point you can call up a *Help* screen which tells you the current settings of the program. A demonstration program showing the advanced features of *Rainbow-Writer* and a good on-screen character generator are included.

John Symes says that the Dragon distributor in Greece is giving away a copy of *Rainbow-Writer* with the Greek character set with every machine! The only real winge is that the display commands must be called by Escape sequences, rather than new Basic commands, so that you have to type *Print CHR$(27) "★★★"* each time (where ★★★ is one of many commands). Of course you could predefine the command sequences you will be using frequently as strings.

This is the most flexible of the high-resolution text enhancements and even though the price is around £20, it is good value if you are going to use the versatile facilities. It is interesting to note that encouragement and a 'limited licence' is given to the incorporation of the program into commercial software, rather than the usual dire (and ineffective!) threats.

Edit+ (including *Hi-res*) (Compusense) is a cartridge so it uses very little of the Dragon memory, but of course it effectively blocks the expansion port so that you cannot add anything else. Two instruction booklets are included, one for *Hi-res* and one for *Edit+*, and since *Hi-res* is also sold separately we will consider the facilities of that first.

The program produces a 51★24 character display, but only operates in *Pmode 4*, which becomes the default mode whenever you use *Print* or a prompt appears. There are four *Print* commands: *Print* uses the whole 51★24 matrix, but *Print @* uses a 32★16 window so that it is compatible with the normal Dragon display and you can test normal-mode programs. *Print 1* is similar to the standard *Print @*, but works on the 51★24 matrix, and *Print %* prints 'sprites' which are specified by X and Y coordinates.

These sprites are actually characters which are put on the screen with exclusive-OR logic, and the sprite mode is rather irritating to use as the prompts, cursor, and *Print* command become distorted. Nine character sets are included (although many of the 'different' characters are the same) and characters can be redefined, although this must be done by calculating binary numbers and the definition must be saved as a separate program.

The *Cls* command is extended to provide a number of functions and control codes are also used to provide some extra features. Auto-repeat is included, but there is a very long delay before it is activated.

The *Edit+* "full screen editor and programmers tool kit" is only activated when you type *Edit.* It displays the program on the 51★24 screen and has editing features of the type usually found on word processors. Reading programs formatted to 51 characters was rather difficult and the screen refresh was very slow so that it took a long time to work through a program.

The editing and "tool kit" facilities were not very impressive especially when compared to the competition, and at £25 for *Hi-res* and £34 for *Hi-res* with *Edit+*, rather over-priced. The cartridge approach is not the most logical way to provide these facilities.

Picture Writer (Rampage) is more than just a text on hi-res screen program as it includes some useful extensions to Basic. It is supplied on a tape which auto-starts, and it sits at the bottom of memory. The

display is only 32★16 but it has true upper and lower case, a full screen cursor, commands to program the cursor through *Print* statements, and it is a great improvement over the standard display.

A major difference to the other text on high-res programs is that you have separate control over text and graphics where these are mixed. There are three types of screen clear. *Pcls* or *Clsg* just clears any graphics on the screen and leaves the text, *Clst* clears the text and leaves the graphics, and *Cls* clears both.

You can specify scroll protected areas or *Freeze* the screen completely, and scroll the text over static graphics. Characters can be redefined using either binary codes or a proper screen-based character generator which is activated by the *Char* command, and *Csavec* saves character sets without the need to remember addresses, and allows you to save only parts of the character set.

If you type *Graf Off* you go back to the normal Dragon display but the additional Basic commands are still available, including the full screen cursor. The keyboard is redefined so that the graphic characters can be accessed directly from the keyboard, and use abbreviated keyword entry. You can set the keyboard back to normal with *Key Off* and auto-repeat and a bell are included which can be turned on and off by *Rep On/Off* and *Bell On/Off*.

An *Old* command is provided which will normally resurrect a program which was accidentally *New*ed, and you can switch between *Fast* and *Slow* mode.

This program offers a useful extension to the facilities of the Dragon and at £10 it is excellent value for money.

Although the Basic commands for handling sound in the Microsoft Extended Colour Basic used on the Dragon are very easy to use, only one sound channel is available which is rather limiting, and the 'speech' produced by *Computavoice* and programs like *Talking Android Attack* is pretty unintelligible.

On the other hand *The Dragon Composer* program (Microdeal/Speech Systems) solves the music problem as it gives you four sound channels, each one with up to seven octaves. You enter tunes in a format which has some resemblance to the *Play* command, but in *Data* statements which are placed at the end of part of the composer program. For example:

```
3010 DATA D5G4D4B4Q
```

means:

Play note D in octave 5 in channel one
G 4 two
D 4 three
B 4 four
(All the notes being quavers (Q))

Fifteen lengths from a whole note to a 1/32 note are allowed, sharps and flats are available, and the tempo and key can be changed. Comprehensive editing and saving facilities are included and when you have entered your tune you can compile it into a self-contained machine code subroutine with the *Complate Source* command.

You can *Play* this *Music* directly, but an important feature of *Composer* is that you can also use this compiled routine to add first-class sound to any other program. Although the processor is totally dedicated to producing the sound you can put the command *Basic* into the Data to return control to Basic during a tune, so that you can arrange to interrupt it if necessary.

This program completely transforms the sound output of the Dragon and even at £15 it is good value for money and includes very clear instructions.

You are never going to get real speech without extra hardware such as that used in the *Speech Synthesis Module* (JCB Microsystems) which is a cartridge giving very clear speech with only a slight transatlantic accent. It uses a General Instrument SP0256 Speech Processor and a custom ROM containing predefined words.

A clear manual is provided which explains in detail everything you could possibly want to know about the system. The simplest method is to use the *Say* command which allows you to easily produce any of the predefined words. For example, a polite computer might start by saying to the user:

```
10 SAY "HELLO' 3, GOOD, 3, MORNING, 5, I, 2, AM
   ,4 ,YOUR, 4, DRAGON, 4, COMPUTER, 5"
20 SAY "PLEASE, 4, TYPE, 4, YOUR, 4, INSTRUC-
   TION, 4"
```

The *Say#* commands deals with numbers and is very impressive when you give it values like 123456789 which immediately comes out as "one hundred and twenty three million, four hundred and fifty six thousand, seven hundred and eighty nine" and if you add a zero to the end it instantly converts it to "1.23456789 exponent plus nine". Equations like *Say.120 2/3* are allowed and it automatically rounds up after eight places.

In addition you can use the 64 allophones (individual speech sounds) to create any word which is then called by the *Speak* command. Using allophones takes some practice and experimentation to get the desired result but it extends the range of the module to an infinite vocabulary. For example, you might like to add the word "master" to that request for instructions:

```
30 SPEAK"MM,AR,SS,TT2,ER1,4"
```

The *Add* command allows you to mix *Say* and *Speak* to form likes like:

```
40 ADD, SAY "BY, 4, DRAGON, 4; SAY# 32; SAY"
   GAMES, 1", SPEAK "SS, 4, MM, AR, SS, TT2,
   ER1, 4"; SAY "o, 3, K, 4"
```

You can also *Say* or *Speak* strings and *Say#* variables. As these commands do not halt the program you can mix speech and graphics very effectively and while the computer is actually speaking you can do almost anything else with it, except create sound, or use the joysticks or cassette interface.

It is obviously a great asset in education, and in producing really "user-friendly" programs. £37.95 is a fair price for this useful add-on. ■

Firm	Program	Cost
Compusense Ltd PO Box 169 286D Green Lanes London N13 5XA	*Edit+*	£34 (+Hi-res)
JCB Microsystems 29 Southbourne Road Bournemouth BH6 5AE	*Speech Synthesis Module*	£37.95
Microdeal 41 Truro Road St Austell Cornwall PL25 5JE	*Rainbow Writer* *Dragon composer*	£20 £15
Premier 208 Croydon Road Anerly London SE20 7YX	*Scribe*	£13.95
Rampage 32 Birchwood Drive Wilmington Dartford Kent PA2 7NE	*Picture Writer*	£10

End of the line

W R Masefield explains how to calculate the frequency response of 4-terminal networks

This program for the ZX Spectrum was developed to be a time-saving aid in the calculation of voltage transfer ratios and input and output impedances of simple 4-terminal electrical networks containing resistance, inductance and capacitance. It is not an exhaustive treatment and is applicable only to networks which can be reduced to a sequence of series and shunt sections of the general form shown in Figure 1.

The method of calculation is by simple *A*-matrices. For those not familiar with matrix algebra, the following brief account may be of help — for a fuller treatment, you should consult a textbook.

Briefly, any 4-terminal network having passive components — resistance (*R*), inductance (*L*) and Capacitance (*C*) — can be represented in the form of a 2 × 2 matrix (Figure 2). There are several ways in which the matrix can be made up. For our purposes, the one relating input voltage and current to output voltage and current (the so-called *A*-matrix), is the one to use (Figure 3). This has the advantage that, for a sequence of sections of a network, the overall matrix is the product of the individual section matrices taken in sequential order:

$(A) = (A_1) \times (A_2) \times (A_3) \ldots$

Matrix multiplication follows a special rule, as shown in Figure 4.

Any series of shunt section can be represented by a simple matrix of the form shown in Figure 5. These matrices are then multiplied together to give the overall matrix. Once the overall matrix has been found, it is a simple matter to derive the frequency response of the complete network, since the voltage transfer ratio is given by:

$\frac{V_{OUT}}{V_{IN}} = \frac{1}{a_{11}}$ with output open-circuit,

and the input and output impedances by:

$Z_{IN} = \frac{a_{11}}{a_{21}}$ with output open-circuit,

and

$Z_{OUT} = \frac{a_{22}}{a_{21}}$ with input open-circuit.

This program is easily adapted for other machines, as it makes no use of artful dodges. On Run, the user is asked to input the number of sections, whether they are series or shunt and all the components of the sections, in turn. Where a particular component is absent a zero is entered. For example, if a section contains resistance only, then zero is entered for inductance and capacitance. The computer recognises the zero to mean "no inductance" or "no capacitance", *not* as a short-circuit or open-circuit condition.

After putting in all the components, the next prompt is for frequency. As written, the maximum frequency is 9,999,999Hz (almost 10MHz) — anything larger will exceed the print format.

The program takes a few seconds to work out the answers, depending on how many sections have to be multiplied together. After display, the next frequency can be entered and so the response is gradually built up. As an example, Figure 6 shows a simple network and the printout obtained for it. ■

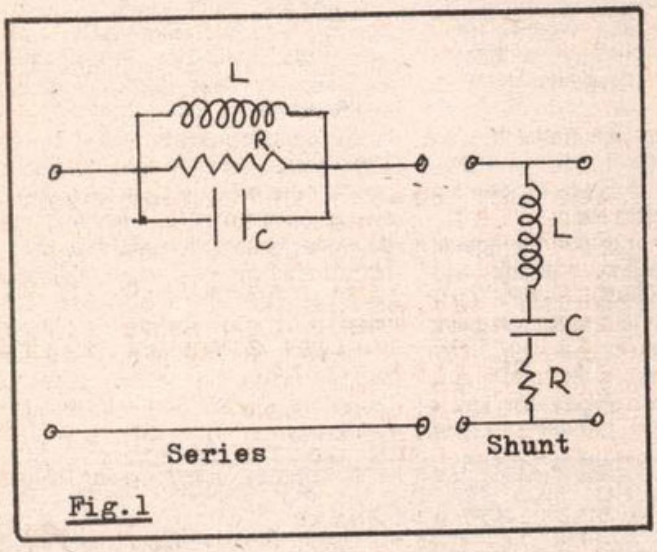


Fig.1

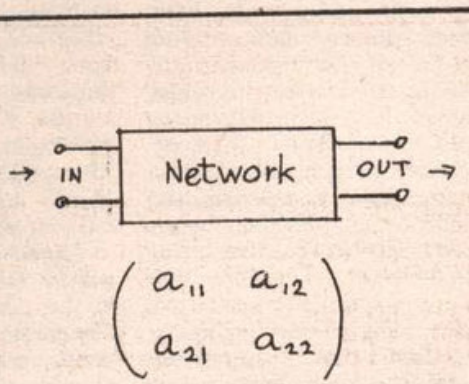


Fig.2

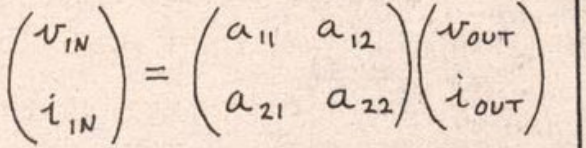


Fig. 3

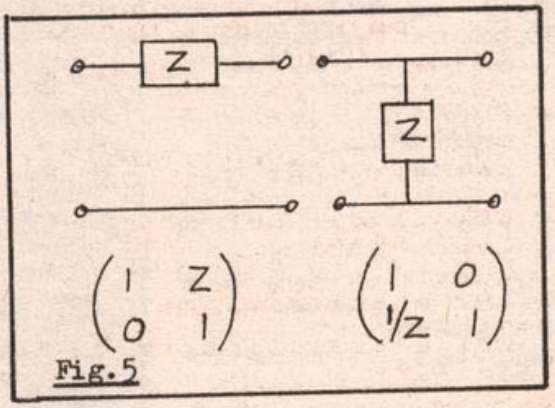
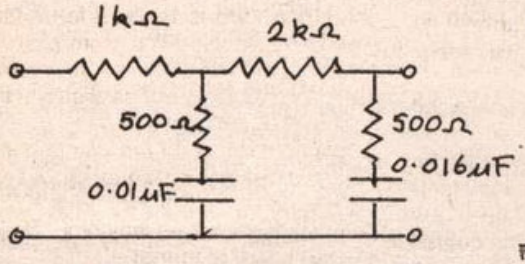


Fig.5

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}\begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix} = \begin{pmatrix} a_{11}b_{11}+a_{12}b_{21} & a_{11}b_{12}+a_{12}b_{22} \\ a_{21}b_{11}+a_{22}b_{21} & a_{21}b_{12}+a_{22}b_{22} \end{pmatrix}$$

Matrix Multiplication

Fig.4



4-Section Network and Frequency Response

FREQUENCY RESPONSE OF 4-SECTION NETWORK

Freq. (Hz)	Vo/V-in (VdB)	Z-in (Ohms)	Z-out (Ohms)
50	-0.2	124182	122722
100	-0.3	62966	61508
200	-0.6	32354	30899
500	-1.5	13975	12531
1000	-2.8	7830	6402
2000	-5	4727	3330
5000	-9.8	2795	1473
10000	-14.6	2086	854
20000	-19.4	1698	569

Fig.6

```
   5 REM NETWORK FREQUENCY RESPO
NSE
   5 REM © W.R.Masefield 1983
  10 CLEAR : INPUT "No. of Secti
ons?";n
  20 DIM b(3*n): LET k=1
  30 LET s$="": FOR j=1 TO n: IN
PUT ("Section ";j;" Series or Sh
unt?");a$
  40 LET s$=s$+a$(2 TO 2)
  50 CLS : PRINT FLASH 1;AT 18,0
;"Enter zero for any R, L or C n
ot present"
  60 INPUT "Resistance? (Ohms)";
b(k),"Inductance? (Henries)";b(k+
1),"Capacitance? (Farads)";b(k+2)
  70 LET k=k+3: NEXT j
 100 CLS : PRINT "FREQUENCY RESP
ONSE OF": PRINT TAB 6;N;"-SECTIO
N NETWORK": PRINT
 110 PRINT "  Freq.  Vo/V-in    Z
-in    Z-out"
 120 PRINT "  (Hz)      (VdB)    (O
hms)   (Ohms)"
 130 INPUT "Frequency? (Hz)";f
 140 LET k=1: LET j=1: GO SUB 30
0
 150 LET c1=d1: LET c2=d2: LET c
3=d3: LET c4=d4
 160 FOR i=1 TO n-1: LET k=k+3:
LET j=j+1: GO SUB 300
 170 LET e1=c1*d1+c2*d3: LET e2=
c1*d2+c2*d4
 180 LET e3=c3*d1+c4*d3: LET e4=
c3*d2+c4*d4
 190 LET c1=e1: LET c2=e2: LET c
3=e3: LET c4=e4: NEXT i
 200 LET v=20*LN (1/e1)/LN 10: L
ET v=INT (v/.1+.5)*.1
 210 LET zi=INT (e1/e3+.5): LET
zo=INT (e4/e3+.5)
 220 PRINT TAB 8-LEN STR$ f;f;TA
B 11;v;TAB 24-LEN STR$ zi;zi;TAB
32-LEN STR$ zo;zo
 230 GO TO 130
 300 REM Matrix SBR'
 310 IF s$(j TO j)="h" OR s$(j T
O j)="H" THEN GO TO 390
 320 IF b(k)=0 THEN LET g=0: GO
TO 340
 330 LET g=1/b(k)
 340 IF b(k+1)=0 THEN LET bl=0:
GO TO 360
 350 LET bl=1/(2*PI*f*b(k+1))
 360 LET bc=b(k+2)*2*PI*f: LET z
=1/SQR (g*g+ABS ((bl-bc)*(bl-bc)
))
 370 LET d1=1: LET d2=z: LET d3=
0: LET d4=1
 380 RETURN
 390 LET r=b(k): LET xl=b(k+1)*2
*PI*f
 400 IF b(k+2)=0 THEN LET xc=0:
GO TO 420
 410 LET xc=1/(2*PI*f*b(k+2))
 420 LET y=1/SQR (r*r+ABS ((xl-x
c)*(xl-xc)))
 430 LET d1=1: LET d2=0: LET d3=
y: LET d4=1
 440 RETURN
```

Fig. 7

Rudely interrupted

***Alan Went** unmasks some of the secrets hidden in the Spectrum interrupts*

The Z80 processor used in the Spectrum has a set of connections and instructions that allow the normal running of a program to be interrupted, and a subroutine called and Run, before returning to the main routine.

Two types of interrupt are allowed on the Z80. Firstly, the non maskable interrupt. When the signal on this pin is activated, the processor will always jump to location *66H* and Run the routine there. This is not used on the Spectrum.

Secondly, the maskable interrupt. A signal on this pin will cause one of three courses of action to occur, depending on the interrupt mode selected. In mode 1, the cpu executes an instruction provided by an external device. This mode is not used on the Spectrum.

Mode 2 is the normal Spectrum mode. When an interrupt occurs, the cpu stores its current program address and jumps to location *38H* (56 dec) and continues from there. The Spectrum routine here increments the Frames (Timer) variable, then reads the keyboard. The hardware is arranged such that these interrupts occur every 20mS (50 times per sec).

When the interrupt occurs, the cpu forms an address using the contents of the *I* register as the high part of the address and the value placed on the data bus by the interrupting device as the lower part of the address. The contents of the address so formed are used as the address to jump to. Thus, a table of subroutine start addresses can be held in memory, with the interrupting device combining with the *I* register to look up the appropriate address for that device. If no data byte is placed on the data bus, the cpu will read *FFH* (255 dec) and thus look at the address *I* ★ *256*+ *255* (and + 1 as a 16 bit address is required), and jump to the address stored there.

When the Spectrum is running a Basic program, and during editing, the interrupts are enabled, and only disabled during time-critical routines such as *Save*/*Load* or when using the beeper. Interrupt mode 1 is selected at all times, and the *I* register contains *3FH* (63 dec).

Listing 1 *On/Off Routines. Assembler*

Addr.	Code. Label	Inst.
FE56	3E09 ON	LD A,9
FE58	ED47	LD I,A
FE5A	ED5E	IM2
FE5C	C9	RET
FE5D	00	NOP
FE5E	00	NOP
FE5F	00	NOP
FE60	3E3F OFF	LD A,3FH
FE62	ED47	LD I,A
FE64	ED56	IM1
FE66	C9	RET
FE67	00	NOP
FE68	00	NOP
FE69	Interrupt Routine Starts here.	

By changing the cpu into *IM2*, we can cause the Spectrum to call our own machine code routines 50 times per second. To do this, we need to set the *I* register to a value where the cpu can find a suitable address for our routine. The value of *I* must, in the Spectrum, stay below *3FH* as it is used when outputting the display — setting *I* to above *40H* will give 'snow' on the screen.

So, we need to find somewhere, where the memory will always contain the same value, and that value will form part of a suitable address for our routine. Looking through the Rom we find that if *I = 9*, then locations *09FF H*/*0A00 H* (2559/2560) contain the address *FE69 H* (65129) which is a suitable address for a routine in a 48K Spectrum. For a 16K version *I = 28H* produces a jump to *7E5C H* (32348).

Therefore, by changing the value of *I* to 9 or 40, we can make the cpu call our own routines. The routines in listing 1 show the method used to change/restore the *I* register and set the interrupt mode, so switching the interrupt routines on and off.

Listing 2 is the Basic program we will be using to *Load* our routines into place. Type it in and *Save* it, then Run. To check the switching routine, line 100 causes a jump back to the normal interrupt routine. Try switching it on and off — the machine should not crash and no effect should be noticed.

Note: the first figure in the line 100 always equals the number of bytes to be poked into place:

RAND USR 65110 (16K — 32330) turns ON RAND USR 65120 (16K 32340) — turns OFF.

Border. Add listing 3 to your base program and *Save* it, as with all routines before Running. This short routine sets the *Border* to be always the same as the permanent *Paper* colour — the demo program starting at line 200 shows this in action. Enter as a direct command *Poke 65131, 120* (16K *32350*) and the *Border* will now flash as the contents of the timer (23672) is sent to the *Border*.

List 2(a)

```
  1 REM List 2
 10 REM BASE PROGRAM
       INTERRUPT ON/OFF
 15 REM 48K SPECTRUM
 25 REM START INTERRUPT WITH
       RAND USR 65110
 28 REM END INTERRUPT WITH
       RAND USR 65120
 30 REM @ Alan D. Went 1983
 40 CLEAR 65110
 50 FOR A=65110 TO 65128: READ
B: POKE A,B: NEXT A
 55 READ C: LET C=C+65128: FOR
A=65129 TO C: READ B: POKE A,B:
NEXT A
 60 DATA 62,9,237,71,237,94,201
 70 DATA 0,0,0,62,62,237,71,237
,86,201,0,0
 90 REM INTERRUPT ROUTINE START
       AT LINE 100.
100 DATA 3,195,56,00
```

List 2(b) 16K

```
  1 REM List 2 (b)
 10 REM BASE PROGRAM
       INTERRUPT ON/OFF
 15 REM 16K SPECTRUM
 25 REM START INTERRUPT WITH
       RAND USR 32330
 28 REM END INTERRUPT WITH
       RAND USR 32340
 30 REM @ Alan D. Went 1983
 40 CLEAR 32329
 50 FOR A=32330 TO 32347: READ
B: POKE A,B: NEXT A
 55 READ C: LET C=C+32347: FOR
A=32348 TO C: READ B: POKE A,B:
NEXT A
 60 DATA 62,40,237,71,237,94,20
1
 70 DATA 0,0,0,62,63,237,71,237
,86,201,0
 90 REM INTERRUPT ROUTINE START
       AT LINE 100.
100 DATA 3,195,56,00
```

Sound. We can make the Spectrum beep continuously, even when Running a program. Reload listing 2 and add listing 4, *Save* and Run, then Run line 200 (change values for 16K) and your Spectrum will sing to you!

If locations *65134* and *65137* (16K *32353* and *32356*) are *Poked* with other values as shown, the tone can be changed. The higher the number, the purer the tone, but the less time allowed to spend running the program and it runs very slowly.

Break disable. One disadvantage of Basic programs, at times, is that they can be stopped, by pressing *Caps Shift/Space*. The next interrupt routine will disable that function. This works by checking the system variable *Errnr* for error code *L Break* into program. When this is detected, the code for *Cont* is entered into the editing area and then, having ensured that the system variables *Oldppc* and *Ospcc* (see p175 Spectrum manual) are correct, a jump is made to the Rom routine that runs a direct command. This has the same effect as pressing *Cont* and *Enter* after a break. Thus, the program continues with the next statement.

To use this in your own programs, add listing 5 to the base program and merge into your program or, after running *Save "break" Code 65110,77* (16K *32330,77*), *Load* into your program after *Clear 65109 (32329) : Load "break" Code.* Adding the line *Rand Usr 65110 (32330)* to your program will then turn the routine on.

Moving display. This routine is designed to show how the screen can be manipulated with an interrupt routine. The chosen lines of the display are moved one pixel to the left on each interrupt. This could be used, for example, to produce a moving landscape, with a game taking place overhead. The part of the screen that moves is a block, up to eight lines deep, starting from the top, middle or bottom of the screen.

When listing 6 has been added, *Saved* and Run, *Poke 65137,(32353)* with the number of lines to be moved and *Poke 65135 (32351)* with:

64 for top third of screen.
72 for middle third,
80 for bottom third.

The program at line 200 (listing 6) gives some examples of this in action.

Trace/Memory Free. This last and longest routine gives the Spectrum a trace command. This places on screen the line and statement number as the program is Run — also the amount of unused memory. The speed that the program runs can be adjusted from 75 percent normal speed to very slow.

One line of the screen is cleared and used as the status line. The first number shown is the memory report. Direct commands are checked for and shown as line *0000:01*. The routine contains its own print routine, so that it will always function even with the printer running.

To use, *Poke 65199 (32418)* with the required speed (not above 40 approx), then turn the routine on. The speed can be changed when trace is on. After use in debugging, etc, it could be replaced in your final program with the break/disable routine previously described.

Note, to save code only; *Save "trace" Code 65110,176 (32330,176)* and reload as in the break/disable example.

In this article I have shown some of the ways in which interrupts can be used within programs — it is now up to you to improve them and write your own. When doing this, the following points must be borne in mind:

(1) Always *Save* the contents of any register that you use and restore it again before turning to the main routine.

(2) When an interrupt occurs, the cpu disables any further interrupt to prevent an interrupt service routine from being interrupted, thus forming an unbreakable loop. Therefore, always ensure that the *EI* (interrupt enable) command is used before returning to the main routine.

(3) If you require the Spectrum to read the keyboard and your routine does not do so, end with a *JP 0038H* — this will read the keys, etc — and then return to the main routine. Otherwise, end service routine with a *Return* instruction. ■

List 3

```
  90>REM  INTERRUPT ROUTINE START
          AT LINE 100.
  95 STOP
  99 REM border 48K or 16K
 100 DATA 15,245,58,141,92,15,15
,15,230,15,211,254,241,195,56,0:
 REM BORDER
 200 REM DEMONSTRATION PROGRAM
 210 RANDOMIZE USR 65110
 220 INK 0: FOR A=0 TO 7: PAPER
A: PRINT "The border changes col
our with  paper!  Without a BORD
ER Command": PAUSE 100: NEXT a
 230 RANDOMIZE USR 65120
```

List 4

```
  90>REM  INTERRUPT ROUTINE START
          AT LINE 100.
  95 STOP
  99 REM SOUND 48K OR 16K
 100 DATA 21,229,213,197,245,17,
16,0,33,16,0,205,181,03,241,193,
209,225,243,195,56,0:  REM SOUND
 199 STOP
 200 REM DEMONSTRATION PROGRAM
 210 RANDOMIZE USR 65110
 215 PRINT "SPECTRUM SOUNDS"
 220 FOR A=120 TO 10 STEP -10: P
OKE 65134,a: PRINT "POKE 65134 =
";a: FOR b=100 TO 10 STEP -10: P
OKE 65137,b: PRINT ,"POKE 65137
";b: PAUSE 25: NEXT b: NEXT a
 230 RANDOMIZE USR 65120
```

List 5

```
  90>REM  INTERRUPT ROUTINE START
          AT LINE 100.
  99 REM BREAK DISABLE 48K OR 16
K
 100 DATA 56,245,58,56,92,254,20
,40,4,241,195,56,0,205,176,22,42
,89,92,205,82,22,35,62,232,119,2
41,241,253,52,13,1,3,0,17,112,92
,33,68,92,253,203,10,126,40,1,9,
237,184,253,54,10,255,251,195,24
4,18:  REM break disable
 199 STOP
 200 REM DEMONSTRATION PROGRAM
 210 RANDOMIZE USR 65110
 215 PRINT "THIS PROGRAM CANNOT
BE BROKEN   INTO! CAPS SHIFT AND
 SPACE WILL ONLY PAUSE THE PROGR
AM "
 220 FOR A=1 TO 1000: PRINT AT 1
0,10;A: NEXT A
 225 PRINT AT 16,0;"THIS WILL WO
RK WITH ANY          BASIC PROGRA
M"
 230 RANDOMIZE USR 65120
```

Continued on page 23

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List 6

```
  90>REM INTERRUPT ROUTINE START
        AT LINE 100.
  99 REM MOVING DISPLAY
                    48K OR 16K
 100 DATA 47,229,213,197,245,33,
0,64,6,8,197,229,6,8,197,126,229
,245,1,31,0,64,93,35,237,176,241
,15,225,193,36,16,237,225,1,32,0
,9,193,16,225,241,193,209,225,19
8,55,0: REM MOVING DISPLAY
 110 REM
 120 REM POKE 65136 WITH
        64 FOR TOP SCREEN THIRD
        72 FOR MIDDLE SCREEN
        80 FOR LOWER SCREEN
 125 REM POKE 65137 WITH No. OF
LINES TO MOVE (MAX 8)
 130 REM
 199 STOP
 200 REM DEMONSTRATION PROGRAM
 215 CLS : POKE 65135,80: POKE 6
5137,8
 220 PLOT 0,0: DRAW 30,15,-1: DR
AW 50,15,-.5: DRAW 50,-5,-.75: D
RAW 26,1,-1: DRAW 13,1,.5: DRAW
20,-10,1
 230 DRAW 51,-2,.2: DRAW 15,-12,
.9
 234 PRINT AT 21,1;"A MOVING LAN
DSCAPE"
 235 RANDOMIZE USR 65110
 240 PAUSE 500
 245 POKE 65135,72: POKE 65137,1

 250 RANDOMIZE USR 65120
 260 POKE 65135,72: POKE 65137,1
: PRINT AT 7,0;"THIS IS A DEMONS
TRATION ""THIS IS A MOVING
MESSAGE""THIS IS A STILL MESSAG
E"
 270 RANDOMIZE USR 65110: PAUSE
400: RANDOMIZE USR 65120
 280 POKE 65135,64: POKE 65137,2

 290 PRINT AT 0,0;"THE DISPLAY W
ILL ONLY STOP TO   BEEP OR DURIN
G LOAD/SAVE        AT OTHER TIME
 IT WILL MOVE"
 295 RANDOMIZE USR 65110
 300 PAUSE 100: BEEP 5,10: BEEP
5,30: PAUSE 100: RANDOMIZE USR 6
5120
```

List 7

```
  99>REM TRACE (48K)
 100 DATA 157,245,197,213,229,33
,0,64,14,8,62,0,6,31,229,119,35,
16,252,225,36,13,32,244,237
 110 DATA 91,101,92,42,61,92,167
,237,82,17,16,0,205,223,254,17,2
4,0,42,69,92,124,60,32,3,33,0,0,
205,229,254,62
 120 DATA 10,205,191,254,58,71,9
2,38,0,111,205,241,254,1,1,1,203
,126,16,252,13,32,249,225,209,19
5,241,195,56,0,19,213
 130 DATA 229,33,0,64,25,229,33,
128,61,22,0,167,23,23,23,95,25,2
25,225,6,7,26,119,36,19,16,250,2
09,209,201,1,240
 140 DATA 216,205,252,254,1,24,2
52,205,252,254,1,156,255,205,252
,254,1,246,255,205,252,254,125,2
05,191,254,201,175,9,60,56,252,2
37,86,61,24,185
 199 STOP
 200 REM TO move status line to
bottom of screen run lines
     205/210
 205 POKE 65219,192: POKE 65220,
80
 210 POKE 65134,192: POKE 65135,
80
```

List 7(b)

```
  99>REM TRACE (16K)
 100 DATA 157,245,197,213,229,33
,0,64,14,8,62,0,6,31,229,119,35,
16,252,225,36,13,32,244,237
 110 DATA 91,101,92,42,61,92,167
,237,82,17,16,0,205,210,156,17,2
4,0,42,69,92,124,60,32,3,33,0,0,
205,216,156,62
 120 DATA 10,205,175,156,58,71,9
2,38,0,111,205,225,156,1,1,1,203
,126,16,252,13,32,249,225,209,19
5,241,195,56,0,19,213
 130 DATA 229,33,0,64,25,229,33,
126,61,22,0,167,23,23,23,95,25,2
25,225,6,7,26,119,36,19,16,250,2
09,209,201,1,240
 140 DATA 216,205,239,156,1,24,2
52,205,239,156,1,156,255,205,239
,156,1,246,255,205,239,156,125,2
05,176,156,201,175,9,60,56,252,2
37,86,61,24,185
 199 STOP
 200 REM TO move status line to
bottom of screen run lines
     205/210
 205 POKE 32353,192: POKE 32354,
80
 210 POKE 32436,192: POKE 32439,
80
```


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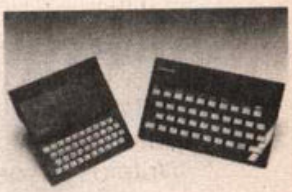

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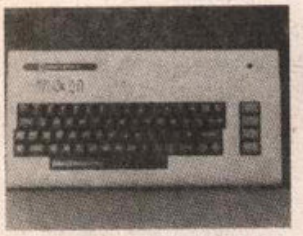

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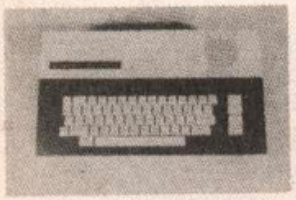

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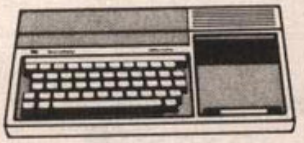

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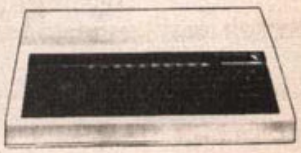

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But, this task will not be easy. The slightest movement or too fast landing will lead to your ship being blown up. Also, cosmic stars float above the surface and on some occasions will cause an explosion. On some screens, landing pads do not appear, so death is imminent no matter what happens. The more screens you clear, the more intense the winds become.

The program has full instructions and a signature tune. The landing screen is drawn in hi-res colour graphics, with stars and a 3D perspective graphics landscape. Landing pads are randomly placed. The ship is two characters high. Fuel readout is at the top of the screen.

Keys for the game are:

Z . . . Left
C . . . Right
M . . . Thrust

It is unwise to keep your hand on a key for too long. Once the craft starts drifting too fast, it will be hard to stop. If you crash into the top, or sides, of the screen, your craft will explode.

If the screen set-up is not to your liking, add this line:

```
655 IF A$="P"THEN GOTO 340
```

On the press of *P*, the screen will be redrawn, though the variables will stay the same.

Variables

CA	Craft position across screen
CB	Craft position down screen
DRIFT	Wind force
DEC	Descent rate
CAB	Ships step of movement across screen
SN	Ships to go
SC	Score

Notes

10-230	Instructions and signature tune
240-330	User defined graphics and sound effects
350-560	Set up screen display
570-680	Prints craft and waits for keyboard input
690-730	Deletes ship
740-830	Checks for crash or land
830-900	Crashes, checks for end of game
910-950	Lands, adds up score
960-1000	Updates instruments
1010-1060	End of game, wait for new start

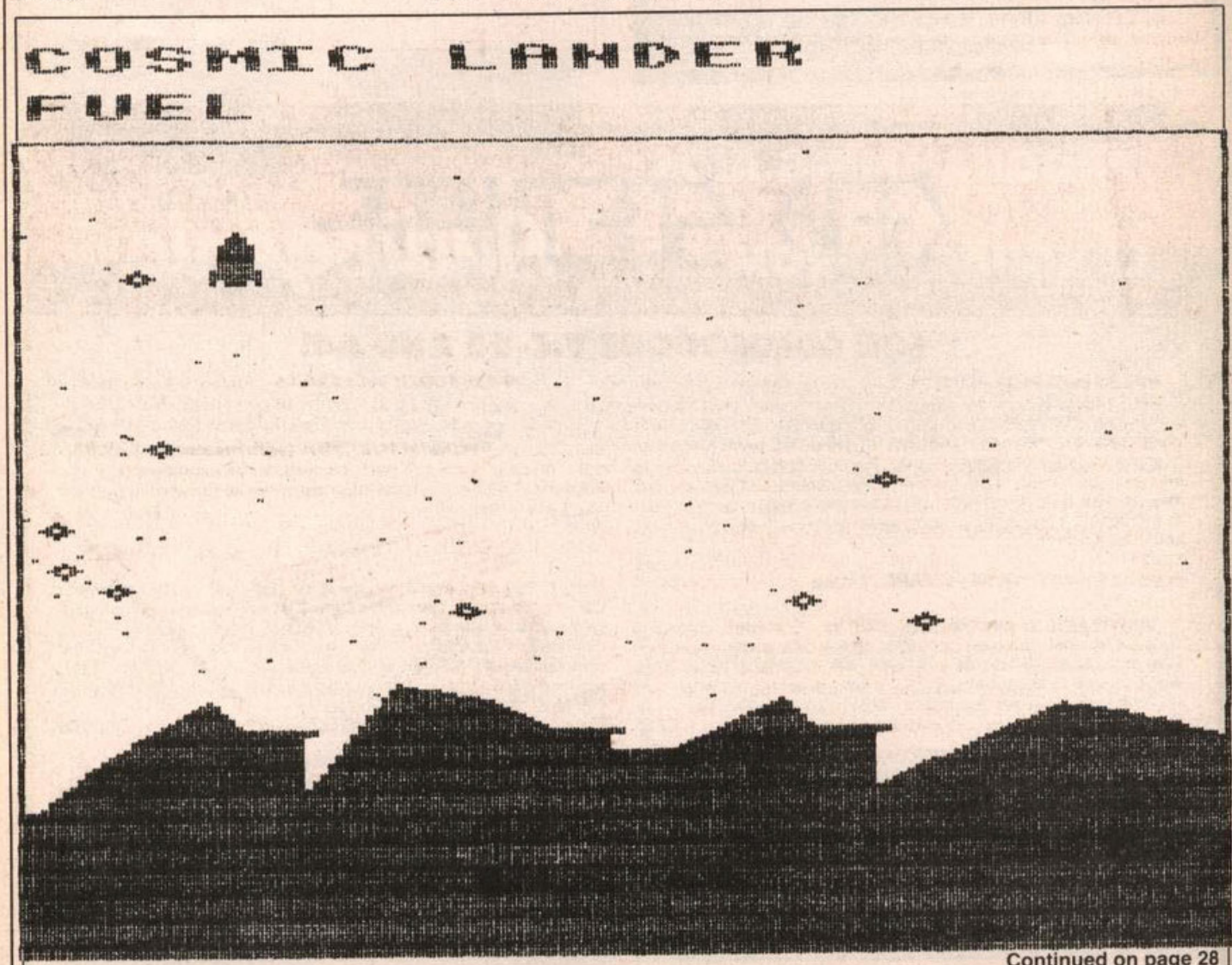
Proc statements

PROCscreen	Sets up screen
PROCcraft	Print craft waits for instructions
PROCmoving	Blacks out craft
PROCpos	Checks for crash or land
PROCcrash	Crashes craft
PROCland	Lands craft
PROCinst	Updates instruments
PROCend	Ends game

Conversion to BBC model A

Delete lines 10, 230
The following lines should read:

```
320 MODE 5;VDU19,0,4,000:VDU23;8202,0;0;
    0;:VDU5
400 FOR N= 1 TO20: X=RND(1240):Y=RND
    (700) + 200
410 Z=RND(2)+1:GCOL1,Z:IF Z=2 THEN MOVE
    X,Y:PRINTCHR$246
420 NEXT MOVE 0,0
520 GCOL0,3:MOVE N-2,250:DRAW N+75,250
750 IF POINT (CA+25,CB-70)=3 THEN 760 ELSE
    780
850 MOVE CA,CB:GCOLO,3:PRINT CHR$
    242:MOVE CA,CB-32:PRINT CHR$243 ■
```



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50. Program to Upper Case
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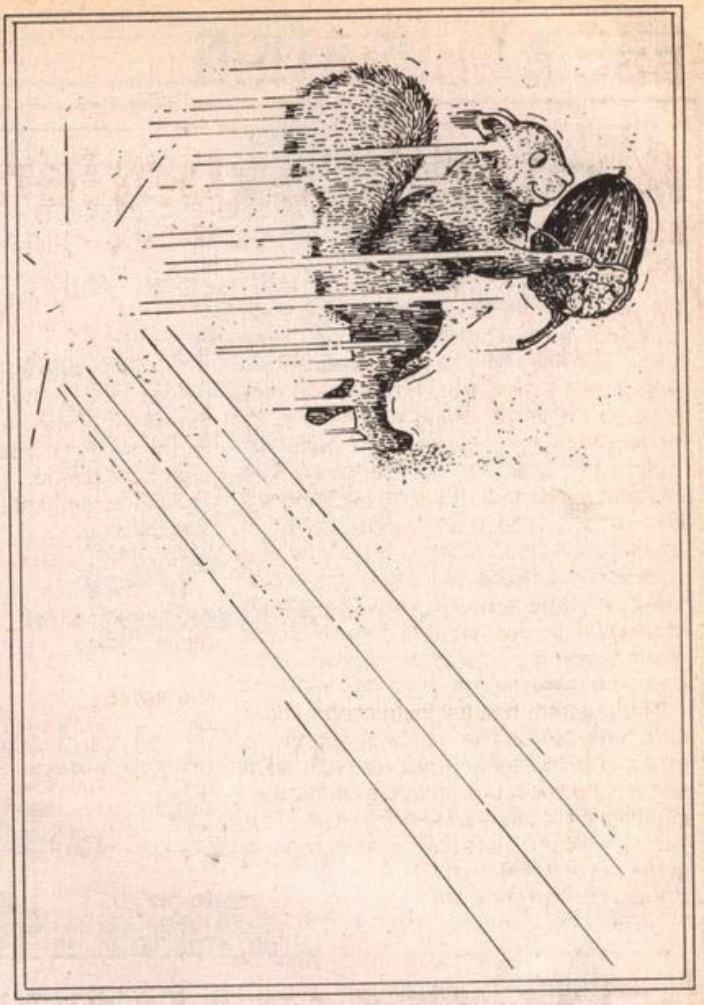

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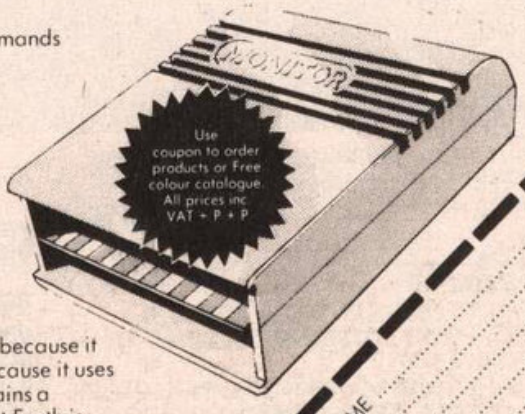

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```
10REM "COSMIC LANDER BY Michael Pearc
  e"
20REM "PROGRAMMED ON THE BBC MODEL A
  32K OS. 1.2 IN APPROX 26K"
30MODE7:*FX15,0
40PRINTCHR$141;"COSMIC LANDER":PRINTC
  HR$141;"COSMIC LANDER"
50PRINTCHR$136;"BY Michael Pearce"
60PRINT'"MISSION TO LAND TO YOUR SPAC
  E CRAFT ON ASET UP PRESSURE PAD"
70PRINT'"FUEL IS LOW AND WHEN RAPPID
  PIPS SOUND  IT IS AT ITS MINIMIUM"
80PRINT'"THE MOON HAS A HEAVY CROSS W
  IND          WHICH DRIFTS YOUR ";
90PRINT"SHIP ACROSS THE SCREEN"
95PRINT"ALSO BEWARE OF FLOATING STARS"
100PRINT'"LAND CAREFULLY ANY MOVEMENT
  ON A"
110PRINT"PRESSURE PAD MIGHT LEAD TO AN
  EXPLOSION"
120PRINT'"KEYS...."
130PRINT"Z.....LEFT"
140PRINT"C....RIGHT"
150PRINT"M...THRUST"
160PRINT'"FUEL BONUS AFTER EVERY LANDI
  NG"
170REPEAT:READF,D:IF F=99 GOTO230
180IFF=0SOUND1,0,0,D ELSESOUND1,-10,F,D
190SOUND1,0,0,1
200UNTIL 0
210DATA56,4,80,24,88,24,96,32,0,4,96,4,
  100,16,100,8,96,12,80,4,96,8,88,32
220DATA99,0
230PRINTCHR$136;"Any key to start";:A=
  GET
240ENVELOPE2,16,16,1,1,200,0,0,126,0,0,
  -126,80,80
250ENVELOPE5,6,2,20,16,16,0,0,126,0,0,
  -126,126,126
260ENVELOPE1,1,1,1,1,5,10,60,80,-1,0,0,
  50,0
270VDU23,240,8,8,28,28,62,62,62,62:VDU
  23,241,62,62,62,127,127,127,93,93
280VDU23,242,0,16,16,16,16,68,56,254:V
  DU23,243,56,68,16,16,16,16,0,0
290VDU23,244,255,255,255,255,255,255,2
  55,255:VDU23,245,24,24,24,24,0,0,0,
  65
300VDU23,246,0,8,28,54,28,8,0,0,0
310SN=3:SC=0:W=3:A$=""
320MODE2:VDU19,0,4,0,0,0:VDU23;8202;0;
  0;0;:VDU5
330CA=200:CB=800:DRIF=RND(W)-(W/2):DEC
  =-10:CAB=0:FUEL=17
340CLS:VDU5
350PROCscreen
360PROCCRAFT:PROCMOVEING:PROCINST:PROCP
  OS
370GOTO360:GOTO330
380DEFPROCscreen
390GCOL0,7:MOVE0,0:DRAW0,900:DRAW1279,
  900:DRAW1279,0:DRAW0,0
400FORN=1TO70:X=RND(1240):Y=RND(700)+2
  00
410Z=RND(11)+1:GCOL1,Z:IFZ=2THENMOVEX,
  Y:PRINTCHR$246
420MOVEX,Y:PLOT 69,X,Y:NEXT:MOVE0,0
430FORC=1TO3:FORN=1TO1700STEP100
440GCOL0,C:MOVE500,0
450PLOT85,N,RND(200-C*30)+200-C*70:NEXT
460MOVE0,0:PLOT85,1280,0:MOVE0,0:IFC=1
  THEN480ELSENEXT
470ENDPROC
480FORN=10TO1200
490IFPOINT(N,250)=1ANDPOINT(N+2,250)=0
  ANDPOINT(N+75,250)=0THEN510ELSENEXT
500GOTO540
510MOVEN-2,250:MOVEN+65,250:GCOL0,1:PL
  OT85,N+65,100
520GCOL0,6:MOVEN-2,250:DRAWN+75,250
530MOVEN-2,247:DRAWN+75,247:NEXT
540GCOL0,3:MOVE10,1005:PRINT"COSMIC LA
  NDER"
550MOVE10,955:PRINT"FUEL":MOVE0,0
560NEXT
570DEFPROCCRAFT
580GCOL0,5
590MOVECA,CB:PRINTCHR$(240):MOVECA,CB-
  32:PRINTCHR$(241)
600GCOL0,3:MOVECA,CB-32:PRINTCHR$(245)
610*FX15,0
620A$=INKEY$(20)
630IFA$="Z"THENCAB=CAB-3:SOUND0,1,4,5
640IFA$="C"THENCAB=CAB+3:SOUND0,1,4,5
650IFA$="M"THENDEC=DEC+3:FUEL=FUEL-1:S
  OUND0,-2,4,10
660IFA$<>""THENTIME=0:REPEATUNTILTIME=
  20
670IFA$=""THENDEC=DEC-1:CAB=CAB+DRIF
680ENDPROC
690DEFPROCMOVEING
700GCOL0,0
710MOVECA,CB:PRINTCHR$240:MOVECA,CB-32
  :PRINTCHR$241
720CA=CA+CAB:CB=CB+DEC
730ENDPROC
740DEFPROCPOS
750IFPOINT(CA+25,CB-70)=6THEN760ELSE780
760IFCAB<6ANDCAB>-6THEN770ELSEPROCCRASH
770IFDEC<10ANDDEC>-10THENPROCLAND ELSE
  PROCCRASH
780IFPOINT(CA+25,CB-70)=1ORPOINT(CA+20
  ,CB-60)=2THENPROCCRASH
790IFCA>1200THENPROCCRASH
800IFCA<10THENPROCCRASH
810IFCB>880THENPROCCRASH
820IFFUEL<1THENPROCCRASH
830ENDPROC
840DEFPROCCRASH
850MOVECA,CB:GCOL0,12:PRINTCHR$242:MOV
  ECA,CB-32:PRINTCHR$243
860SOUND0,5,4,20:SN=SN-1
870VDU4:PRINTTAB(2,10);"FUEL BONUS GON
  E":PRINTTAB(3,12);"CRAFTS LEFT ";SN
880TIME=0:REPEATUNTILTIME=700
890IFSN=0THENPROCEND
900GOTO330
910DEFPROCLAND
920GCOL0,14:MOVECA,CB:PRINTCHR$240:MOV
  ECA,CB-32:PRINTCHR$241
930GCOL0,12:MOVECA,CB-32:PRINTCHR$245
935*FX21,4
940SOUND1,2,0,40:VDU4:PRINTTAB(4,10);"
  FUEL BONUS ";FUEL
950TIME=0:REPEATUNTILTIME=700:SC=SC+20
  +FUEL:W=W+2:GOTO330
960DEFPROCINST
970VDU4:FORN=5TOFUEL:COLOUR7:PRINTTAB(
  N,2);CHR$244:NEXT
980PRINTTAB(N+1,2);" "
990IFFUEL<5THENSOUND2,-10,150,2
1000VDU5:ENDPROC
1010DEFPROCEND
1020VDU4:PRINTTAB(1,10);"   END OF GAME
1030PRINTTAB(3,12);"  SCORE ";SC;"      "
1040PRINTTAB(1,14);"KEY TO PLAY AGAIN"
1050*FX15,0
1060A=GET:RUN
```

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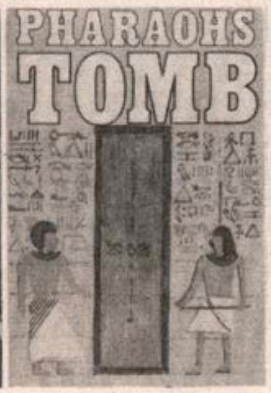

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Unrestricted access

***Bernice Hennessy** explains how to obtain machine code access to Basic functions*

In his article "A Routine Matter" (*PCW* 20-26 October), Peter Whittaker describes a very useful technique for calling Basic Rom routines from a machine code program. In a similar manner, you can access the functions of Basic and also any additional Basic commands provided, for example by disc operating systems or some hardware add-on modules.

To do this, you need to know that the Basic system uses a list of reserved commands and functions, together with their corresponding addresses. During Basic initialisation, pointers to these are set up in Ram as follows:

$120 Number of normal reserved words
$121 Address of normal reserved words list
$123 Address of statement despatch table
$125 Number of function reserved words
$126 Address of function reserved words list
$128 Address of function despatch table

Listings 1 and 1a are generalisations of Peter Whittaker's program which display both normal reserved words and Basic functions. You will see that the statement despatch table only contains *Exec* addresses for tokens up to 186 Renum, because later tokens are always used in conjunction with an earlier one. Functions are represented by a pair of tokens, the first always being $*FF*.

The lists of reserved words and the addresses of the subroutines to implement them are normally stored in the Basic Rom. The way in which extra commands are added to Basic (or existing commands given new meanings) is to move the reserved word list and despatch table (ie, list of addresses) into either protected Ram or the cartridge Rom area. It is then possible to redefine commands and their meanings as required. Listing 2 shows an example of this where the function reserved word list and function dispatch table have been moved into Ram and the following modifications made:

The INT and MEM functions no longer exist.
Token 255 129 has been redefined as QNT and points to $8C31 (the old MEM routine).
Token 255 155 has been redefined as % and points to $7CE5 in Ram where a machine code routine gives the function its meaning.

Using this technique, it is possible to redefine Basic words at will (although you change the meaning of existing words at your peril!) and to define meanings for extra Basic commands which you can add to your Dragon's repertoire. ■

```
5 REM DRAGON — BASIC TOKENS  BY B.HENNESSY
10 PRINT#-2
20 A=127:B=PEEK(289)*256+PEEK(290):C=PEEK(291)*256+PEEK(292):
   D=127+PEEK(288)
30 PRINT#-2,PEEK(288);"NORMAL RESERVED WORDS — LIST BEGINS
   AT";B;" — ADDRESSES BEGIN AT";C
35 T$="":B=B-1
40 GOSUB 200
50 PRINT#-2
60 A=127:B=PEEK(294)*256+PEEK(295):C=PEEK(296)*256+PEEK(297):
   D=127+PEEK(293)
70 PRINT#-2,PEEK(293);"FUNCTION RESERVED WORDS — LIST BEGINS
   AT";B;" — ADDRESSES BEGIN AT";C
75 T$="255 ":B=B-1
80 GOSUB200
90 STOP
200 PRINT#-2,"TOKEN";TAB(20)"BASIC";TAB(40)"EXEC ADDRESS"
205 PRINT#-2,TAB(41);"DEC.   HEX."
210 A=A+1:IF A>D THEN RETURN ELSEPRINT#-2,T$;A;TAB(20)" ";
220 B=B+1:IF PEEK(B)>128 THEN PRINT #-2,CHR$(PEEK(B));:
   GOTO220 ELSE PRINT#-2,CHR$(PEEK(B)-128);
230 E=PEEK(C)*256+PEEK(C+1):C=C+2:PRINT#-2,TAB(39)E;"  "
   ;HEX$(E):GOTO210
240 END
```

Fig 1

34 FUNCTION WORDS — LIST BEGINS AT 32450 — ADDRESSES BEGIN AT 32583

TOKEN	BASIC	EXEC ADDRESS DEC.	HEX.
255 128	SGN	37925	9425
255 129	QNT	35889	8C31
255 130	ABS	37950	943E
255 131	POS	39646	9ADE
255 132	RND	38770	9772
255 133	SQR	38551	9697
255 134	LOG	37436	923C
255 135	EXP	38675	9713
255 136	SIN	38865	97D1
255 137	COS	38859	97CB
255 138	TAN	38934	9816
255 139	ATN	39031	9077
255 140	PEEK	36582	8E96
255 141	LEN	36295	8DC7
255 142	STR$	35904	8C40
255 143	VAL	36444	8E5C
255 144	ASC	36326	8DE6
255 145	CHR$	36386	8DD2
255 146	EDF	47104	B800
255 147	JOYSTK	47885	B88D
255 148	FIX	39254	9956
255 149	HEX$	40974	A00E
255 150	LEFT$	36337	8DF1
255 151	RIGHT$	36366	8E0E
255 152	MID$	36373	8E15
255 153	POINT	47684	BA44
255 154	INKEY$	46998	B796
255 155	%	31973	7CE5
255 156	VARPTR	39668	9AF4
255 157	INSTR	39860	9884
255 158	TIMER	40281	9059
255 159	PPOINT	42695	A6C7
255 160	STRING$	39812	9B84
255 161	USR	40221	9D1D

Fig 2

Continued on page 33

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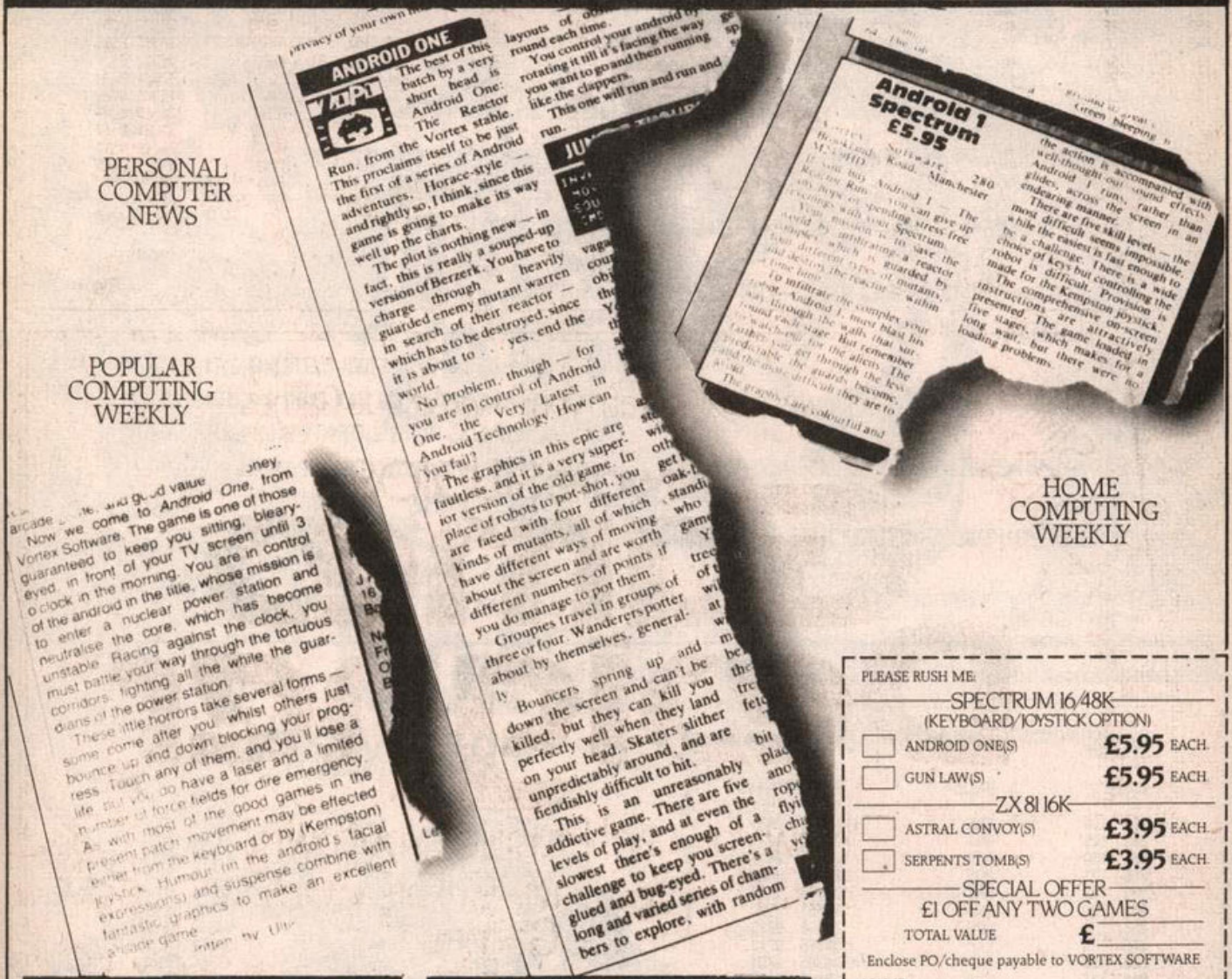

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78 NORMAL RESERVED WORDS — LIST BEGINS AT 32819 — ADDRESSES BEGIN AT 33108

TOKEN	BASIC	EXEC DEC.	ADDRESS HEX.
128	FOR	33864	8448
129	GO	34233	8589
13p	REM	34326	8616
131		34326	8616
132	ELSE	34326	8616
133	IF	34375	8647
134	DATA	34323	8613
135	PRINT	36925	903D
136	ON	34421	8675
137	INPUT	34683	872B
138	END	34898	8532
139	NEXT	34857	8829
140	DIM	35467	8A88
141	READ	34679	8777
142	LET	34492	86BC
143	RUN	34213	85A5
144	RESTORE	34868	8514
145	RETURN	34291	85F3
146	STOP	34105	8539
147	POKE	36589	8E9D
148	CONT	34144	8568
149	LIST	36522	8EAA
150	CLEAR	34161	8571
151	NEW	33813	8415
152	DEF	40065	9C81
153	CLOAD	46884	B6D4
154	CSAVE	46722	B682
155	OPEN	47144	B828
156	CLOSE	46668	B64C
157	LLIST	36516	8EA4
158	SET	47578	B9D2
159	RESET	47619	BA03
160	CLS	47711	BA5F
161	MOTOR	47489	B981
162	SOUND	47770	BA9A
163	AUDIO	47839	BADF
164	EXEC	46968	B770
165	SKIPF	47134	B81E
166	DEL	48289	9061
167	EDIT	39269	9965
167	EDIT	39269	9965
168	TRON	39641	9AD9
169	TROFF	39642	9ADA
170	LINE	42825	A749
171	PCLS	43200	A8C0
172	PSET	42735	A6EF
173	PRESET	42739	A6F3
174	SCREEN	43518	A9FE
175	PCLEAR	43545	AA19
176	COLOR	43220	A8D4
177	CIRCLE	45624	B238
178	PAINT	44167	AC87
179	GET	43768	AAF0
180	PUT	43763	AAF3
181	DRAW	45137	B051
182	PCOPY	43710	AA8E
183	PMODE	43439	A9AF
184	PLAY	44477	AD8D
185	DLOAD	41033	A049
186	RENUM	48442	9DFR
187	TAB(	21319	5347
188	TO	52809	CE49
189	SUB	20180	4ED4
190	FN	16706	4142
191	THEN	54096	D350
192	NOT	20435	4FD3
193	STEP	21078	524E
194	OFF	58259	C453
195	+	28946	51D2
196	−	19535	4C4F
197	★	51013	C745
198	(/)	22736	5808
199	^	21321	5349
200	AND	52883	CE43
201	OR	20435	4FD3
202	>	21569	5441
203	=	52801	CE41
204	<	21710	54CE
205	USING	28549	5045

34 FUNCTION RESERVED WORDS — LIST BEGINS AT 33226 — ADDRESSES BEGIN AT 33360

TOKEN		BASIC	EXEC DEC.	ADDRESS HEX.
255	128	SGN	37925	9425
255	129	INT	38841	9499
255	130	ABS	37958	943E
255	131	POS	39646	9ADE
255	132	RND	38770	9772
255	133	SQR	38551	9697
255	134	LOG	37436	923C
255	135	EXP	38675	9713
255	136	SIN	38865	97D1
255	137	COS	38859	97CB
255	138	TAN	38934	9616
255	139	ATN	39031	9877
255	140	PEEK	36582	8E96
255	141	LEN	36295	8DC7
255	142	STR$	35904	8C40
255	143	VAL	36444	8E5C
255	144	ASC	36326	8DE6
255	145	CHR$	36386	8DD2
255	146	EDF	47104	B808
255	147	JOYSTK	47885	B880
255	148	FIX	39254	9956
255	149	HEX$	40974	A88E
255	150	LEFT$	36337	8DF1
255	151	RIGHT$	36366	8E8E
255	152	MID$	36373	8E15
255	153	POINT	47684	BA44
255	154	INKEY$	46998	B796
255	155	MEM	35889	8C31
255	156	VARPTR	39668	9AF4
255	157	INSTR	39860	9884
255	158	TIMER	48281	9059
255	159	PPOINT	42695	A6C7
255	160	STRING$	39812	9834
255	161	USR	40221	901D

Fig 1a

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A registered connection

Pete Gerrard takes a look at some of the registers connected with the Sid chip

Last week I gave you some of the fundamental information regarding the use of the 6581 Sid chip in your Commodore 64.

While space precludes an in-depth look at everything connected with the chip, this week we're going to take a detailed look at just some of the more interesting registers, starting with register 54276.

At this point it would be useful to dig out last week's copy, and have the Sid memory map in front of you.

Control Register
This is the most important register of them all, containing eight control bits with the following functions:

Gate — Bit 0
This controls the envelope generator for voice 1, and when this bit is set to a '1' the envelope generator is triggered and the Attack/Decay/Sustain (or ADS) cycle is begun.

When this bit is reset to a zero, then the release part of the cycle begins.

This envelope generator controls the amplitude of voice 1 as it appears at the audio output, and must therefore be triggered in order for the selected output of voice 1 to be audible.

Sync — Bit 1
When set to a '1' this synchronizes the fundamental frequency of voice 1 with the fundamental frequency of voice 3, producing what are known as 'hard sync' effects.

Varying the frequency of voice 1 with respect to voice 3 produces a wide range of complex harmonic structures from voice 1 at the frequency of voice 3.

In order for this to take place, obviously voice 3 must be set to some frequency or other, preferably lower than that of voice 1, but naturally higher than zero. Nothing else connected with voice 3 has any effect on Sync.

Ring Mod — Bit 2
When set to a '1' this bit replaces the triangle waveform of voice 1 with a ring modulation combination of voices 1 and 3: obviously, one must previously have selected the waveform of voice 1 to be a triangle one!

Varying the frequency of voice 1 with respect to voice 3 produces a wide range of non-harmonic overtone structures. Again, nothing else connected with voice 3 has any effect on Ring Mod.

Test — Bit 3
This bit, when set to a '1', resets and holds voice 1 at zero, until the bit is cleared.

The noise waveform of voice 1 is also reset, and if a pulse wave has been selected this is held at a DC level.

Triangle — Bit 4
When this is set to a '1', the triangle waveform is selected for voice 1. This is low in harmonics, and thus produces a mellow, reed-like note.

Sawtooth — Bit 5
When this is set to a '1', the sawtooth waveform is selected for voice 1. This is rich in harmonics, and thus produces a brassy, trumpet-like note.

Pulse — Bit 6
When this is set to a '1' the pulse waveform is selected for voice 1. The harmonic content of this waveform can be varied by altering the pulse width registers, producing a wide variety of different musical (and not so musical) sounds.

Sweeping through the pulse widths can produce some dynamic effects, and add a sense of motion to the sound. Also worthy of experiment is a rapid altering of pulse widths.

Noise — Bit 7
When set to a '1', the noise waveform is selected for voice 1. This is a totally random signal which changes at the frequency of voice 1, and thus is of most use in generating purely sound 'effects', like missiles taking off, engines revving, or explosions.

One of the above waveforms must be selected in order for voice 1 to produce any audible sound, although that sound can be turned off without un-selecting a waveform, as the voice at the end is a function of the envelope generator only.

You cannot add more than one waveform together to produce something totally different from the above four, although you're welcome to try!

Filtering techniques
This concerns memory locations 54293 and 54294, known as Freq Lo/Freq Hi — registers $15 and $16.

As bits 3 to 7 of register $15 are not used, these two combine together to form an 11-bit number which linearly controls the cut-off, or centre frequency of the programmable filter. The approximate cut-off frequency is obtained from:

FCout = ((6.6E − 8 + FCn * 1.28E − 8)/C) Hz

where FCn is the 11-bit number in the above two registers and C is the value of the two filter capacitors connected to pins 1 to 4, or in our case 2200 picoFarads.

This gives an approximate filter range of 30 Hz to 12 KHz, according to:

FCout = (30 + FCn * 5.8) Hz

Res/Filt — Register $17 (54295)
Bits 4 to 7 of this register control the resonance of the filter, where resonance emphasises components of the frequency at the cut-off frequency of the filter, thus causing a sharper sound.

There are 16 resonance settings, ranging linearly from no resonance, when this is set to zero, or maximum resonance, when it is set to 15.

Bits 0 to 3 determine which signals will be routed through the filter:

Bit 0: When this is set to zero, voice 1 appears directly at the audio output, and there is no filtering effect. When set to 1, voice 1 is processed through the filter, and the harmonic content of voice 1 is altered according to the selected filter parameters.

Bit 1: Ditto for voice 2.

Bit 2: Ditto for voice 3.

Bit 3: Ditto for external audio input on pin 26.

Mode/Vol — Register $18 (54296)
Usually referred to as the master volume control, this actually does a whole lot more.

Bits 0 to 3 are the actual volume settings, and allow you to select an overall volume ranging from 0 (silence) to 15 (maximum).

Bits 4 to 7 select various filter modes and output options:

Bit 4: When set to a '1', the low pass output of the filter is selected and sent to the audio output. For a given filter input signal, all components of the frequency below the filter cut-off are passed through unaltered, whilst all those above the cut-off are attenuated at a rate of 12 decibels per octave.

Bit 5: As above for band pass output, but attenuation above and below the cut-off is at a rate of 6 decibels per octave.

Bit 6: As above for high pass output, and attenuation below the cut-off is back to 12 decibels per octave.

Bit 7: When this is set to '1' the output of voice 3 is disconnected from the direct audio path, so setting voice 3 to bypass the filter and setting 3 OFF to a '1' stops voice 3 from reaching the audio output. Thus voice 3 can be used for modulation purposes without any extraneous noises coming out.

These filter modes are additive, in that one can combine a number of different modes at the same time. Playing with, and understanding, these frequency alterations is the key to getting the most out of the 6581.

I have not given you any concrete examples here, so you'll just have to sit down and do it for yourself. But, armed with the above information about how the important registers can be altered for filtering, synchronisation, and other techniques, the 6581 Sid chip should begin to reveal just a few of its secrets to you. ■

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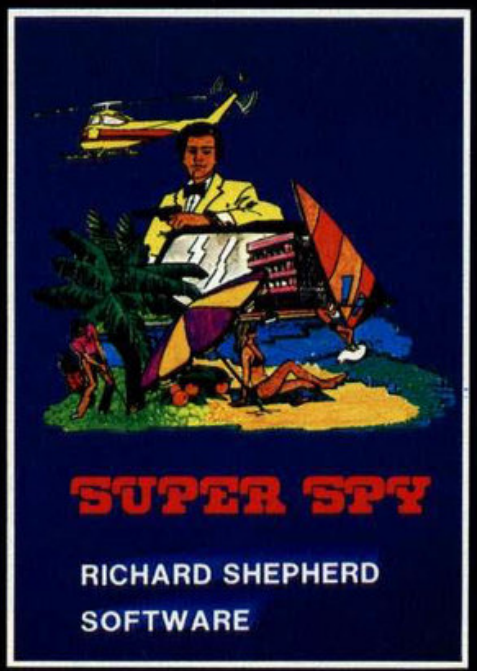

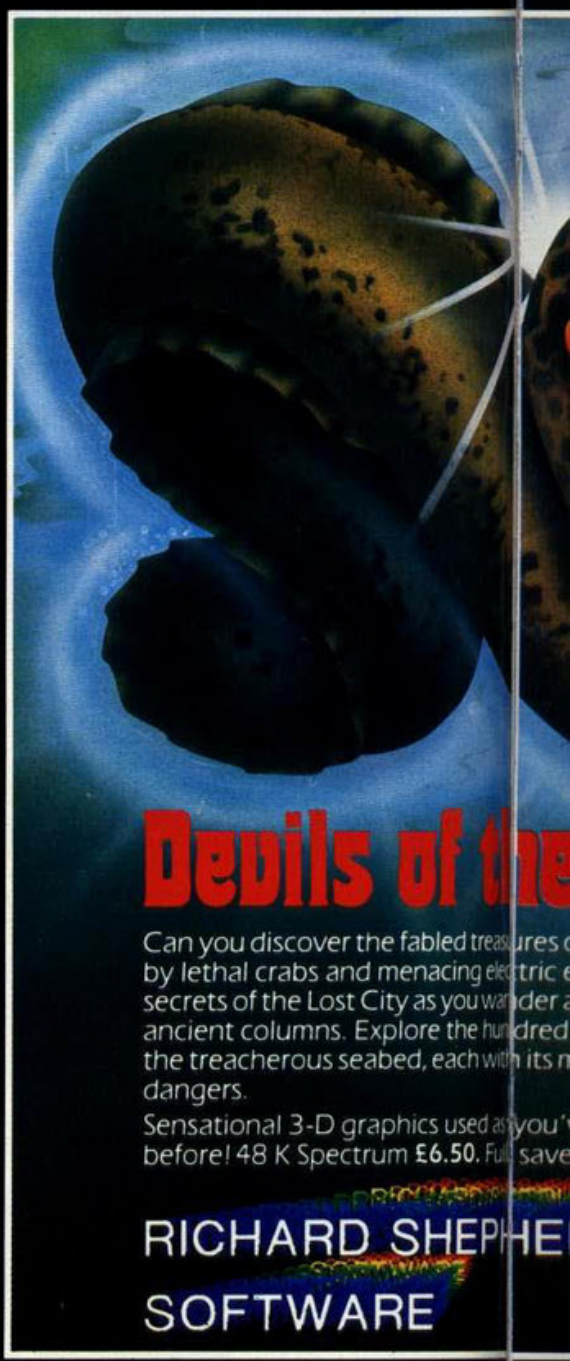

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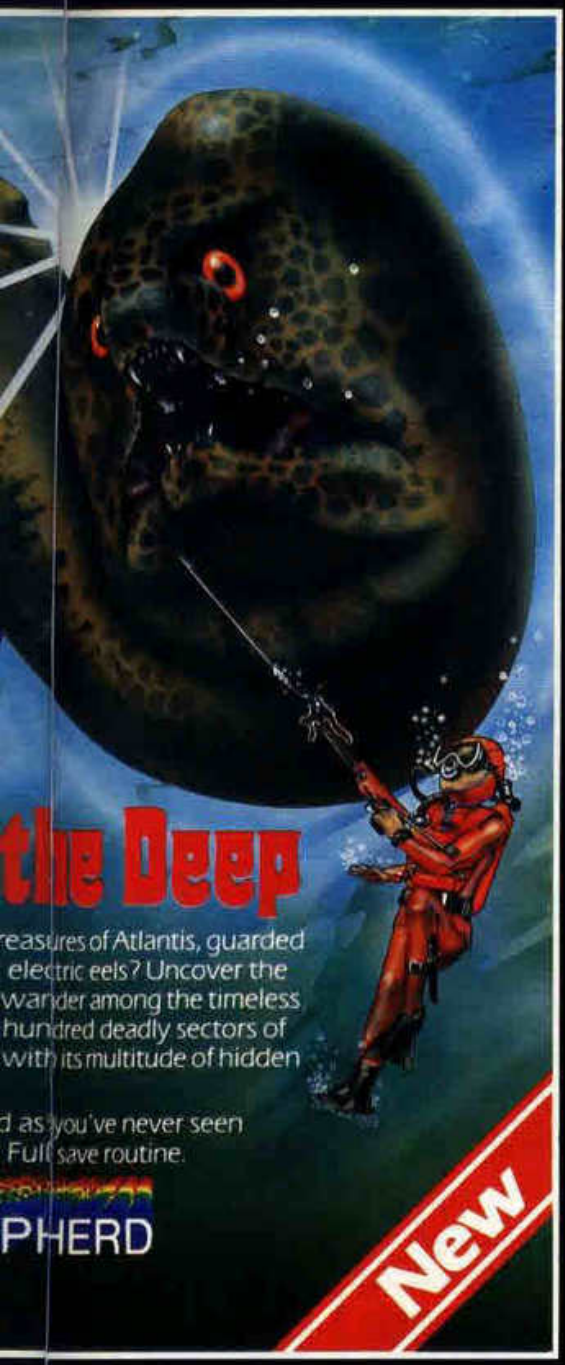

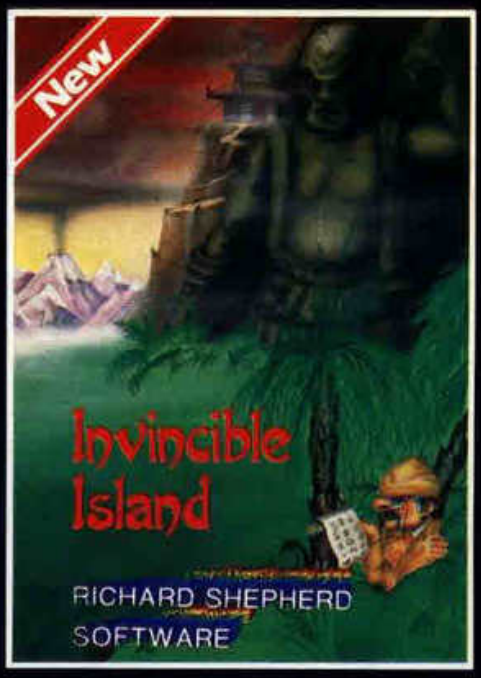

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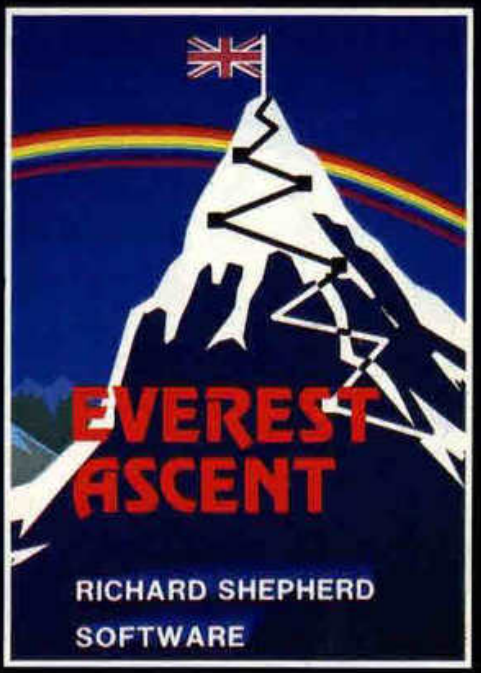

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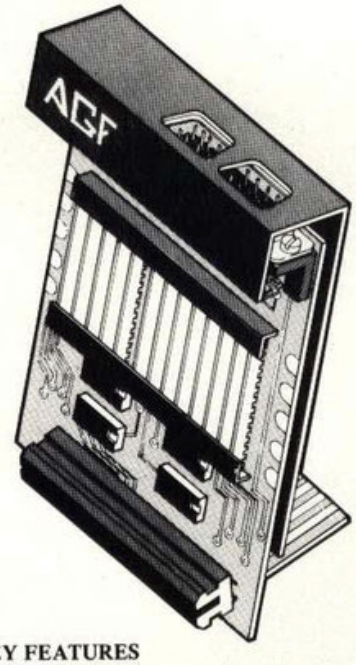

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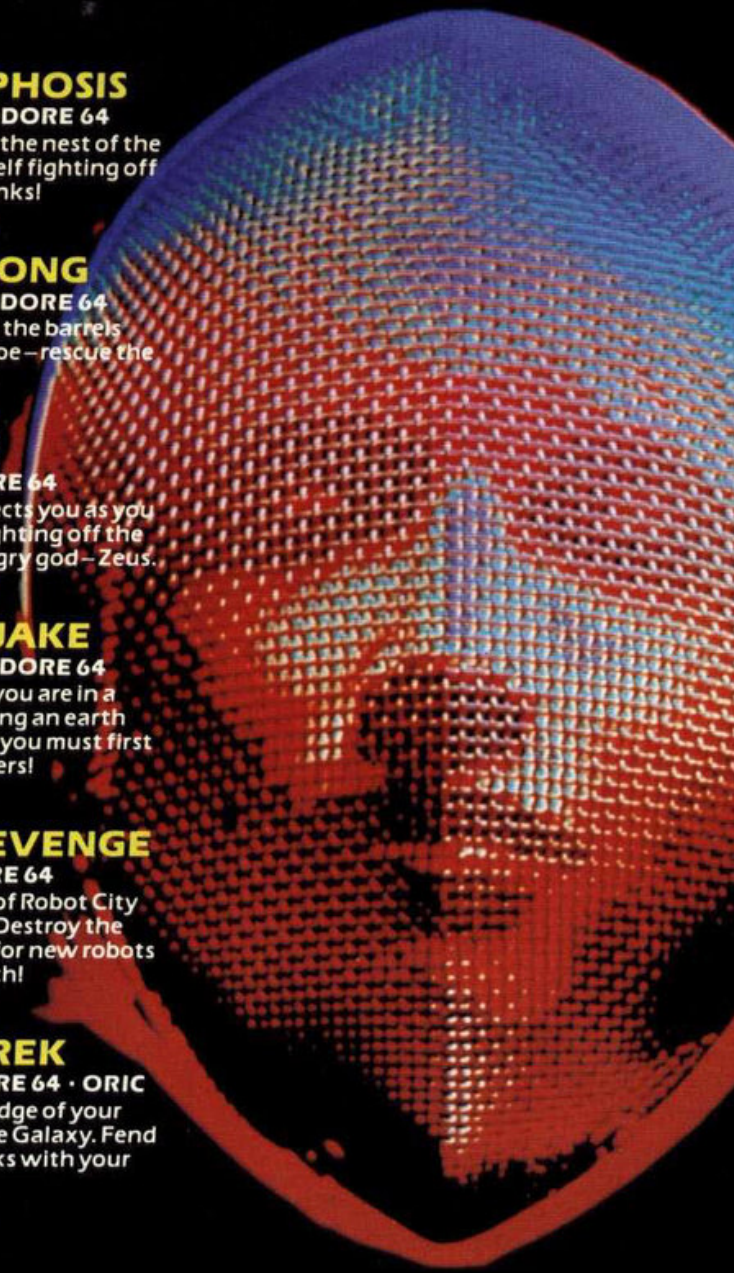

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A crowded market

***Andrew Pennell** takes his Sord in both hands and enters the cut and thrust world of the under-£200 computer market*

The CGL M5 is yet another contender in the crowded sub-£200 computer market. It is manufactured by Sord in Japan and sold in this country by CGL, known for their *Game & Match* toys.

The standard M5 machine costs £149.95, and comes with 20K Ram and 16K Rom. This is not as attractive as it first seems as 16K of the Ram is dedicated to the video display, leaving only 4K for the user. Of the Rom, 8K is contained in the machine as the operating system, while a further 8K is supplied in the Basic-I plug-in cartridge. Supplying the main language on a detachable cartridge is a very good idea, as it can be changed or upgraded. Something which may be rather necessary on the M5.

The main unit is little larger than the Spectrum, though rather heavier. It is in pleasant two-tone colours, with a detachable flap that occupies the rear third of the top. The flap has to be removed when the machine is in use, as it covers the cartridge slot. The cartridges themselves are exactly the same size as cassette boxes, and they fitted into my cassette rack perfectly. The keyboard is one of the popular (with manufacturers anyway) moving-rubber key types, but is much nicer to type on than the Spectrum. Each key is shaped as a square with a corner removed, for some inexplicable reason, and there are even 55 keys, removing the need for the complicated shifts required on the Spectrum's 40 keys. Unfortunately there is no space bar, and the space key is just under the *Return* key, which is not really a good place for it. It also has two *Shift* keys, a *Ctrl* key, a *Func* key (for single-key entry) and a *Reset* key, which sensibly also requires *Ctrl* to be pressed. Each key has the main symbol in white, any keywords in yellow, and graphic symbols in blue. As the keys themselves are also blue, it makes the graphics all but invisible under normal light.

Along the back of the case are the power and cassette sockets, a Centronics printer socket, two joystick sockets, tv output, and video and audio outputs. Regrettably, the joystick sockets are non-standard, so only the CGL 'joypads' will fit. This is a problem since they are not very good.

The power supply is a huge black slab that has to sit next to the main unit because of its short lead — aesthetically pleasing it is not, but, thankfully, it is silent.

Inside the case there is only one circuit board containing the electronics. It is well concealed under a considerable weight of metal shielding which really does cut down on radio interference — Sinclair please note. Among the components are the Z80A microprocessor, the Texas 9929 video chip, a Z80 CTC timer chip, a 76489 sound chip, and an 8K *Rom*. The CGL M5 uses the same video chip as that in the now defunct TI 99/4A, the new Memotech MTX500 (see *Popular Computing Weekly*, November 17), and the forthcoming MSX-standard series machines. The sound chip is the same as that used by the BBC micro and the Memotech.

Because of its apparent similarities with the Memotech, I was very interested in the display quality on the M5. The machine initialises to white letters on a black background, and appears twice on the tv dial — there was no discernible difference between the two. Unlike the Memotech, all the characters were visible on the screen, but it was similar in the way the picture distorts 'CinemaScope' fashion, so that circles are oval in shape. Colour stability was better than the Memotech, and the sound quality very much better.

The M5 is supplied with the Basic-I Rom cartridge which CGL say is Easy BASIC for Beginners. I can only presume that the I in the name means in fact Basic for Idiots!

The first thing I did with the computer was to type in a three-line program to print the character set and it would not run. After Listing it I found that the word *Let* had been inserted before each statement. After examining the manual I discovered that if a space is not entered after each line number then *Let* is inserted — it is claimed that this is done so that you do not have to type *Let,* but it seems ridiculous to me. Spaces are also required to separate commands, else they are not accepted. Normally commands have to be typed in letter by letter, but if the *Func* key is held down with certain letters a whole keyword is generated. This single-keyword entry is optional but, again, if you don't press *Space* after each keyword the line will not run.

Lines are edited using a fairly standard screen editor, using the cursor keys in conjunction with *Ctrl*. Insert mode can be entered with *Ctrl P*, and left with *Ctrl O*. Delete works — in the opposite way to the norm — removing the character to the right of the cursor — but this seems to be getting more popular and one soon gets used to it. Program lines can be entered in either upper or lower-case and are listed in upper-case. A wide range of graphics characters can be accessed direct from the keyboard, though the manual has to be referred to as half the legends are missing and the other half are illegible due to the colour clash of the keys and keyboard already mentioned. Control codes can also be entered in listings, by holding *Shift, Ctrl* and the appropriate key, and they get listed as inverse characters. The codes are important since they control the different screen modes.

The Basic itself is rather unusual in that it is integer-only. This means that no decimals are allowed, and numbers are limited to the range ± 32767. The last micro I can remember that was integer-only was the Acorn Atom some years ago. After thinking about it though, for a beginner, integer-only is probably sufficient. The best part of Basic-I is its speed — it is incredibly fast. Simple tests showed it to be at least four times faster than the Spectrum, and marginally faster than the BBC! Its speed is obviously due to the integer limitation. The commands are fairly standard, with some additions for graphics.

The M5 has four graphics modes. The simplest is Text, which is 40 × 24 characters in two colours. Graphics Mode 1 has a resolution of 256 × 192 pixels, but only a maximum of 256 characters can be displayed, each with a foreground and background colour chosen from a palette of 16 colours. Graphics Mode 2, the most useful, has the same resolution, but the screen is fully bit-mapped in colour giving a colour resolution of 64 x 192. Finally, multi-colour mode, in which each pixel can be any of 16 colours, has a resolution of only 64 × 48 and is really not at all useful.

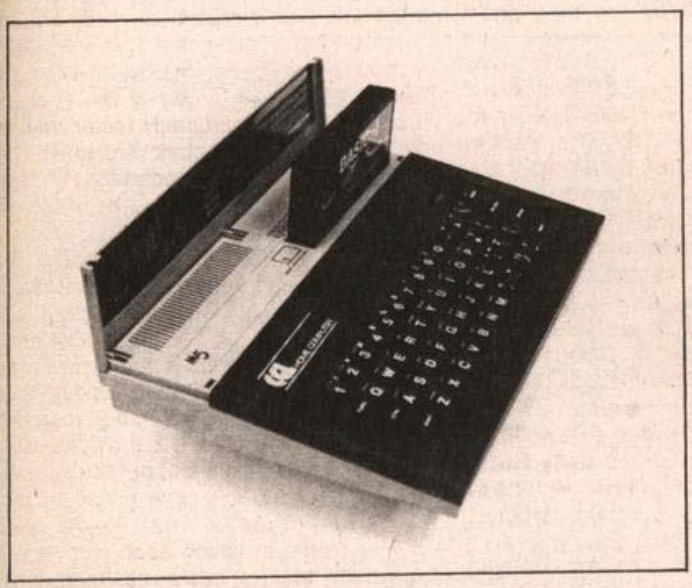
The best feature of the Texas 9929 chip, and thus the M5, is its ability to display and control large graphics shapes — Sprites. All of the above modes, except Text, can support up to 32 Sprites each of size up to 32 × 32 pixels which are independent of the graphics screen, and can be one of 16 colours.

Basic-I has only a few commands for accessing the graphics, and none are explained in detail or at all clearly in the manual. To switch between graphic modes, certain control codes have to be printed, and this is certain to confuse the beginner. If for some reason an error occurs in some of the modes, the error message will be invisible, and the computer appears not to be working. This is particularly a problem in Multi-colour or Graphics 2 modes, as characters are not printed sensibly in either. The manual unwisely advises that the power be removed if the screen displays meaningless characters, but this is simply not so. Eventually, after pressing complicated *Ctrl* sequences, control can be regained.

Once in a particular graphic mode there are a handful of commands to define the shape, colour, size and position of the Sprites, but their use is poorly explained in the manual's Appendix. There are no

commands to plot points or draw lines, or to use the sound chip.

This would not be a great problem if CGL provided sufficient technical information to allow access by *Pokes, VPokes* (for the video Ram) and *Outs,* like Commodore do, but no mention is made. I was most unimpressed with the CGL M5 until I typed in a demonstration program from the back of the manual. It produced a rather impressive game in colour with Sprites and background characters. The listing was full of *Pokes* and other such commands, but no explanation of them was given. It also showed how to use the sound chip using an Out instruction but, again, no details were given. At this stage I realised the CGL had a lot of potential, but I could not get to it.



Then I managed to get hold of a copy of the Basic-G cartridge.

Basic-G, at £34.95, is a cartridge that comes in a huge plastic box, with foam padding to fill it, and a massive 280-page manual. Noticeably heavier than Basic-I, it contains 16K of Rom and an extra 4K of Ram. On the front of the manual are the words 'Easy Basic for Games' and, after examining the contents, it certainly seemed like it.

As well as all the Basic-I commands, Basic-G adds over 50 new ones, mainly for graphics. The graphics modes (except the useless Multi-colour mode) are very well supported, with easy colour commands, pixel plots, line drawings, circles, ovals and even polygons. There is a powerful *Paint* command which is extremely fast and fills in any irregular shape with solid colour. The commands Bar and Box are given for drawing line and solid rectangles. For controlling the Sprites there are a wealth of commands, the most impressive of which is *Move:* it allows movement to a given point, at a given speed, or movement in a given direction, at a given speed. A maximum of twelve Sprites can be moving together, automatically, at one time, though others can be moved using *For Next* loops. There is a limitation, not mentioned in the manual — only four Sprites can be on a given horizontal line. That information I discovered in the Memotech manual. The *Joint* statement allows Sprites to be joined together to make bigger shapes. To detect collisions between Sprites, there is a command *On Coinc Gosub xxx,* and if any two Sprites touch each other then routine *xxx* is executed. These graphic commands make it simple to write complicated games and they run fast, too.

As well as the extra graphics commands, Basic-G also supports the sound chip. On the M5 the sound output is through the tv speaker and it is nice and clear. The commands for using it are *Play,* for music, and *Sg,* for sound effects. The M5 has three tone channels and one noise channel — all easily used Basic-G. The *Play* command is used in a similar way to that on the Dragon 32, but can address all three channels. It is not just the note that can be controlled. So can the octave, duration, volume, tempo and envelope. The control commands are all clearly explained, even to musical ignoramuses like myself. The *Sg* command can also be used to control the tone generators, but that requires more work.

To aid easy programming, there are several levels of 'interrupts'. Normally these are only available on other machines via machine-code. An interrupt is an occurrence that stops normal program flow for a while, while it does something else; when the extra routine has finished the normal program flow is resumed.

On the M5 there are six types of interrupts controllable from Basic-G. *On Coinc Gosub* has already been mentioned. The others are: *On Event Gosub* and *On Alarm Gosub,* which trigger on certain timed occurrences; *On Key Gosub,* used when a key is pressed; *On Joy Gosub,* when a joypad is moved; and *On Error Gosub,* when any error occurs. This type of interrupt management is a brilliant idea, and deserves to be duplicated on the next generation of home micros.

On the back of the M5 is a socket for a printer cable of the Centronics type. When a printer is connected both listings and text are available by *LList* and *LPrint* commands. Also available is the *PCopy* command which copies the hi-res screen to an attached printer, using parameters set up with the *PMode* command. From what I could see, it should work with any dot-matrix printer that has a bit-mode with 8 dots, such as the Epson machines. It would appear, however, to rule out the popular Seikosha GP100.

Although Basic-G has a large number of good features, it still has the idiosyncrasies of Basic-I. Spaces are still required in lines (except after line numbers), error messages are still just numbers and, incredibly, it is still integer-only.

Just before writing this review, I received the M5 Technical Manual, which I hoped would cover all the omissions from the Basic manuals. Unfortunately 'Technical Manual' is not really accurate — most of it is just the Appendix from the Basic-G manual. There are a couple of pages devoted to I/O locations, a vague memory map and a circuit diagram, but actual details of the graphics and sound chips are almost non-existent.

In fact, M5 owners who want to know more should try and get a Memotech manual, as it contains all they should need. There is little mention of machine-code in any M5 document, and information is particularly lacking on the system variables and where to put the code in memory. For independent support a machine needs to have certain technical information available, as Texas found to their cost, and CGL don't seem able to supply nearly enough.

The standard M5 machine with Basic-I and 4K user-Ram seems expensive at £150. I thought only Commodore could get away with omitting the extra commands to use machines (eg, the Commodore 64 and Simons' Basic), but CGL obviously seem to think that they can too.

There is a paragraph in the technical manual that says: 'Basic-I is not designed to bring out all the M5 capabilities. The built-in synthesiser requires much time to produce sounds and the fine colour graphics are difficult to produce on the screen.' I wholeheartedly agree. No such statement appears in CGL's adverts though. With Basic-G and 8K user-Ram it should really be compared with the 16K Spectrum, but costs £185, making the CGL less attractive. However, Basic-G is a brilliant games-writing language (except for the inexcusable lack of floating-point numbers), even though writing similar programs from machine-code is almost impossible with the current level of technical data.

There is supposed to be a 32K Ram pack coming shortly. If CGL were to sell the 32K Ram pack together with Basic-G and the M5 Console at a discount it could make an attractive package.

My feeling is that there are already too many machines competing for the sub-£200 market. CGL will have to change their current tactics if they wish to start the long-heralded Japanese invasion by supplying Basic-G as standard. And that's just for starters. Independent support will be slow in coming without more technical information being easily available. ■

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.

Frequency

on Spectrum

This program draws frequency graphs of the sound being received at the ear socket.

First enter the small basic program and save it using the line:

Save "Sound" *Line* 5

New the computer then enter and *Run* the hex loader program. Use this program to enter the 93 bytes of hex code which constitutes the main program. The hex is the second column of figures starting 110501. When all the code has been entered input "STOP" to stop the program then save the machine code using the line:

Save "Sound" *Code* 65000,100. *New* the computer then rewind the tape and load the basic program. When loaded it will automatically load the machine code and then stop.

The easiest way to use the program is to first record the sound you want analysed onto tape. Run the program and after the tone the computer waits for a signal at the ear socket. Connect the tape recorder as for loading, and play. The computer will store values corresponding to the frequency at location 60000 to 60254.

The program will then draw a simple time versus frequency graph of the values. Press enter to run the program again. Owners of Casio VL-Tones can connect the instrument directly to the ear socket for analysing the waveforms produced by the instruments *Adsr* function.

```
            ORG  65000
            LOAD 65000
FDE8 110501         LD   DE,261
FDEB 216606         LD   HL,1638
FDEE CDB503         CALL 949
FDF1 DBFE     L1:   IN   A,(254)
FDF3 FEFF           CP   255
FDF5 28FA           JR   Z,L1
FDF7 2160EA         LD   HL,60000
FDFA 06FF           LD   B,255
FDFC C5       L2:   PUSH BC
FDFD 1600           LD   D,0
FDFF 06FF           LD   B,255
FE01 DBFE     L3:   IN   A,(254)
FE03 FEFF           CP   255
FE05 2801           JR   Z,L4
FE07 14             INC  D
FE08 10F7     L4:   DJNZ L3
FE0A 72             LD   (HL),D
FE0B 23             INC  HL
FE0C C1             POP  BC
FE0D 10ED           DJNZ L2
FE0F 00             NOP
FE10 3E02           LD   A,2
FE12 CD0116         CALL 5633
FE15 CD6B0D         CALL 3435
FE18 3E02           LD   A,2
FE1A CD0116         CALL 5633
FE1D D9             EXX
FE1E E5             PUSH HL
FE1F D9             EXX
FE20 3E00           LD   A,0
FE22 F5       L5:   PUSH AF
FE23 4F             LD   C,A
FE24 0600           LD   B,0
FE26 CDE522         CALL 8933
FE29 2160EA         LD   HL,60000
FE2C C1             POP  BC
FE2D C5             PUSH BC
FE2E 48             LD   C,B
FE2F 0600           LD   B,0
FE31 09             ADD  HL,BC
FE32 46             LD   B,(HL)
FE33 0E00           LD   C,0
FE35 110101         LD   DE,257
FE38 CDBA24         CALL 9402
FE3B F1             POP  AF
FE3C 3C             INC  A
FE3D FEFF           CP   255
FE3F 20E1           JR   NZ,L5
FE41 D9             EXX
FE42 E1             POP  HL
FE43 D9             EXX
FE44 C9             RET
            END
>R
HEX LOADER

  10 DEF FN A$(A)=CHR$ (A+48+7*(
A>9))
  20 DEF FN B$(A)=FN A$(INT (A/1
6))+FN A$(A-16*INT (A/16))
  30 DEF FN C$(A)=FN B$(INT (A/2
56))+FN B$(A-256*INT (A/256))
  40 DEF FN A(A$)=CODE A$-48-7*(
A$>"9")
  50 DEF FN B(A$)=16*FN A(A$(1))
+FN A(A$(2))
 100 LET N=65000: LET D$=""
 110 IF D$="" THEN PRINT : PRINT
 FN C$(N);" ";: INPUT D$
 120 POKE N,FN B(D$)
 130 PRINT D$( TO 2);
 140 LET N=N+1: LET D$=D$(3 TO )
 150 GO TO 110

BASIC PROGRAM

  1 BORDER 1: PAPER 0
  2 INK 6: CLS
  3 RANDOMIZE USR 65000
  4 INPUT A$: GO TO 3
  5 LOAD ""CODE
```

Frequency
by Chris Eckersley

Screen Block Delete

on Spectrum

This machine code routine is designed to help you clear parts of the screen without damaging another part which you may want to leave on.

The program will clear any line(s) or column(s) the user specifies. To use the routine do the following *Pokes*

27004 With the first column to clear – 1
27008 With no. of columns to clear
27014 With no. of lines to clear
27016 With specified paper colour

As the programe stands it will *Poke* in the machine code and then *List* the program three times and delete the top left-hand corner of the screen.

This program can be used when, for example, some instructions need to stay on the screen whilst others need not.

```
    1 REM ************************
    2 REM **Screen Block Delete**
    3 REM **    By D.Parkinson   **
    4 REM ************************
    5
 8990 REM  *SAVE CODE BY TYPING*
 8991 REM SAVE"name"CODE 27000,26
 8992
 9000 FOR g=27000 TO 27025: READ
 a: POKE g,a: NEXT g
 9010 DATA 17,32,0,30,235,97,233,
 6,16,225,35,229,197,6,12,54,53,2
 37,90,16,250,193,16,241,225,201
 9020 LIST : LIST : LIST : LET t=
 USR 27000
```

Screen Block Delete
by D Parkinson

Shoot Out

on Vic20

You are a gunman. When an object appears in front of you, you must shoot as quickly as you can by pressing Z. After you have shot, your gunman will blow his gun.

Program notes

10-25	Introduction
30-240	Prints man on screen
242-255	Moves object
260-345	Moves bullet and sound effects
500-700	Print man blowing gun
710-770	Prints 'Got it'

Variables

N Object position
Q The bullet

```
10 PRINT"■SHOOT OUT"
20 PRINT"■BY IAN FIELDER"
21 PRINT"■USE 'Z' TO FIRE"
25 FORQ=1TO3000:NEXT
30 POKE36879,155
40 PRINT"■■  ▒▒▒   "
50 PRINT"▬▒▒▒▬▬ "
60 PRINT"  ◤▔▏ "
70 PRINT"  ▏  ◢▀▀"
80 PRINT"  ▙▁▚▏  "
90 PRINT"  ▏▛  "
100 PRINT"  ▛▜▌ "
110 PRINT"  ▏▏▏  "
120 PRINT"  ▏▏▏  "
130 PRINT"  ▏▙▏  "
140 PRINT"  ▏  ▔▁ ▁▔"
150 PRINT"  ▙▁▁▁▒▛"
160 PRINT"  ▙▟▟▟  "
170 PRINT"  ▏▏▏▏  "
180 PRINT"  ▏▏▏▏  "
190 PRINT"  ▏▏▏▏  "
200 PRINT"  ▏  ▏  "
210 PRINT"  ▏  ▏  "
220 PRINT"  ▏  ▏  "
230 PRINT"  ▏  ▏  "
240 PRINT"  ▏▏  "
242 N=7700
243 N=N+22
244 POKEN,86
245 GOSUB250
246 FORM=1TO5:NEXTM
247 POKEN,32
248 IFN=8184THEN242
249 GOTO243
250 IFPEEK(197)=33THEN260
255 RETURN
260 Q=7909:R=15
261 POKE36878,R
262 POKE36877,255
265 GOSUB275
270 FORI=1TO11:R=R-1:GOTO280
275 POKEQ-22,78:POKEQ+22,77:POKEQ,42:RETURN
280 POKE36878,R:POKE36877,255:POKEQ+1,46
290 FORJ=1TO5:NEXTJ
295 POKEQ-22,32:POKEQ+22,32:POKEQ,32
300 POKEQ+1,32
310 Q=Q+1
320 IF PEEK(Q+1)=86 THEN 750
345 POKE36877,0
350 NEXTI
500 PRINT"■■  ▒▒▒   "
510 PRINT"▬▒▒▒▬▬ "
520 PRINT"  ◤▔▏  "
530 PRINT"  ▏  ◢▀▀"
540 PRINT"  ▙▁▚▏▏  "
550 PRINT"  ▏▛▒▌  "
560 PRINT"  ▛▜▌ o"
570 PRINT"  ▏▏▏/▏"
580 PRINT"  ▏▏/ /"
590 PRINT"  ▏▏/ /  "
600 PRINT"  ▏  /  "
610 PRINT"  ▚▁/▏  "
620 PRINT"  ▙▟▟▟  "
630 PRINT"  ▏▏▏▏  "
640 PRINT"  ▏▏▏▏  "
650 PRINT"  ▏▏▏▏  "
660 PRINT"  ▏  ▏  "
670 PRINT"  ▏  ▏  "
680 PRINT"  ▏  ▏  "
690 PRINT"  ▏  ▏  "
700 PRINT"  ▏▏  "
710 FORH=1TO2000:NEXT
720 GOTO40
750 PRINT"■■■■■■■■GOT IT!!"
756 POKE36877,0
760 FORL=1TO1000:NEXTL
770 GOTO30
```

Shoot Out
by Ian Fielder

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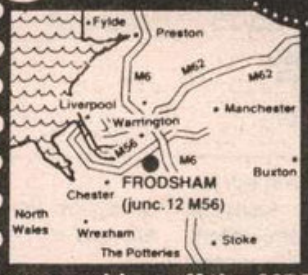

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Cavern Runner

on Vic20

The idea of the game is to dodge the meteors as you travel down the cavern. You have 25 missiles in case of an emergency. Use them carefully. As a last resort there is a hyperspace function to get you out of trouble. Controls are:

Z = Left
C = Right
M = Fire
Space = Hyperspace

Or use a joystick, down for hyperspace

The game consists of two routines, the game and the death section. Each one calls the other routines as it needs them.

The game includes music and hi-score table.

Program notes

10-59	Sets up User Defined Graphics
66-68	Tune
69-119	Instructions
154-230	Main loop
800-910	Death routine and another game
1000-55020	Various routines.

```
0 POKE788,194:HI=100:PRINTCHR$(8):PRINT"■"
  CHR$(142):O=8186
1 DIMP$(8):FORA=1TO8:P$(A)="  100 *VIC-20*
  ":NEXTA:COL$="■■■■■■■■"
3 POKE36879,25:PRINT"■":POKE36878,15
4 FORQW=0TO21:POKE7680+QW,160:POKE8164+QW,
  160:POKE38400+QW,(QWAND7)
5 POKE38884+QW,(QWAND7):NEXTQW
7 PRINT"■■    CAVERN  RUNNER"
10 PRINT"    ------  ------":PRINT"■■■■■
  (VIC +3K  RAM)"
12 PRINT"■■■■■■BY■■■■A.HAMPTON"
13 PRINT"■■■■■--------"
15 PRINT"■■■ DEFINING  CHARACTERS"
16 PRINT"■"SPC(5)"■PLEASE  WAIT":PRINTSPC
   (5)"■----------"
20 POKE51,255:POKE52,27:POKE55,255:
   POKE56,27
25 FORI=0TO511
30 POKE7168+I,PEEK(32768+I):NEXTI
35 FORI=0TO(5*8-1):READA
40 POKE7168+I+(35*8),A:NEXTI
50 DATA60,66,157,161,161,157,66,60,56,126,
   255,126,254,248,60,8
55 DATA66,102,126,126,90,102,60,24,16,56,
   108,68,108,108,124,124
56 DATA0,0,255,255,255,255,255,255
59 POKE36869,255:GOSUB51000
60 GOSUB50000:POKE198,0
61 POKE36879,138:PRINT"■":PRINT"■■■■■■■■
   JOYSTICK(J)■■■■■■■■■■OR■■■■■■■KEYBOARD(K
62 GETJK$:IFJK$=""THEN62
63 IFJK$="J"THENKJ=0:GOTO66
64 IFJK$="K"THENKJ=1:GOTO66
65 GOTO62
66 FORMU=1TO14:READNN,TT:POKE36876,NN:FOR
   GG=1TOTT:NEXTGG:POKE36876,0:NEXTMU:POKE
   36876,0
67 DATA195,100,187,50,183,100,195,100,195,
   100,195,100,201,100,195,200,187,100,_8
   3,100
68 DATA195,100,209,150,215,50,219,255
69 POKE36865,160
70 PRINT"■■■   CAVERN  RUNNER "CHR$(35)
75 PRINT"    ------  ------"
80 PRINT"■ DODGE THE METEORS AS"
90 PRINT"■  YOU DIVE  DOWN THE":PRINT"■"
   SPC(9)"CAVE."
100 PRINT"■ YOU GET MORE  POINTS"
105 PRINT"■THE FURTHER YOU TRAVEL",
110 PRINT"■  BUT YOU  HAVE 25"
115 PRINT"■MISSILES IN CASE OF AN■
    EMERGENCY."
119 GOSUB1000
120 IFKJ=0THENGOSUB9500
121 IFKJ=1THENGOSUB9750
131 PRINT"■■■■■■CONTROLS:":PRINT"
    ■■■--------"
132 IFKJ=0THENGOSUB20000
133 IFKJ=1THENGOSUB10500
135 IFKJ=0THENGOSUB9500
136 IFKJ=1THENGOSUB9750
140 POKE36879,8:SC=0:PRINT"■"
150 PRINT"■■■■■■■■■■
```

SOFTWARE FOR SPECTRUM AND ZX81

OUR POLICY

We aim to create programs which you will keep on using until your computer wears out. You won't find our programs in the top ten and you will look in vain for colour adverts and fancy packaging. Nevertheless we have built up a solid following of discerning users in all parts of the world. Read the reviews of our programs if you can find them. We have been consistently praised for quality, originality and value for money.

WHAT DO YOU GET?

The bulk of our cassettes are now made by the factory which produced the Horizons tape. Programs are recorded twice and carry on the reverse side an audio narrative to supplement the operating instructions. Where appropriate, cassettes are accompanied by a comprehensive and clearly written instruction manual.

48K SPECTRUM

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16K ZX81

Here is a selection of titles still available for ZX81. Send sae for illustrated catalogue. These are the ZX81 equivalents of the Spectrum programs described above. Although similar in concept the specifications fall short of the descriptions given for the Spectrum.

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TASK — CHECK

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```
    151,200,143,200,143,200,136,200,135,200
    ,130
6050 DATA185,135,425
6055 RESTORE
6056 FORU=1TO68:READF:NEXT
6060 RETURN
7000 FORA=7680TO7680+21:POKEA,39:POKEA+
    30720,3:NEXTA
7002 FORA=8164TO8164+21:POKEA,39:POKEA+
    30720,3:NEXTA
7004 FORA=7680TO8164STEP22:POKEA,39:POKEA+
    30720,3:NEXTA
7006 FORA=7701TO8185STEP22:POKEA,39:POKEA+
    30720,3:NEXTA
7008 RETURN
8000 POKE36879,26:POKECE,38:POKECE+30720,0
8003 Z1=36864:Z2=36865:FORZ3=1TO50:Z4=INT
    (RND(1)*2+10):Z5=INT(RND(1)*8+32)
8005 POKEZ2,Z5:POKEZ1,Z4:POKE36877,220
8010 FORX9=1TO25:NEXTX9,Z3:POKEZ1,12:
    POKEZ2,38:POKE36877,0:RETURN
9000 FORM=200TO203:POKE36876,M:NEXTM:
    POKE36876,0
9002 RETURN
9500 PRINT"■■"SPC(6)"PRESS FIRE":
    POKE37139,0:POKE37154,127
9502 IF(PEEK(37137)AND32)>0THEN9502
9504 RETURN
9750 PRINT"■■"SPC(7)"PRESS F7"
9751 POKE198,0
9752 IFPEEK(197)<>63THEN9752
9754 RETURN
10000 K=PEEK(37137):Q=PEEK(37152)
10010 IF(KAND16)=0THENGOSUB2000
10020 IF(QAND128)=0THENGOSUB3000
10030 IF(KAND8)=0THENGOSUB4000
10040 IF(KAND32)=0THENGOSUB5000
10050 RETURN
10500 PRINT"■■■Z-LEFT":PRINT"■■■C-RIGHT"
    :PRINT"■■■M-FIRE":PRINT"■■■SPC-HYPER
    SPACE"
10510 RETURN
20000 PRINT"■■■■USE JOYSTICK"
    :PRINT"■DOWN-HYPERSPACE":RETURN
30000 OO=PEEK(197)
30010 IFOO=33THENGOSUB2000
30020 IFOO=34THENGOSUB3000
30030 IFOO=32THENGOSUB4000
30040 IFOO=36THENGOSUB5000
30050 RETURN
50000 PRINT"■■":POKE36879,42:POKE198,0
50010 PRINT"■■■SPACESHIP SOUND":PRINT"
    ■■■■■■■■[Y:N]"
50020 GETHH$:IFHH$=""THEN50020
50030 IFHH$="Y"THENQD=255:GOTO50060
50040 IFHH$="N"THENQD=0:GOTO50060
50050 GOTO50020
50060 RETURN
51000 PRINT"■"
51002 FORXC=1TO100:UP=INT(RND(1)*506):UL=
    INT(RND(1)*7):POKE7680+UP,209:
    POKE38400+UP,UL
51003 POKE36876,INT(RND(1)*128+128):NEXTXC
    :POKE36876,0:POKE36879,77
51004 FORIY=1TO3
51005 FORPI=0TO22:POKE36864,12+PI:
    POKE36865,38+PI:POKE36866,150-PI:
    POKE36867,1.4-PI*2
51010 POKE36876,220+PI:NEXTPI
51020 FORPI=22TO0STEP-1:POKE36864,12+PI:
    POKE36865,38+PI:POKE36866,150-PI
51025 POKE36867,174-PI*2
51030 POKE36876,220+PI:NEXTPI,IY:POKE36876,0
51040 PRINT"■■":RETURN
55000 FORXA=22TO0STEP-1:POKE36866,XAOR128:
    POKE36867,XA*2OR128:POKE36876,220+XA:N
    EXTXA
55010 FORXA=1TO22:POKE36866,XAOR128:POKE
    36867,(XA+1)*2OR128:POKE36876,220+
    XA:NEXTXA
55020 POKE36876,0:FORJ9=1TO400:NEXTJ9:RETURN
```

Cavern Runner
by Andrew Hampton

Patterns

on BBC

The program produces a pattern on the screen and makes sound effects while doing this. It will run on both BBC machines without any modifications.

Program notes

10-60	Attributes.
80	Change to mode 2.
90-180	First section.
190-280	Second section.

```
10REM ********************
20REM *** PATTERNS ***
30REM ***     BY      ***
40REM ***   COLIN     ***
50REM ***   PRYKE     ***
55REM *** AGED 14     ***
60REM ********************
70CC=1
80MODE2
90FOR A=1 TO 1280
100SOUND0,-15,A/2,1
110GCOL0,CC
120MOVE640,512
130DRAWA,1024
140MOVE640,512
150DRAWA,0
160CC=CC+1
170IF CC=8 CC=1
180NEXT
190FOR A=1 TO 1024
200SOUND1,-15,A/3,1
210GCOL0,CC
220MOVE640,512
230DRAW0,A
240MOVE640,512
250DRAW1280,A
260CC=CC+1
270IF CC=8 CC=1
280NEXT
```

Patterns
by Colin Pryke

Murder at the Manor

GEMTIME

Death comes to a quiet country village when the Lord of the Manor is savagely murdered.

The police are baffled with no obvious clues to help them.

Your skills as an ace investigator are required to identify and apprehend the murderer. This will involve searching for clues (which could be dangerous requiring ingenious deductions), examining the scene of the crime and asking questions of the right people.

What is the mystery of the Gravediggers Hut?

What secret does the safe hold?

What lurks at the bottom of the brook?

These may be some of the questions you will ask yourself during your investigation into the **murder at the manor.**

The game is based on a fixed map, comprising the Manor House, the Gaden, the Town, the Graveyard and many other fully described locations, inhabited by a variety of individual characters whom you are likely to meet.

It is up to you to solve the murder, the locals may know the answer — but will they tell YOU!

This original adventure fills your 48K Spectrum with over 120 locations, all of which are depicted in full colour machine-coded graphics.

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WARNING — this is a 4D adventure where night brings added difficulties.

"Highly recommended." (*Popular Computing Weekly*, Vol 2 No 42).

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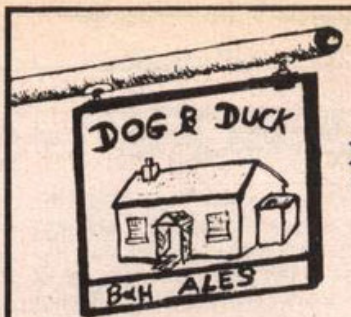

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★ **LUNAR LANDER AND RESCUE** £6.95
A brilliant two-part game. Part one is an arcade standard lander which trains you for part two. Here you must rescue lunar engineers in a tortuous cavern. Fuel dump landings and falling stalactites add to the perils of your heroic mission in one of the best Dragon programs available.
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Close The Box

on Dragon 32

This program is based on the old board game for two or more players. Each player throws dice and covers the numbers indicated by the dice. He continues until no further moves are possible. The board is cleared and play passes to the next player. Any numbers remaining uncovered at the end of a player's turn are counted against him. More than 45 points and you have lost. This continues until only one player is left.

Program notes

80	Sets up a string of green for blanking out words etc.
90-170	Ascertain the number of players and their names.
240-310	Set up board numbers.
320	Prints the score.
400-420	Set up colour strings for the board.
430-510	Draw the board.
520	Holds the input prompt at the bottom left of the screen.
540-800	Enter players choice and prevent inadvertent entering of wrong numbers.
840	Checks for a winner.
910-940	Roll die 1.
970-1020	Print die 1 numbers.
1030	Checks for board score of six or less and deletes right die if required.
1040-1080	Roll die 2.
1110-1160	Print die 2 numbers.
1200-1280	Instructions.
1290-1350	Keeps score and notifies losers and the winner.

The players overall score (in brackets) can be deleted by removing [;"(";45 – B + S(I);")"] in line 320.

```
10 CLS
20 PRINT@39,"* CLOSE THE BOX *"
30 PRINT@108,"* FOR *"
40 PRINT@169,"* DRAGON 32 *"
50 PRINT@232,"* J.D.BATEMAN *"
60 PRINT@299,"* 4/10/83 *"
70 FOR D=1 TO 750:NEXT
80 C$=CHR$(143)+CHR$(143)+CHR$(143)+CHR$
(143)+CHR$(143)
90 CLS:PRINT@224,"HOW MANY PLAYERS ARE T
HERE(PRESS NUMBER THEN ENTER)
100 INPUTX:CLS
110 T=X
120 DIM N$(X)
130 FOR I=1 TO X:CLS
140 PRINT@224,"PLAYER";I;"PLEASE INPUT Y
OUR NAME."
150 INPUTN$(I)
160 NEXTI
170 CLS
180 PRINT@106,"INSTRUCTIONS?":PRINT@139,
"PRESS Y/N".
190 INPUT Q$
200 IF Q$="Y" THEN GOSUB 1200
210 S(I)=0
220 FOR I=1 TO X:PRINT@0,N$(I);:W=0:W1=0
:W2=0:W3=0:W4=0:W5=0:W6=0:W7=0:W8=0:B=0:
CLS
230 IF S(I)>45 THEN GOTO 1310 ELSE GOSUB
840
240 PRINT@136,"1":PRINT@139,"2"
250 PRINT@142,"3"
260 PRINT@232,"4"
270 PRINT@235,"5"
280 PRINT@238,"6"
290 PRINT@328,"7"
300 PRINT@331,"8"
310 PRINT@334,"9"
320 IF A<10 THEN B=A+B:PRINT@448,"YOUR S
CORE IS ";45-B;"(";45-B+S(I);")"
330 PRINT@151,"PRESS"
340 PRINT@181,"REQUIRED"
350 PRINT@213,"NUMBERS"
360 PRINT@247,"THEN"
370 PRINT@278,"<ENTER>"
380 PRINT@310,"OR (11)"
390 PRINT@339,"TO PASS PLAY"
400 X$=CHR$(138)+CHR$(129)+CHR$(131)+CHR
$(130)+CHR$(129)+CHR$(131)+CHR$(130)+CHR
$(129)+CHR$(131)+CHR$(130)+CHR$(133)
410 Y$=CHR$(138)+CHR$(133)
420 Z$=CHR$(138)+CHR$(132)+CHR$(140)+CHR
$(136)+CHR$(132)+CHR$(140)+CHR$(136)+CHR
$(132)+CHR$(140)+CHR$(136)+CHR$(133)
430 PRINT@102,X$;
440 PRINT@134,Y$;:PRINT@137,Y$;:PRINT@14
0,Y$;:PRINT@143,Y$;
450 PRINT@166,Z$;
460 PRINT@198,X$;
470 PRINT@230,Y$;:PRINT@233,Y$;:PRINT@23
6,Y$;:PRINT@239,Y$;
480 PRINT@262,Z$;
490 PRINT@294,X$;
500 PRINT@326,Y$;:PRINT@329,Y$;:PRINT@33
2,Y$;:PRINT@335,Y$;
510 PRINT@358,Z$
520 PRINT@96,CHR$(143);:PRINT@128,CHR$(1
43);:PRINT@160,CHR$(143);:PRINT@192,CHR$
(143);:PRINT@224,CHR$(143);:PRINT@256,CH
R$(143);:PRINT@288,CHR$(143);:PRINT@320,
CHR$(143);:PRINT@352,CHR$(143);:PRINT@38
4,CHR$(143);
530 INPUT A
540 IF A=D1 OR A=D2 THEN L=L+1
550 IF A=D1+D2 THEN L=L+2
560 IF L>2 THENA=0
570 IF A=W THEN 810
580 IF A=W1 THEN 810
590 IF A=W2 THEN 810
600 IF A=W3 THEN 810
610 IF A=W4 THEN 810
620 IF A=W5 THEN 810
630 IF A=W6 THEN 810
640 IF A=W7 THEN 810
650 IF A=W8 THEN 810
660 IF A=0 THEN  820
670 IF A=11 GOTO 1290
680 SOUND55,5
690 IF A=D1 THENPRINT@19,C$;:PRINT@51,C$
;:PRINT@83,C$;
700 IF A=D2 THENPRINT@25,C$;:PRINT@58,C$
;:PRINT@89,C$;
710 IF A=D1+D2 THENPRINT@19,C$;:PRINT@25
,C$;:PRINT@51,C$;:PRINT@58,C$;:PRINT@83,
C$;:PRINT@89,C$;
720 IF A=1THENW=1: PRINT@136,CHR$(128);:
GOTO320
730 IF A=2 THENW1=2: PRINT@139,CHR$(128)
;:GOTO 320
740 IF A=3 THENW2=3:PRINT@142,CHR$(128);
:GOTO320
750 IF A=4 THENW3=4:PRINT@232,CHR$(128);
 GOTO320
760 IF A=5 THEN W4=5:PRINT@235,CHR$(128)
```

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```
::GOTO320
770 IF A=6 THEN W5=6:PRINT@238,CHR$(128)
::GOTO320
780 IF A=7 THENW6=7:PRINT@328,CHR$(128);
'GOTO320
790 IF A=8 THENW7=8:PRINT@331,CHR$(128);
'GOTO320
800 IF A=9 THENW8=9:PRINT@334,CHR$(128);
'GOTO320
810 SOUND1,5
820   GOSUB  840
830 GOTO520
840 IF T=1 THEN1340 ELSEPRINT@0,N$(I);"
PRESS P "
850 PRINT@85,CHR$(143):PRINT@87,CHR$(143
):PRINT@90,CHR$(143):PRINT@92,CHR$(143);
860 PRINT@32,"FOR YOUR DICE"
870 P$=INKEY$:IF P$=""GOTO 870
880 IF P$<>"P" THEN SOUND 77,7:GOTO 840
890 FOR J=1 TO 20
900 L=0
910 PRINT@21,"*":PRINT@23,"*":PRINT@21,C
HR$(143):PRINT@23,CHR$(143)
920 PRINT@54,"*":PRINT@54,CHR$(143)
930 PRINT@85,"*":PRINT@87,"*":PRINT@85,C
HR$(143):PRINT@87,CHR$(143)
940 NEXT
950 D1=RND(6)
960 PRINT@50,D1
970 IF D1=1 THENPRINT@54,"*"
980 IF D1=2 THENPRINT@21,"*";:PRINT@87,"
*"
990 IF D1=3 THENPRINT@21,"*";:PRINT@54,"
*":PRINT@87,"*"
1000 IF D1=4 THEN PRINT@21,"*";:PRINT@23
,"*";:PRINT@85,"*":PRINT@87,"*"
1010 IF D1=5 THENPRINT@21,"*";:PRINT@23,
"*";:PRINT@54,"*":PRINT@85,"*":PRINT@87,
"*"
1020 IF D1=6 THENPRINT@21,"*";:PRINT@23,
 *";:PRINT@53,"*":PRINT@55,"*":PRINT@85,
"*":PRINT@87,"*"
1030 IFB>38 GOTO 1170
1040 FOR J=1 TO 30
1050 PRINT@59,"*":PRINT@59,CHR$(143)
1060 PRINT@26,"*":PRINT@28,"*":PRINT@26,
CHR$(143):PRINT@28,CHR$(143)
1070 PRINT@90,"*":PRINT@92,"*":PRINT@90,
CHR$(143):PRINT@92,CHR$(143)
1080 NEXT
1090 D2=RND(6)
1100 PRINT@61,D2;
1110 IF D2=1 THEN PRINT@59,"*";
1120 IF D2=2 THEN PRINT@26,"*":PRINT@92,
"*"
1130 IF D2=3 THEN PRINT@26,"*":PRINT@59,
"*";:PRINT@92,"*"
1140 IF D2=4 THEN PRINT@26,"*":PRINT@28,
"*":PRINT@90,"*":PRINT@92,"*"
1150 IF D2=5 THEN PRINT@26,"*":PRINT@28,
"*":PRINT@59,"*";:PRINT@90,"*":PRINT@92,
"*"
1160 IF D2=6 THEN PRINT@26,"*":PRINT@28,
"*":PRINT@58,"*";:PRINT@60,"*";:PRINT@90
,"*":PRINT@92,"*"
1170 FOR G=0 TO 18:PRINT@G,CHR$(143);:NE
XT
1180 FOR G=32 TO 44:PRINT@G,CHR$(143);:N
EXT
1190 RETURN
1200 CLS:PRINT@9,"close the box"
1210 PRINT@65,"THE PLAYER IN PLAY PRESSE
S <P> TO CAST THE DICE,AND THEN USES  TH
E SCORE TO COVER THE NUMBERS  (CLOSE THE
 BOXES).WITH A THROW  OF 5:4 FOR EXAMPLE
,HE CAN COVER  9  (THE AGGREGATE) OR USE
 EACH ONE SEPARATELY TO COVER 5 AND 4."
1220 PRINT@289,"THE PLAYER PRESSES <ENTE
R> THENPRESSES <P> FOR THE NEXT CAST OFT
HE DICE."
1230 PRINT@385,"AGAIN HE HAS THE CHOICE
OF THE AGGREGATE OR ONE OR BOTH NUMBERSU
SED SEPARATELY TO CLOSE BOXES."
1240 FOR J=1 TO 28000:NEXT:CLS
1250 PRINT@9,"close the box":PRINT@65,"H
E CONTINUES IN THIS FASHION    UNTIL HE
IS UNABLE TO CLOSE AT LEAST ONE BOX.HE M
UST THEN INPUT11 HIS SCORE IS RECORDED A
ND THEBOARD IS CLEARED.THE DICE ARE   PA
SSED TO THE NEXT PLAYER."
1260 PRINT@257,"WHEN A PLAYER ACCUMALATE
S MORE THAN 45 POINTS HE DROPS OUT OF  T
HE GAME.":FOR J=1 TO 19000:NEXT:CLS:PRIN
T@9,"close the box"
1270  PRINT@65,"IF THE AGGREGATE OF THE
NUMBERSLEFT ON THE BOARD IS SIX OR LESST
HE RIGHT DIE IS DISCARDED.PLAY IS CONTIN
UED UNTIL ALL THE BOXESARE CLOSED OR A S
CORE IS GIVEN  WHICH CANNOT BE USED.THE
PLAYER ENDS HIS TURN BY INPUTTING 11."
1280 PRINT@320,"THE LAST PLAYER LEFT IN
THE GAME         IS THE WINNER.":FOR J=0
TO 15000:NEXT:RETURN
1290 CLS:S(I)=S(I)+45-B:IF S(I)>45 GOTO
1330
1300 PRINT@99,N$(I);" YOUR SCORE IS";S(I
):FOR D=0 TO 1500:NEXT:IF S(I)>40 THEN F
OR J=0 TO 25:PRINT@235,"BE CAREFUL":FOR
F=0 TO 2:PRINT@235,C$+C$+C$:NEXT F:SOUND
100,1:NEXTJ
1310 ' <C> J.D.B. 4/10/83 <C>
1320 NEXT I:CLS:GOTO 210
1330 T=T-1:PLAY"O1L7GFEDC":PRINT@99,N$(I
);" YOUR SCORE IS";S(I):PRINT@204,"you're
 out":FOR J=0 TO 2500:NEXT J:CLS:GOTO 1
310
1340 CLS:PRINT@235,N$(I)
1350 PRINT@327,"you are the winner.":PLA
Y"O4L8CEGL4O5CO4L8GL4O5C"
1360 PRINT@448,"PRESS BREAK THEN TYPE RU
N TO TRY AGAIN
1370 GOTO1370
```

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by J Bateman

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Quasimodo

on Vic20

This program uses ugd, colour and sound. Move Quasimodo across the screen to ring the bell without being killed by the fireball. You have a time limit and points awarded by how far inside the limit you are.

Once you complete a screen you get a new sheet which is faster. The abbreviation "?" should be used in the print statements at the end of the program.

Variables

Y =	Your position.
X =	Fireballs position.
SC =	Score.
HI =	Hi score.
Tm =	Time.
L,L$ =	Lives left.
F =	Extra life

Program notes

1-9	Sets up user defined graphics.
11-30	Set screen layout.
40-60	Move fireball and print score.
70-140	Move Quasimodo.
300-350	Cleared screen.
400-440	Dead.
500-580	End of game.
1000-1100	Title screen (my highest score is 12,390).

```
0 GOTO999
1 POKE51,255:POKE52,27:POKE55,255:POKE56,
  27:POKE36869,255
2 FORJ=0TO511:X=PEEK(32768+J):POKE7168+J,
  X:NEXT
3 FORJ=0TO71:READX:POKE7432+J,X:NEXT
4 DATA24,24,60,90,153,36,34,33,42,92,234,
  255,103,246,90,44
5 DATA127,127,127,127,127,127,127,0
6 DATA254,254,254,254,254,254,254,0,1,1,
  1,1,1,1,1,1
7 DATA1,1,1,1,3,3,3,7,128,128,128,128,192
  ,64,64,160
8 DATA7,15,31,63,63,126,16,15,160,208,232
  ,240,240,126,8,240
9 POKE36879,8:POKE36878,15:N=0:T=200:Y=78
  34:X=7854:L=3:TM=990 :M=2
10 F=0:SC=0:G=0:L$="!!!!"
11 PRINT"■"
20 PRINTTAB(19);"■■"
21 PRINTTAB(19);"■■"
22 FORJ=1TO5:PRINTTAB(19);"■■":NEXT
30 PRINT :FORJ=1TO95 :PRINT"■■■";:NEXT:P
  RINT"■■■"
39 GOTO430
40 X=X-1:IFX<7835THENPOKE7835,32:X=7854
42 POKE7831,37
43 IFSC>=99600THENSC=0
44 PRINT"■■HI=      ■■■■■■■"HI;TAB(11);"
       ■■■■■■■■■TM="TM
45 PRINT"■SC=       ■■■■■■■"SC;TAB(11);"
       ■■■■■■";RIGHT$(L$,L-1)
46 IFSC>HITHENHI=SC
50 POKEX,34:POKE X+30720,1:POKEX+1,32:POK
  E36876,220:POKE36876,0
55 IFPEEK(X-1)=33THEN400
60 FORJ=1TOT:NEXT
66 TM=TM-30:IFTM<=0THEN400
68 G=G+1
69 IFG<MTHEN40
70 GETA$
80 IFA$="■"THENY=Y-1:POKE36876,200:POKEY+
  1,32
81 IFY=7834THENY=7835
   IFA$="■"THENY=Y+1:POKEY-1,32:POKE36876
   ,200
100 IFA$=" "ANDY>=7833THENY=Y-22:POKEY+22
    ,32:Q1=1:POKE36876,200
111 IFQ2=3THENQ2=0:Y=Y+22:POKE36876,200:P
    OKEY-22,32
115 IFQ2=2THENQ2=3
116 IFQ1=1THENQ1=0:Q2=2
120 POKEY,33:POKE36876,0
130 IFPEEK(Y+1 )=34THEN400
135 IFPEEK(7833+20)=33ORPEEK(7833+21)=33
    THEN300
140 GOTO40
300 N=N+1:T=T/1.4:SC=SC+TM
301 TM=990
302 FORC=1TO5
310 FORJ=128TO255STEP5
320 POKE36876,J:NEXT:NEXT
325 IFT<10THENT=30
330 IFN=>10THENM=M+1
332 POKE36876,0
333 IFM=>6THENM=6
340 IFSC>1500ANDF=0THENL=L+1:F=F+1
345 POKEY,37:POKEX,32:X=7853:Y=7835
350 GOTO40
400 FORJ=255TO128STEP-.4
410 POKE36874,J:NEXT
420 POKE36874,0
425 L=L-1:IFL=0THEN500
430 N=0:T=200:TM=990:POKEX,32:POKEY,32:X=
    7853:Y=7835
440 GOTO40
500 REM END OF GAME
510 PRINT"■■■■■■■■    SCORE="SC"■"
540 PRINT"■■   AGAIN [Y/N]?"
 50 GETW$:IFW$=""THEN550
560 IFW$="Y"THEN9
570 IFW$="N"THENEND
580 GOTO550
999 POKE36879,152
1000 PRINT"■■       QUASIMODO":PRINT"■■■
     BY GLENN ACKROYD":PRINT"■       1983"
1001 PRINT"■■ GUIDE QUOSIMODO TO    THE
     BELL BEFORE THE   TIME RUNS OUT"
1002 PRINT"■ JUMP OVER THE FIRE-  BALLS!!"
1003 PRINT"■ CONTROLS:-"
1004 PRINT"■ CRSR DOWN = LEFT":PRINT" CRSR
     LEFT = RIGHT":PRINT" SPACE BAR = JUMP
     "
1005 PRINT"■ EXTRA LIFE AT 1500
1100 GOTO1
```

Quasimodo
by Glenn Ackroyd

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Alien Attack

on Spectrum

The object of this game is to shoot the invader which is coming down to earth. As your score gets higher he gets faster — the higher up the screen he is when you shoot him the more points you get. If the invader should manage to reach earth, all his friends will join him and the game is over.

Program notes

Lines	
2-30	Sets the graphics
100-225	Main program
230-1000	Speed of Invader
2000-2050	Fire
2500-2540	Alien death
3000-3060	Your death
9000-9550	User defined graphics

Graphic notes

120 = Graphic A, Inverse space, Graphic C, Graphic C,
200 = Graphic E
220 = Graphic E
2030 = Graphic C
2510 = Graphic F
3020 = 32 Graphic E's
(Line 222 is simply 32 inverse spaces)

```
  1 GO SUB 9000
  2 LET sc=0: LET v=10: BORDER
0: PAPER 0: INK 7
  3 LET q=0
  4 LET x=20: LET y=0
  5 LET o=1: LET p=15
 20 LET a=0: LET b=15
 30 LET z=0
100 REM ******MAIN PROGRAM******
110 LET y=y+(INKEY$="p" AND y<2
8)-(INKEY$="o" AND y>1)
120 PRINT AT x,y;"A";AT x-1,y
+1;"▌"
130 PRINT AT x,y-1;" ";AT x,y+3
;" ";AT x-1,y;" ";AT x-1,y+2;" "
132 IF s=5 THEN GO TO 140
135 LET z=x: LET c=y
140 IF INKEY$="a" THEN BEEP .1,
60: GO SUB 2000
145 IF q=5 THEN FOR e=1 TO 3
150 PRINT AT o,p;" "
160 LET d=INT (RND*v)
170 IF d=1 THEN LET o=o+1
180 IF d=2 OR d=4 THEN LET p=p+
1
190 IF d=3 OR d=5 THEN LET p=p-
1
195 IF p=30 THEN LET p=29
200 PRINT AT o,p;"X"
210 IF o=20 THEN GO TO 3000
215 IF q=5 THEN NEXT e
220 PRINT AT 0,0; INVERSE 1;"s
ore ";sc;AT 0,10;"Value of X =";
20-o
222 PRINT AT 21,0; INK 4; BRIG
T 1;"                                "
225 REM ******DIFFICULTY******
230 IF sc>50 THEN LET v=7
240 IF sc>100 THEN LET v=5
250 IF sc>125 THEN LET v=3
260 IF sc>200 THEN LET q=5
1000 GO TO 100
2000 REM ******FIRE******
2010 PRINT AT z,c;"▌"
2015 IF z=1 THEN PRINT AT z+1,c;
" ": GO TO 100
2017 IF z=0 THEN RETURN
2020 LET z=z-1
2030 PRINT AT z,c+1;"▌"
2040 IF z=o AND c=p-1 OR o=z AND
p-1=c THEN GO TO 2500
2050 GO TO 2000
2500 REM ******Alien dies******
2510 PRINT AT o,p; FLASH 1;"X";
FLASH 0
2520 BEEP .5,30: BEEP .5,40
2530 LET sc=sc+(20-o)
2535 PRINT AT 0,p;" "
2540 GO TO 5
2999 REM ******YOU DIE******
3000 PRINT AT 0,0;"": FOR n=1 TO
20
3010 BEEP .5,n
3020 PRINT "▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌
▌▌▌▌▌▌▌▌▌▌▌▌"
3030 NEXT n
3040 PRINT AT 10,10; FLASH 1;"Ga
me over";AT 12,8;"score ";sc
3050 IF INKEY$="" THEN GO TO 305
0
3060 RUN
8999 REM ******USER-DEFINED GRAPHICS
9000 RESTORE 9500
9010 FOR i=USR "a" TO USR "f"+7
9020 READ a: POKE i,a
9030 NEXT i
9040 RETURN
9500 DATA BIN 00000001,BIN 00000
011,BIN 00000111,BIN 00001111,BI
N 00011110,BIN 00111100,BIN 0111
1000,BIN 11110000
9510 DATA BIN 10000000,BIN 11000
000,BIN 11100000,BIN 11110000,BI
N 01111000,BIN 00111100,BIN 0001
1110,BIN 00001111
9520 DATA 0,0,BIN 00011000,BIN 0
0011000,BIN 00011000,BIN 0001100
0,BIN 00011000,BIN 00011000
9530 DATA 0,0,BIN 10000000,BIN 1
0000000,BIN 10000000,BIN 1000000
0,BIN 10000000,BIN 10000000
9540 DATA BIN 01111110,BIN 01011
0100,BIN 01011010,BIN 01111110,B
IN 00011000,BIN 00100100,BIN 010
00010,BIN 10000001
9550 DATA BIN 10010011,BIN 11010
111,BIN 00111000,BIN 00111000,BI
N 00111000,BIN 01010100,BIN 1001
0010,BIN 10111001
```

Alien Attack
by P Baillie

Microradio

GW6JJN

Morse tutor

As promised, here are some reviews of amateur radio software on the market. The first tape is a morse code tutor written by two people with the name J E Price. Their callsigns are *G40IK* and *G40IL* and the mail order address is 4 Housman Walk, Kidderminster, Worcs DY10 3XL; the price of the tape for the 16 or 48K Spectrum is £4.50.

The program by Messrs Price is a professional piece of software which is extremely suitable for learning morse code to the standard required by the examiner. The program opens with some nice user defined graphics of morse keys hammering away. The program is menu driven and, by selecting the required speed and lesson, the computer patiently bleeps out morse code in groups of letters and/or figures.

You can return to the menu at any time to change the lesson and each time this happens there is a pleasing screen clear routine. A morse tutor is not a very sophisticated problem for a computer, so the routines that are added to this program give it a nice touch of professionalism that makes the tutor value for money.

The second tape received was from *G4RWT* Amateur Radio Software, 68 Forest Road, Paddock Wood, Tonbridge, Kent TN12 6JX. The price is £4.50 (cheques to R M Walton). This tape consists of a morse tutor for the 16K Spectrum, a morse tutor for the 48K Spectrum and a program called *Sattrack*, also for the Spectrum. *Sattrack* is, of course, a satellite tracking program.

The first impression is that this tape is good value, two for the price of one, and this impression is confirmed by use. The morse tutor is also a good piece of software, professionally executed and perfectly adequate for learning the code. Again, graphics are used and there are instruction sheets that help in understanding the program.

The accompanying sheets also contain an interface diagram, which will help you to interface the Spectrum to the transceiver in order to send morse code from within the program. One of the menu selections is a morse keyboard, which enables you to send morse simply by pressing the relevant key on your micro.

The *Sattrack* program also has instructions about its use. This program will enable you to track any amateur satellite, given its orbital data (available from AMSAT). Data is built into the program, but this may need updating from time to time. Since the going rate for a computer program on tape these days is about a fiver, then you must consider this good value. Both the tutor and the *Sattrack* program do what is required of them and both are user friendly in that the user is prompted for input and the instructions are clear.

If there are any other producers of radio software out there, then please let me know — there is far too little radio software about as it is for it to go unsung. ■

Ray Berry GW6 JJN

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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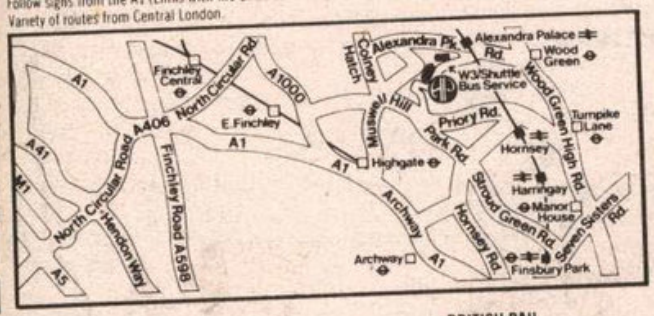

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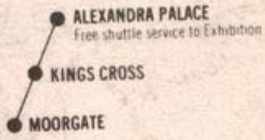

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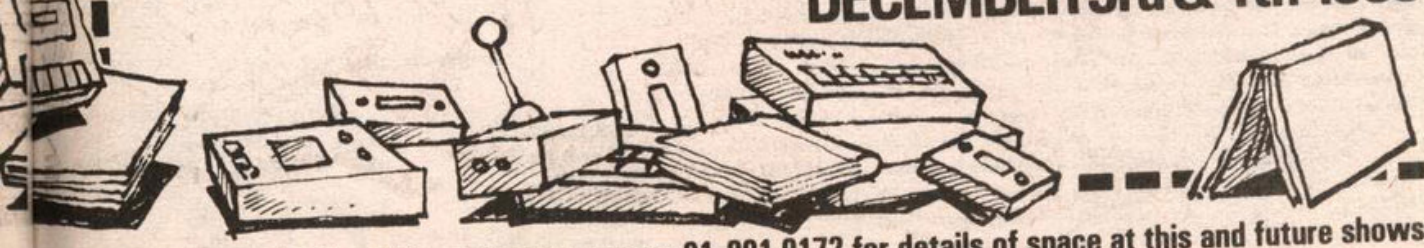

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Dragon advice

Knight's Quest, from Phipps Associates (which I first looked at in issue 42), seems to be holding the attention of a lot of people at the moment. Playing this for the few moments that I could spare, when it first arrived, I thought — yes, a nice traditional adventure, which will pass a few hours. But recently, I have come to look upon it as very much more complex than I had originally thought. And so, it appears, do several of our regular readers.

Geoffrey Larsen, of Clifton, in Bristol, for example, reckons that *Knight's Quest* "becomes increasingly more addictive and difficult as you progress, and I preferred it to *The Hobbit*" — high praise indeed! Susan Schoen, of Cardiff, also enjoyed playing KQ, and sent me an account of her game, written entirely from memory, as her Spectrum had surrendered after giving sterling service for the duration! Thanks to both of you for a lot of very helpful advice, and thanks to Phipps, who have very kindly sent me some welcome hints to help me answer your queries.

A few weeks ago, I gave you the wrong advice to help you deal with the Dragon — at that time I said you would, eventually, need to kill the Dragon, so that you would be able to cross over the river in the ferry. Well, although the Dragon is too heavy to come in the ferry with you, and you will have to cross the river, don't kill the Dragon! I'm afraid that reviewer's short-sightedness overcame me, and I didn't realise that the adventurer would need the Dragon at a later stage (thus going against my own Golden Rule of Adventuring, *Everything has a purpose*!).

The Dragon will be extremely useful to you later in the Adventure, and in his cave, you may find something just as useful (although this will take a bit of lateral thinking, and is not an easy problem to crack). This is only the very start of the Adventure — you'll find a lot more to keep you happy. As Geoffrey Larsen says, "There are many more problems in this game than *The Hobbit*!"

Knight's Quest is an Adventure that will keep you happily frustrated for many a long hour, and is one that I can recommend without hesitation. Incidentally, Geoffrey, if you are still having problems in *Colossal Adventure*, from Level 9, all I can say is that you are on the right track with the magic words — but you need to say them directly after climbing the beanstalk (remember the fairy story!). Have you found the Emerald yet? Once you have found the treasure that you are seeking, you must use another magic word to deposit the treasure in the building.

From one Dragon to another — I've already had an update, from Dungeon Software, of their latest large release of Adventure programs. The first of the programs is *Return of the Klarz*, the sequel to *Crystal Chalice*, which I mentioned a couple of weeks ago. Then comes *Dream Machine*, which is programmer Mike Meineck's "answer to *Pimania*"! and finally *Back Lot*, which is "an Adventure set after hours on the back lot of a Hollywood film studio".

Mike, feeling that he is not worked hard enough doing all this, is now adding Commodore 64 graphics to the whole range. I haven't actually seen any of these Adventures yet, but apparently many of you have invested in them and are already, says Peter Woods, the Dungeonmaster, ringing in with pleas for help with dealing with the piranhas in the Black Lake, in *Crystal Chalice*.

His advice, which he would like me to pass on to anyone struggling with the problem, is to study how the Brazilian Indians deal with them when crossing rivers!

Sticking with the Dragon, and new releases, Salamander Software have just let loose *Lost in Space* on an unsuspecting world. The subject of this, the second in the Dan Diamond trilogy, concerns the sub-Mike Hammer private eye getting stuck on a derelict spaceship (from Sunset Strip to a trip into the Sun!). The ship is filled with chatty doors (believe me!) and bored robots. The object is to escape, and this you must do by finding your way to the bridge and taking control of the ship.

The display is the same as in Part One, *Franklin's Tomb*. Top left is a description of the current location, and anything that you may be able to see. On the right of the screen is an inventory list, which is visible throughout the game, while the bottom third of the screen contains all your command input and the computers responses. As well as the usual kind of objects found in this type of Adventure, you will also come across several coloured discs, for which you will find special uses (so I'm reliably informed!).

The program recognises a vocabulary of about 50 verbs and 80 nouns — but watch out for Red Herrings and Blue Kippers!

Following the example set by *Franklin's Tomb*, a manual is included in the package, graced by 13 pages of beautifully-drawn pictures of the locations (and these may contain vital clues).

The video-style cases that contain the Adventures seem to be getting bigger with each one — are Dan's cases also getting bigger? Anyway, *Fishy Business* is the third part of the trilogy, and I can't wait!

Gary Miller, of Peckham, in the course of a long letter containing a large gripe (write to the company concerned, Gary, and ask for a Hint sheet. I know that they produce one, and may, indeed, give help on a specific point if you ask), mentions the good old *Hobbit* problem, the Goblin's Dungeon!

This has been covered very well in previous corners, Gary, and I'm not going over it again, but if you are still stuck, and for the benefit of newcomers to *The Hobbit* (and if you are the proud owner of a BBC, Commodore, or Oric, then this program must be added to your collection — ask your favourite aunt to make it a Christmas pressy for you!), then turn to the Adventure Corner in *PCW*, 21-27 July, where some, if not all, should be revealed.

Gary reckons that *Sorcerer's Castle*, from Mikrogen is one of the ultimate Adventures. He is an old Dungeons and Dragon fan, and obviously enjoys all the good old-fashioned monster-bashing.

There are one or two more programs around that borrow from D&D, although a solo outing on a computer can only really be a rather pale imitation of the original. However, I like *Dungeon Master*, from Crystal Computing, and you should find that it gives you a good flavour of D&D, with Charisma, Wisdom, Intelligence, and all the other details such as Hit Points, lots of Magic Spells and plenty of potions all making an appearance.

Not only that, but *Dungeon Creator*, on the same tape, allows you to actually play Dungeon Master and map out and populate your own Dungeon in the privacy of your own home (see a more detailed look at the tape in Adventure Corner, *PCW*, 22-28 September). An excellent pair of programs which should whet the appetite of the jaded D&Der. ■

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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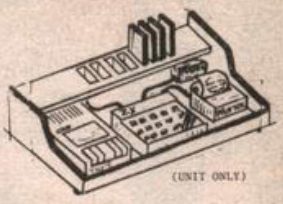

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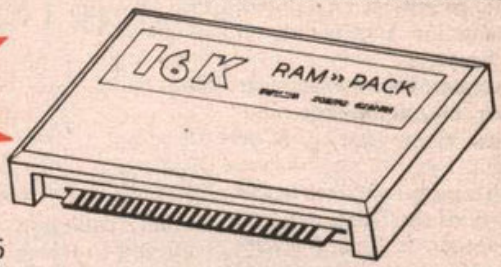

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IN COMMAND

Michael J Lever of Lilliesfield Avenue, Barnwood, Gloucester, writes:

Q I own two 48K Spectrums, one is an Issue 1, and the other is an Issue 2. I have discovered an interesting, (and annoying) difference, between the two of them. It concerns the *In* command.

Normally the *In* command should return just one value, (255), if no key is pressed. I have used this feature in a number of games, written on my Issue 1 Spectrum. However I discovered that when I *Loaded* the games into my Issue 2, *In* returned a value of 191, and the games did not work properly.

Can you tell me how to remedy this bug, so that 255 is returned on my Issue 2 Spectrum?

A To be fair to Sinclair, the specifications never suggested that *In* would always return 255. The way to get 255 returned is to make sure that 255 is there. If you proceed the *In* with *Out* x, 255 where x is the keyboard value you are checking, then *In* will return a value equal to the *Out* value. Unless, of course, that value is changed by pressing a key.

TAPE TO DISC

David Cartwright of Bowshaw, Dronfield, Sheffield, writes:

Q At the school I attend we have a computer room with 11 computers, three of which are connected to disc drives. I use the computer room quite a lot and we have recently acquired several discs for the disc drive machines.

However, I have found that the system for saving and loading machine code programs on tape does not work on the discs. Could you please tell me how to put machine code programs on to disc and how to calculate the address.

I know how to transfer from tape to tape but nobody at school knows how to do this on a disc. When I looked it up in the manuals under *Save it just gave a lot of meaningless address letters, FFFF, 5555 etc. Even the teachers could not help. Please can you help as I urgently need an answer?

A A lot of people have been disappointed when, having bought discs, they find that they cannot easily transfer programs on tape to the disc. Most of the problems stem from the fact that the disc operate by using 2.5K of user RAM. Essentially what you'll have to do is relocate all the programs on tape so that they do not use any of the same space as the discs. The cassette page is at *& E00* while the discs are at *& 1900*. Any program using the space in between will find it already occupied.

To explain in any detail how to move the programs would take an article that is beyond the scope of this page. If you try the following * OPT 1,2 then *CAT and then *Run* the program. At the end you will get the length, load address, and execute address in that order. This should be enough for you to relocate your program.

RAM PACK WOBBLE

Eileen Morris of Beechwood Drive, Woodford Green, Essex, writes:

Q Can you offer some advice to a young at heart pensioner who has just bought herself a ZX81? I bought one of those packs that have the extra 16K RAM in it, and I was doing fine until I put the extra RAM on to play chess. The screen displays the program but it waves all over the place. It's not the cassette recorder. Any advice?

A This letter firmly disproves the theory that every computer owner is a male under the age of 20. I hope I can solve your problem. There are two likely causes. One is that your television just needs re-tuning slightly. All computers can wander off-channel sometimes, the ZX81 more than most. Adding the RAM pack might help to de-tune it. Because you actually get the program on the screen I think this is the most likely cause of your problems.

The other cause could be something to do with the timing, or the coding of the timing signal. The problem should be in the RAM pack as the computer works well enough without it fitted. Do you find that the pattern "beats" or does it seem random? The easiest thing to check here is that the RAM pack is firmly attached to the computer. RAM pack wobble is still a major cause of faults on the ZX81.

If re-tuning the television doesn't work and you're sure the RAM pack is fixed tightly, I'm afraid you'll just have to return the pack to the manufacturers.

FLAT ADAPTOR

David Jones of Haol Cefni, Ciermawr, Morriston, Swansea, writes:

Q Please can you help a down and out computer Junkie? Last week I trod the streets of Swansea looking for the six-pin flat adaptor for the Vic20 and the C2N cassette deck.

The answer I got from all the computer and audio shops was that my only hope was to contact Commodore direct, and that it would otherwise be impossible to obtain. I have now waited a week and a half but have had no reply from them. Do you know where I might write, phone, or pray to get one?

A What you need is a US standard edge connector. The American standard is 0.15, and you should be able to find one with the right number of connections. One place I know that does have them is Maplin Electronic Supplies, Unit A, Oats Road South, Hadleigh, Benfleet, Essex SS7 2BB.

PASS WORDS

Shane Gale of Alectus Way, Witham, Essex, writes:

Q I am writing to ask you if, when you are dialling into another computer, you have to guess the pass words? Or is there a manual available that lists them? I already have access to the code numbers of six or seven large computers, but the missing piece of the puzzle is the code words. Can you help?

A No, of course you don't have to guess the pass words, but the whole idea is that only the user knows them, and no one else. Why have a pass word to protect a system, if a list of them were readily available? I can understand the excitement, and sense of achievement, that must come from breaking into a computer system. However, what people do not seem to realise is that apart from being theft, it is also very dangerous, especially if, as has happened in the United States, people try to break nuclear and military computers. These people have now been caught by the FBI.

Remember that the government does not know that your intentions are innocent — if caught you could find yourself being treated more like a terrorist. Breaking generally, it's just likely to create problems in the long-run as companies spend more and more money preventing it. It could, for example, mean that the computer checks the source of each call — a kind of phone tapping. Would you want that?

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DRAGON 32 plus £68 software and two joysticks, manuals plus five games and programs, £170. Tel: Leeds 693736.

DRAGON 32 plus £300 worth of software, two joysticks, cassette deck and books, £270 ono. Tel: Mike, Bristol (0272) 613309 after 7.30 pm.

DRAGON 32, joystick, £260+ of software which includes: Composer, Planet Invasion, Assembler and lots more. Magazines, books, two cartridges, hi-res, Starship Chamalon, £240 ono. Contact: P. Tracy, Warton 635353 after 6 pm.

DRAGON 32 software for sale or swap. Planet Invasion, Space War, Chess, Frogger, £6 each or swap for Microdeal, J. M. Morrison, etc. No adventures or compendiums. Write to: Paul Fisher, 9 Nelson Close, Mickleover, Derby.

DRAGON 32 plus cassette player, 2 joysticks, programming books, magazines and software, £110 ono. 22 Upfield, Horley, Surrey. Tel: 02934-2613.

DRAGON 32, cassette, joysticks, software and books including two cartridges, Tasmon Demon Assembler, Invaders, magazines, £350 worth of software including Microdeal and Morrisons best sellers plus other programs, swap BBC model or 300 or nearest offer. Tel: Grimsby 851391 or 851708.

DRAGON 32, four months old, joysticks, cassette loader, £50 of software plus books, £220 ono. Tel: 01-206 0919.

DRAGON 32, perfect, under guarantee, all leads and software (Microdeal, Salamander), 2 Microdeal joysticks, interface, books and light pen, worth £475, sell for £299. Tel: Medway (0634) 270317.

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DRAGON 32. Five highly imaginative games on a quality cassette plus original documentation including Pucmann, Invader Synthesiser, Duel and Colony, costing £3.50 inc p&p. Cheques/PO to A. J. Wass, 19 Fernwood, Marple Bridge SK6 5BE.

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DRAGON 32. Good condition guaranteed all leads new joysticks reliable recorder 4 Microdeal cassettes Berserk cartridges, worth £270, offers over £180. Telephone Dundee 67411 after 6 pm.

DRAGON 32. Still boxed 1 month old and new cassette recorder, 1 pair joysticks all leads and manual, 2 cassette games, cost £225, bargain only £180. Tel: Accrington 0254 391020.

DRAGON 32. £40 of software, manuals, lead, book and cassette player, £130. Tel: 0582 607969 after 6 pm.

DRAGON 32. £400 software, machine code cartridge, 1 joystick, 4 games, sell £90 ono. Barton 781147, Don Cambell.

DRAGON 32 + 3 cartridges, joysticks, cassette, s/w and books, £180. Tel: Fleet (Hants) 02514 20152.

DRAGON 32 + joysticks + dust cover + £160 top name software + 6 books, £180 or swap for 48K Spectrum Issue 2 + software. Tel: East Grinstead 0342 27072.

DRAGON 32, 3 months old, a pair of joysticks, dust cover, approx £50, 2 cartridges, £170 ono. 021-326 9501.

DRAGON FOR SALE, £135, no offers, with extras. Tel: 061-945 1269.

DRAGON 32, manual, joysticks, leads, plus £70+ of software including Ring of Darkness, Katerpillar, Planet Invasion plus £30+ of magazines, worth over £350, sell for £200 ono. Tel: 0792 401823.

DRAGON 32, cassette recorder, over 25 tapes including Donkey King, Katerpillar Attack, Hi-res cartridge, 51 x 24 screen, 2 joysticks, light pen, book, magazines, only £220 for quick sell. Tel: 01-703 7985.

DRAGON 32, boxed, with all leads, manuals, etc, book, £30 worth software, all Dragon User magazines, worth £220, sell £140. Ring 0704 68894.

DRAGON 32, under guarantee, boxed, including all leads, £30 worth of software, 2 new joysticks and £20 worth of books and mags, £150. Tel: Leeds 604981 after 5 pm.

DRAGON 32, complete with 20 software tapes (Arcade, Adventures, Home Finance), three cartridges (inc Chess), books, joystick, printer cable and Dragon User magazines, £210 ono. Phone 01-641 2285, Johnson.

DRAGON 32, very good condition, 3 joysticks, 3 books, over £220 worth of s/w, cost £450, sell for £210 ono. Tel: (0279) 815623.

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ATARI VCS plus four cartridges, including Space Invaders with joystick and paddles, will sell for £75 ono (or will swap for Spectrum). Tel: 051 220 0049.

ATARI VCS, 10 cartridges, excellent condition, worth £400. Sell for £130. Tel: 455 1042.

ATARI 400 48K, moving keyboard, program recorder, joystick, all manuals, PSU etc. 50 machine code games include most famous titles and others! £270 ono. Tel: 01-599 6946.

ATARI 800 48K with disc drive, 810, inc: Atari Basic, Microsoft Basic, Assembler Editor, Monkey Wrench, two arcade and adventure games + manuals. Sell for £570. Tel: 01-722 4570.

65 ATARI VCS CARTRIDGES between £8 and £10 inc: Missile Command, Asteroids. Tel: Bicester 242 408 (5-6 pm).

ATARI VCS + two paddles + two joysticks — games cartridges, £50. 01-568 7325.

ATARI VCS plus Pacman and Defender with Combat, joysticks, all for £50. Tel: Southend 710266 after 4 pm on weekdays.

ATARI, VCS and all the gear, plus nine cartridges and a dust cover, including Pacman, Space Invaders, Chopper Command and Asteroids, worth over £250, bargain at £95. Tel: Southend-on-Sea 232420.

ATARI VCS with Space Invaders and Combat cartridge, £50. Tel: 01-675 0797.

ATARI VIDEO COMPUTER SYSTEM plus six cartridges, including: Defender, Asteroids and Space Invaders. All boxed, £100 or nearest offer or will sell games separately. Tel: Penrith (Cumbria) 63518.

ATARI 400, Basic, Star Raiders, two joysticks and over £15 worth of books, only one month old. Sell for £160 ono, worth over £200. Tel: 01-656 3735 evenings only.

ATARI VCS. Good condition, five cartridges, £50 ono. Tel: 01-328 2075.

ATARI VCS. Paddles and joystick, nine cartridges, Asteroids, Space Invaders, £150. Tel: 01-452 4838.

ATARI 800 48K tape recorder, disk drive, £300 of software, as new would cost £950, accept £650. Tel: 021-550 9924.

ATARI VCS .plus joysticks, paddles, combat cartridge and manuals, excellent condition, still guaranteed, £50. Atari VCS tidy, two cartridge holders and dustcover, £7. Empire Strikes Back cartridge, £17. Phoenix cartridge, £17. The lot for £85 ono. Tel: Woking (04862) 70318.

ATARI 400 48K, 410 program recode, £150 of games, back-up cassette, still in boxes, with one Atari and quickshot joystick. Offers or swap for BBC. Tel: 01-550 0106 after 4 pm or swap for BBC.

ATARI VIDEO COMPUTER SYSTEM with three cartridges, Combat, Street Racer and Space Invaders. All boxed with full instructions. Very good condition, £75 ono. Tel: 0254 381335.

Wanted

WANTED PRINTER for BBC. Phone Maldon 869398.

SWAP. Atari 400 plus 16K, Basic, recorder, manual and software for Spectrum 48K plus bits or sell for £130. As new. Ideal for Christmas. Tel: Martin after 7 pm, Burgh Heath 57278.

SPECTRUM SOFTWARE SWAP, 3D Tanx, Arcadia Hobbit, Flight Simulation, Gulpman, Jetpac, Penetration, Centipede and many more. Tel: 01-789 5728.

WANTED. Faulty or damaged ZX Spectrum 48K or 16K. Tel: Abingdon 834613 after 5.30 pm.

WANTED. 16K Spectrum. Must be Model 1 plus PSU leads etc. No software needed. Tel: Rugby (0788) 60405, Mr. Shelley.

SWAP Dragon 32 for BBC Model B including £200 of software. Most popular titles, still under guarantee. Mint condition. Leads, joystick, manuals included. Tel: 01-370 5696.

WANTED. ZX Spectrum 48K software, printer if available. Tel: Chesham (0494) 772544.

SWAP OR SELL Oric-1 48K cassette recorder, joystick, interface, quickshot joystick, £50 software, printer voucher, worth £300. Very good condition, swap for Atari 600XL or sell for £200 ono. Tel: Melton Mowbray 60281.

SWAP ADVENTURELAND cartridge for any other in Scot Adams CB. Tel: (0698) 421 327, Hamilton.

SWAP SPECTRUM for Dragon software. Mostly interested in adventures, would like Mysterious Adventure series, but anything considered. Tel: 0392 833240.

AN ATARI 810 disk drive plus disk software. Tel: Dudley 53149 evenings.

WANTED BADLY. 16K/48K Spectrum with manuals, will pay £70 to £90 plus postage costs. Also wanted quality software. Send offers to Jan Erik Borge, Box 42, 3135 Torød, Norway.

SWAP Dragon 32 plus joysticks and software including: Frogger, Shuttle, The King and more also *Dragon User* magazines. Four months old, boxed, for 48K Spectrum with software (under guarantee).

WANTED. Diagrams and technical information on T199/4A add-ons. Also secondhand RS232, modules, cartridges, etc. Write: T. R. Freeman, 155 Albert Street, Fleet, Hants GU13 9RP.

For sale

SHARP MZ 80K built-in screen and tape recorder, £350 of software and manuals, user guide and program books and dust cover, for £295 ono. Tel: 01-455 6641, Golders Green, after 4.30 pm.

LYNX 48K, as new. Still under guarantee. Boxed with manuals, leads, demonstration tape and users magazines, £150. Tel: Wickford, Essex, 68701.

PHILIPS G7000 VIDEOGAME, 18 cartridges, dustcover. Good condition, value £360, sell £170 or NU cartridges separate, £8.50 each. Quest for the Rings, £18. Tel: Accrington 0254 396847.

LYNX SOFTWARE GAMES PACK III, plus IV, Adventure Quest etc., book plus two newsletters. Any reasonable offer over £10 accepted. Tel: Egham 33502 (Surrey). Private sale. Good condition.

FOR SALE OR SWAP. Spectrum software. Most well known titles, including Arcadia, Flight Simulator, etc. Tel: Lairg (Scotland) 0549 2113.

SELL VIDEOGENIC 16K, £250 worth of software, books and manuals, £200 ono. Contact: 49 Homefield Road, Pucklechurch, Bristol BS17 3QA. Tel: 027582-2145.

MICRO-PROFESSOR ONLY, £90. Brand new, only two months old. Tel: 01-351 2269 after 6 pm.

LYNX 48K, six months old, complete with compatible tape recorder, nine games tapes, associated books, newsletters and listings. Bargain at £175. Write to: 31 Irwell Place, Platt Bridge, Near Wigan WN2 5EF.

ARCADIA, 3D Tanx, £3; Time-gate Battlezone, £4; Hobbit, £9; Flight Simulation, £6; VU-3D, £7; magazines and books, 25p p&p. Write to: D. Appleton, 9 Coronation Road, High Bridge, Somerset. (Private sale).

ZX PRINTER. Original roll unfinished plus five rolls of paper. Improved spool and software to enable sideways print, £25. Tel: Bath 887155 during office hours.

WIRELESS WORLD MICRO PSICOMP 80 Z80 + number cruncher based, built by professional engineer from Robust + power tran kit, full paper work + news letters. Offers? Tel: 01-289 7219 (evenings).

INTELLIVISION. Boxed as new. Unwanted gift. Three free games. Hardly used. Bargain at £75 ono. Tel: Oswestry (0691) 656488.

CROMEMCO high resolution colour graphics system. Complete 760 X 340 Pixel system with graphics, software. New cost over £3,500. Offers around £2,000. Tel: Aberdeen (0224) 572933.

TRS-80 MODEL 1, level 2, Basic 48K, expansion interface, one disc drive, cassette, lots of software including: Scripsit, Edtasm, Zchess II, Nendos 80, etc. £400 ono. Tel: (07918) 6254.

DATA CASSETTE RECORDER CCR800 for Spectrum, Oric, etc. Very reliable, £18. Forth Manual, Winfield complete Forth book, Hampson tape version 2, £9. Tel: 0203 383212 or 0992 830248.

LYNK 48K MACHINE, four months old, hardly used, mint condition, manuals, introductionary cassette, boxed as new, cost £225, sell for £190 ono. Tel: 01-626 1500 (office hours), extension 2017.

TI94A, as new, £75. Chess and personal records cartridges, £20 each. TI-55/II LCD programmable calculator, £20. Chess Challenger 7 chess computer, £35. 20 Callerton Close, Ashington, Northumberland NE63 9QT.

INTELLIVISION GAME plus six games, £130. Tel: 01-876 0095.

OHIO SUPERBOARD, faulty, hence £40 or offers. 8086 development system with intel monitor eproms etc, offers. Hugh Bridge, 363 Kennington Lane, Vauxhall, London SE11 5QY. Tel: 01-735 1862.

TEXAS INSTRUMENT P199 home computer games module: Barsc, Chess, Munchman, £20 ono. Hardly used. Tel: 01-558 0767 (evenings).

GEMINI GALAXY 2 800K DISK. As new, £200. Tel: (0753) 882399.

SHARP MZ80K plus printer, £600. Tel: (0753) 882399.

ASTRO CLASH for the unexpanded Vic20, good sound effects and graphics, for only £1.20 a copy inclusive of p&p. Send to 32 Grange Road, Strood, Kent.

SHARP MZ80, built-in screen, cassette recorder, Basic tapes, manual, Forth tapes and programming books plus £250 software for sale, £350. Tel: 01-455 6641 after 4 pm.

COLEVISION ZAXXON CARTRIDGE. Offers to Alistair, Bedford 212 646 after 5 pm.

ORIC-1 48K complete with manual, P.S.U., all leads, Forth cassette and manual, assembler/disassembler and documentation plus a couple of games, £130. Tel: Essex (0245) 50432.

CBM 64 SOFTWARE, S/H private sale. At least 50 per cent off list. Tel: Ged on Warrington 31288 ext 231 between 12 pm and 12.30 any Monday.

VIC20 plus cassette, Programmer's Aid cartridge, machine code cartridge, 16K plus 3K Ram cartridges, joystick, books and many magazines, £150 ono. Tel: 0634 813196.

FULLER SPEECH SYNTHESISER. Excellent condition, £30. Selling because buying a microdrive. Tel: Wolverhampton 737179 after 4.30 pm.

ORIC 8k Rampack, mint condition, boxed. Swap for software or sell £15. Tel: 041-778 5184 evenings/weekend.

NEWBRAIN COMPUTER, AD model, built-in display, manual, printer, leads, games, cassette and beginners guide. Virtually unused, £160 ono. Tel: 021-520 2617.

8271 DISC controller chip wanted for BBC, £15 paid. Tel: Peter on Upminster 24385.

PHILIPS G7000 COMPUTER, as new, with six games including computer pack, £65 ono. Tel: Tottenham 801-5580.

SWAP PORTASS 3½in. centre lathe, C/W motor, single phase, 3-jaw, 4-jaw chucks for Dragon data disc drive. Gray, 178 Grange Road, Letchworth, Herts.

ELEVERTHALLS program 6809, will buy or swap for Dragon software. Tel: Richmond 811611.

SWAP VIC Super Expander cartridge for two games cartridges must be (Moneywars, Cosmic, Jailbreak, Manangerie). Tel: Stevenage (0438) 811634 after 7 pm.

SPECTRUM 16K/48K. Tel: Langford (0458) 020130.

EXCHANGE OF BUY ZX81 software. Send list. 65 Grassdale View, Sheffield S12 4LZ.

BBC SOFTWARE, 50 programs, a range to choose from. Ring for details. Tel: 574 2576.

BBC SOFTWARE, Acorn Soft originals and many others, £6 tapes all £4 each, must sell. Tel: 051-420 3462.

BBC MODEL A (32K) plus printer port plus joysticks, £350 ono. Epson MX80 FT III hi-res printer, £350 ono (less 10 per cent for both). Tel: Halifax 41048.

BBC MODEL B. Still boxed, large amount of software plus joysticks and magazines etc, £700 ono. Tel: 01-575 0640 after 6 pm.

BBC MODEL B 1.2 O/S, guaranteed. Bought September 1983, software available, £360. Tel: (0753) 73099

TNT SOFTWARE

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An original game with on-screen scoring plus Hi-Score. Watch out for the Spider, mind the Bees don't confuse. Remember eat all your veg, a Super Carrot can improve your eyesight — now you can see the gate. Careful round those Rocks. Can you survive a full 12 months in a garden like this?

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T.N.T. Software, Dept B
Melton House, Lindal
Ulverston, Cumbria

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48K SPECTRUM

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All programs run in the **48K ZX SPECTRUM** and are available from all good computer shops. In case of difficulty please order direct using the coupon below.

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All at £5.50 each (inclusive of VAT and 1st class postage)

I enclose cheque/P.O. for £ or debit my Access Account No.

Name

Address

INCENTIVE SOFTWARE LTD., 54 London Street, Reading RG1 4SQ. Tel: Reading (0734) 591678

ELABORATE

Gateway To The Skies is an elaborate text adventure for the BBC with 32K. It is so vast it will not fit into the machine and so has to be loaded in two parts.

The program has single key entry of all movement commands, but adopts the standard Verb/Noun format for all other instructions.

The basic point of the adventure is to search for hidden golden artefacts and take them to the palace of King Zalea. You can save the game at any stage and you'll probably need to — it sounds like a long one. A Spectrum version is also available.

Program *Gateway To The Skies*
Price *£8.00 (Spectrum £6.95)*
Micro *BBC (32K)/Spectrum 48K*
Supplier *Solar Soft*
5 Westmorland Drive
Camberley
Surrey GU15 1EW

CORRUPT

Richard Shepherd Software has been one of the most successful games houses specialising in adventures for the Spectrum.

The company has now released its first program for the Commodore 64. The game *Ship of the Line* is an adaptation of the program of the same name on the Spectrum.

You assume the role of an unashamedly corrupt, sea captain in charge of a Royal Navy warship, in the 17th century. You must fight ferocious sea battles to win treasure with which to bribe your way to the top.

Succeeding in the game is a matter of careful planning and luck, will you have enough rations to feed your mutinous crew? Will your ammunition run out?

Program *Ship of the Line*
Price *£6.50*
Micro *Commodore 64*
Supplier *Richard Shepherd Software*
Elm House
23-25 Elmshott Lane
Cippenham
Slough
Berks

MAGIC

Compilers are wonderful things. The biggest problem with Basic is that it is simply too slow to produce the kind of exciting games that you want to play repeatedly.

Machine code on the other hand is fiendishly difficult (well I think so anyway). A compiler though, magically turns a Basic program into machine code while you sit back and watch.

The first compiler I've seen for the BBC B has just been issued by Park Software. If it all sounds a bit too good to be true, well, as with all compilers, there are limitations.

The maximum program length is 8K and only 300 program lines are allowed. Similarly, you are limited to 26 variables and 30 procedures. Nevertheless, with care, most things are possible and you could find the compiler very useful.

Program *Compiler*
Price *£14.95*
Micro *BBC B (1.2 OS. A with 32K)*
Supplier *Park Software*
26 Romilly Park Road
Barry
South Glamorgan
CF6 8RQ

3D SCRAMBLE

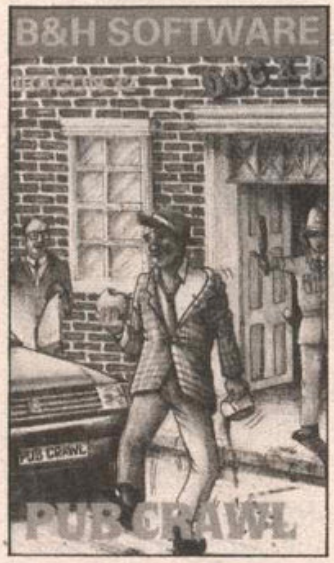
Zaxxan is the first version I've seen on the Spectrum of the impressive *Zaxxon* arcade game.

Although plot-wise the format is similar to *Scramble* — break through the enemies defences to reach and destroy some ultimate objective — the game achieved its reputation because of the 3D presentation of the attack.

Your aircraft, complete with shadow, is seen from above and to the side. The enemy defences are seen from a similar perspective. The way the screen scrolls diagonally, adds to the sense of pace and drama in the game.

Program *Zaxxan*
Price *£5.50*
Micro *Spectrum 48K*
Supplier *Starzone Software*
74 Wallingford Road
Shillingford
Oxford OX9 8HB

FUZZY



Let me be honest. I have always thought that Dragon software was appalling — everything I saw was overpriced and dull, and incidently, usually written in Basic.

However, things are looking up. After the excellent *Ugh* by Softek, we have *Pub Crawl* by B&H Software and it's another superb Dragon game.

The screen displays a layout of various pubs and a hamburger joint. You leave home trying to visit as many pubs as you can, downing a swift pint in each. Naturally after a while things start to get a little fuzzy and with all that traffic about you'd best grab a burger to line your stomach.

Later stages of the game bring on police cars that dash about like something from the Sweeney — can you drink all the pints and make it back home?

The game is entirely in machine code and it shows; the action is very fast and the sound effects are amusing.

Program *Pub Crawl*
Price *£6.95*
Micro *Dragon 32*
Supplier *B&H Software*
208 King Street
Cottingham
Hull

MS RIGHT?

Lonely? Spent too much time sitting alone in front of your tv? Looking for Miss Right (or Mr Right) — now there's no need to switch off the tv and rush madly into dozens of meaningless relationships, use your computer to plan ahead.

Matchmaker is the program you need, roughly equivalent to the systems used by professional companies, it will store 100 people's replies to a series of 25 questions and, according to their answers, match them.

Using the computer's rating system you will be able to find the person who most likes what you like, etc. But what will you have to talk about?

Program *Matchmaker*
Price *£9.99*
Micro *Commodore 64*
Supplier *Commodore*
675 Ajax Avenue
Slough Trading Estate
Slough
Berks SL1 4BG

SKILLS

Games Graphics and Sounds is a book intended to be both a general guide to what kinds of game are available and specific information on how some of the effects are programmed.

Along with the types of game, the skills required for each are discussed and there are various colour illustrations.

Also included is a guide to what to buy for games playing and a number of programs to type in. Given the colour illustrations it looks reasonable value at £4.95.

Book *Games Graphics and Sounds*
Price *£4.95*
Micro *General*
Supplier *Francis Lincoln*
Apollo Works
5 Charlton King's Road
London NW5 2SB

DANGEROUS

Terminal Software whose *Pinball* achieved wonders in 3K on the Vic has entered the competitive world of Spectrum programs.

Both of its new releases are graphics adventures — *Vampire Village* and *Space Island*.

Space Island gives you an android to control — the only equipment you have been able to get down to the planet Zyro from your spaceship orbiting the planet. You must use your android to locate the origin of a dangerous time distortion on the planet.

Movement and instructions to the android are all by single key presses although there are many more options than usual. The only graphics I managed to see of the game before my android drowned was the map of the planet and this was well done. The packaging, too, is very robust and appealing. Recommended.

Program *Space Island*
Price *£6.95*
Micro *Spectrum 48K*
Supplier *Terminal Software*
28 Church Lane
Prestwich
Manchester M2 7LW

LADDERS

More praise for Dragon software. This time for *Castle Attack*, a multi-screen arcade game with many features.

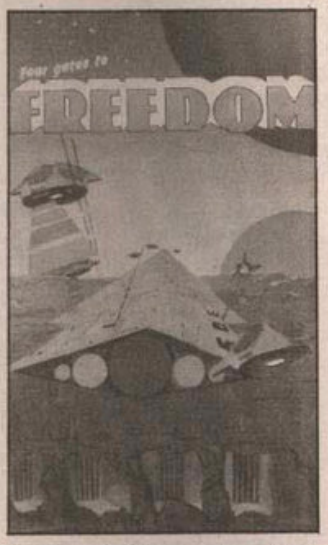
The first section is a bit like *Apple Panic* although very well done — you must run up a number of ladders on the walls of a castle to reach three keys, but you must get them in the right order.

The problem is, various barrels and arrows are hurtling across the screen — you can avoid them but your time is limited. That, though, is only part one.

In the second section you play a variant of Mastermind with the life of a beautiful princess as the stake. The knife suspended above her draws nearer as you fumble at the logic of a four shape code. As ever, everything gets more and more difficult as you go along. Fine stuff.

Program *Castle Attack*
Price *£6.50*
Micro *Dragon 32*
Supplier *M & D Systems*
39 Sheridan Road
Frimley
Surrey GU16 5DU

SUPERB



Phoenix Software whose double package *Death Mines of Sirius* I thought very good value for money have now released their first Vic game in the double cassette arcade/adventure series.

I can say that the action part of this package called *Four Gates To Freedom* is superb. It's a sophisticated version of *Breakout* where you fire at the walls with lasers. I've seen nothing faster, noisier or more addictive outside of some of the Llamasoft games.

Mastering the action game (a seemingly impossible task) will give you the start up code to the adventure.

The task then is to release the crew of a star cruiser who are held in suspended animation somewhere in the mysterious catacombs of Xzinos. It has all the standard adventure features and the package is highly recommended.

Program *Four Gates To Freedom*
Price *£9.95*
Micro *Vic20 (+8K)*
Supplier *Phoenix Software*
Spangles House
116 Marsh Road
Pinner
Middlesex

OPPRESSED

Red Shift has made the world of war-game orientated computer programs its own.

The latest addition to the range is *Nebula* for the 48K Spectrum. It has the classic scenario of expansionist emperors forcing oppressed peoples to battle it out for territory and glory.

I must admit that in the past I have expressed doubt with the manuals that accompany these sort of epic games — mainly because I can't understand them. On this occasion though, I can happily report that the manual is (a) quite short and (b) fairly easy to understand, so it may be that *Nebula* could be an introduction to the subject.

Program *Nebula*
Price *£9.95*
Micro *Spectrum 48K*
Supplier *Red Shift*
12c Manor Road
London N16 55A

MYSTERY

The one place where the Spectrum (16K) has no advantage over the ZX81 16K is in running text adventures. In fact, the ZX81 has more available memory.

So it's good to see that adventures are still being issued for the machine — the most recent is *Don't Look Now*.

You explore a series of caves meeting peculiar strangers who will probably want to kill you and finding objects whose function is quite likely to remain a mystery.

There is no ultimate end to the game and you must simply use your ingenuity to get as far as you can.

Program *Don't Look Now*
Price *£4.95*
Micro *ZX81 (16K)*
Supplier *MDD Whitehouse*
7 Dornie Close
Stewarton
Kilmarnock
Ayrshire KA3 3HE

WELCOME

The Commodore 64 is a very powerful machine, but important utilities like machine code programming tools are still relatively scarce.

At the moment there isn't much choice for the 64 owner wanting to venture into assembly language; assembler and disassembler programs are few and far between.

For this reason the *Commodore 64 Mastercode Assembler* should be welcome news, combining as it does a machine code monitor, disassembler, file editor and assembler in one package.

There's no point in trying to list all the features in a short piece like this, but I can say that the manual is clearly written and the program is very user friendly. I'd better add that it's by Sunshine (which is us) and was written by book authors David Lawrence and Mark England.

Program *Commodore 64 Mastercode Assembler*
Price *£14.95*
Micro *Commodore 64*
Supplier *Sunshine Books*
12-13 Little Newport St
London WC2R 3LD

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, London WC2R 3LD.

This Week

Program	Type	Micro	Price	Supplier
A 10 Bomber	Arc	Colour Genie	£8.00	Ipswich
Amazing Ollie	Ed	BBC B	£6.95	Storm
Armageddon	Arc	Commodore 64	£9.95	Visions
Assembler/Disassembler	U	Commodore 64	£9.50	Micro Video
Banana Drama	Arc	Commodore 64	£9.95	Visions
Bandits	Arc	Electron	£7.95	Program Power
Battle Brick	Arc	Lynx	£4.50	Bus Tech
Big Time	Ad	Spectrum	£4.50	Mushroomsoft
Cassette 10	Ed	BBC B	£11.85	Schoolsoft
Centimunch	Arc	Spectrum	£5.95	TNT
Chess	S	Electron	£7.95	Program Power
Croaker	Arc	Electron	£7.95	Program Power
Dare Devil Dennis	Arc	BBC	£7.95	Visions
Deathchase	Arc	Spectrum	£6.95	Micromega
Dodge City	Arc/Ad	Spectrum	£9.95	Phoenix
Double Trouble	Arc	Spectrum	£5.90	Starlite
Drone War	Arc	Spectrum	£4.95	Enigma
Espionage	Ad	Dragon 32	£4.95	Exodus
Felix and the Fruit Monsters	Arc	Electron	£7.95	Program Power
Felix in the Factory	Arc	Electron	£7.95	Program Power
Fireflash	Arc	Spectrum	£6.95	Abacus
Fool's Gold	Ad	Commodore	£6.99	Romik
Galactic Warriors	Arc	Spectrum	£6.95	Abacus
Geniepede	Arc	Colour Genie	£8.00	Ipswich
Golden Apple of Zeus	Ad	Vic20	£6.99	Romik
Goodness Gracious	Arc	Commodore	£6.95	Beyond
Graphics Package	Ut	Spectrum	£4.50	Dream
Gusher	Arc	Commodore 64	£9.95	Visions
Heist	Arc	BBC B	£6.95	Softspot
Helpline	Ed	Lynx	£4.50	Bus Tech
Hobbit	Ad	BBC B	£14.95	Melbourne
Hopper	Arc	Spectrum	£6.95	PSS
I Do	U	BBC/Electr	£12.65	Acornsoft
Invaders	Arc	Lynx	£7.00	Bus Tech
Invoicing	U	Dragon 32	£24.95	Micro Bus
Jumping John	Arc	Lynx	£7.00	Bus Tech
Krazy Kong	Arc	Spectrum	£6.95	PSS
Light Pen Editor	U	Commodore 64	£10.50	Micro Video
Lynx Muncher	Arc	Lynx	£4.50	Bus Tech
Martian Rescue	Arc	Colour Genie	£8.00	Ipswich
Minefield	Arc	Lynx	£4.50	Bus Tech
Moonraider	Arc	Electron	£7.95	Program Power
Proteus	Arc	Spectrum	£6.95	Abacus
Rapedes	Arc	Spectrum	£5.95	Visions
Roborun	Arc	Lynx	£6.00	Bus Tech
Sketchpad	Ed	BBC B	£6.95	Storm
Snooker	S	BBC	£8.95	Visions
Snooker	S	Commodore 64	£8.95	Visions
Snooker	S	Vic20	£8.95	Visions
Star Warrior	Arc	Spectrum	£6.95	Visions
Starclash	Arc	Spectrum	£6.95	Micromega
Stock Control	U	Dragon 32	£49.95	Micro Bus
Surround	Arc	Lynx	£4.50	Bus Tech
Swoop	Arc	Electron	£7.95	Program Power
Sword Of Hrakel	Ad	Vic20	£6.99	Romik
Tank Battle	Arc	Jupiter	£4.95	Plasma
The Dating Game	U	BBC/Electron	£12.65	Acornsoft
The Shaky Game	Arc	Spectrum	£8.00	Epic
Tombs of Xelops	Ad	Commodore 64	£6.99	Romik
Transistor's Revenge	Arc	BBC B	£6.95	Softspot
Transylvanian Tower	Ad	Dragon 32	£6.95	Richard Shepherd
Up Periscope	Arc	Dragon	£6.95	Beyond
White Crystal	Arc	Dragon 32	£6.99	Romik
Word Feud	Arc	Commodore 64	£7.95	Audiogenic
Wordsearch	Arc	Lynx	£6.00	Bus Tech
Zombie Panic	Arc	Lynx	£4.50	Bus Tech
Zorgon's Kingdom	Arc	Vic20	£6.99	Romik

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.

Book Ends

POOR ORIC

A nice, undemanding idea, to fill a small gap in a computer owner's stocking, this Christmas is *Computing: A Bug's Eye View* by Shiva.

It's a neat little book containing nothing but cartoons on a computing theme, all featuring the bizarre bugs and insects created by Cosgrove.

Most of the jokes are of the groon, groan kind — Hamlet bug looking over an Oric with a sword through it says (you can see it coming, can't you) "Alas, poor Oric". Probably not good for much more than a couple of hours read, but at £2.95 perhaps that doesn't really matter.

Book *Computing: A Bug's Eye View*
Price *£2.95*
Micro *General*
Supplier *Shiva Publishing*
4 Church Lane
Nantwich
Cheshire CW5 5RQ

VIOLENCE

Games of death, destruction and other wanton violence abound in *Tim Hartnell's Giant Book of Spectrum Games.*

Programs with names like *Suicide* and *Nuclear Fallout* suggest this might not be the book to ask your aged granny to buy for you as a Christmas present.

Having said that though, I should add that most of the games look like they might actually be worth your while typing them in.

The book is published by Fontana which means it should be very widely available and at £3.95 it looks good value.

Book *Tim Hartnell's Giant Book of Spectrum Games*
Price *£3.95*
Micro *Spectrum 16/48K*
Supplier *Fontana Paperbacks*
8 Grafton Street
London W1X 3LA

Top 10 Top 10 Top 10 Top 10

BBC*

1	(1)	Planetoids	(Acornsoft)
2	(3)	Rocket Raid	(Acornsoft)
3	(2)	Hopper	(Acornsoft)
4	(4)	Swoop	(Program Power)
5	67)	Meteors	(Acornsoft)
6	(5)	Monsters	(Acornsoft)
7	(8)	Alien Swirl	(Program Power)
8	(—)	Missile Base	(Acornsoft)
9	(10)	Countdown to Doom	(Program Power)
10	(—)	Pheasibility Experiment	(Digital Fantasia)

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

ZX81*

1	(1)	QS Scramble	(Quicksilva)
2	(4)	1K Chess	(Artic)†
3	(—)	Fantasy Games	(Psion)
4	(5)	Sabotage	(Psion)
5	(—)	Espionage	(Psion)
6	(6)	Chess	(Psion)
7	(7)	Asteroids	(Quicksilva)
8	(—)	Space Raiders	(Psion)
9	(2)	Defender	(Quicksilva)
10	(8)	Football Manager	(Addictive Games)

*All run in 16K except where shown. †1K.
(Figures compiled by Boots & Co, London)

Dragon

1	(1)	Frogger	(Microdeal)
2	(3)	Mined Out	(Quicksilva)
3	(—)	Cuthbert in the Jungle	(Microdeal)
4	(10)	The King	(Microdeal)
5	(—)	Ring of Darkness	(Wintersoft)
6	(6)	Champions	(Peaksoft)
7	(—)	Pettigrew's Diary	(Shards)
8	(4)	Drone	(Cable)
9	(—)	Dragonfly II	(Hewson)
10	(7)	Empire	(Shards)

(Figures compiled by Boots & Co. London)

Vic20

1	(—)	Wizzard and the Princess	(Melbourne House)
2	(3)	Wacky Waiters	(Imagine)
3	(4)	Panic	(BugByte)
4	(5)	Catchna Snatcha	(Imagine)
5	(7)	Matrix	(Llamasoft)
6	(1)	Arcadia	(Imagine)
7	(—)	Amok	(Audiogenic)
8	(—)	Bewitched	(Imagine)
9	(2)	Skyhawk	(Quicksilva)
10	(8)	Frantic	(Imagine)

(Figures compiled by Boots & Co, London)

Atari

1	(1)	Zaxxon	(Datasoft)
2	(2)	Miner 2049'er	(Big Five)*
3	(—)	Preppie	(Adventure International)
4	(—)	Zork II	(Infacom)†
5	(6)	Meteors	(Acornsoft)
6	(—)	Witness	(Intacom)†
7	(—)	Jumpan Junior	(Apyx)*
8	(—)	Planet Fall	(Intacom)†
9	(—)	Savage Pond	(Starcade)
10	(—)	The Blade of Blackpoole	(Sirius)‡

*Cartridge. †32K cassette. ‡48K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Books

1	(1)	Advanced User Guide for the BBC Micro, *Bray, Dickens and Holmes*	(Cambridge Micro Centre)
2	(6)	Commodore 64 Programmer's Reference Guide, *Commodore*	(Commodore)
3	(2)	30 Hour Basic, *Prigmore*	(NEC)
4	(3)	Supercharge Your Spectrum, *Webb*	(Melbourne House)
5	(7)	One Hundred Programs for the BBC Micro, *Gordon*	(Prentice-Hall)
6	(—)	Spectrum Hardware Manual, *Dickens*	(Melbourne House)
7	(10)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)
8	(—)	BBC Micro — an expert guide, *James*	(Granada)
9	(—)	Using the 64, *Gerrard*	(Duckworth)
10	(8)	Anatomy of the Dragon, *James*	(Sigma)

(Figures compiled by Watford Technical Books, Watford 0923 23324 Prestel 28824)
(Last week's position in brackets)

Spectrum

1	(2)	3D Ant Attack	(Quicksilva)
2	(—)	Harrier Attack	(Durrell)
3	(3)	Lunar Jetman	(Ultimate)
4	(—)	Jet Pac	(Ultimate)
5	(—)	Bugaboo	(Quicksilva)
6	(1)	Flight Simulation	(Psion)
7	(—)	Maziacs	(DK'Tronics)
8	(4)	Zzoom	(Imagine)
9	(7)	Kong	(Ocean)
10	(—)	Manic Miner	(Bug Byte)

(Figures compiled by W H Smith and Sons, London)

Advertising Standards

When we just cannot get our arcade scores any higher, or figure out how to get past that fierce lavatory seat with one hand tied behind our back, the cares of the world on our shoulders, and that Pesky Pie-Person giving us clues all the time, computer-exhaustion finally takes hold.

We desperately want to relax, so we pull out the computer lead, push the aerial back in and think of a number between one and four. This helps to sooth our tattered nerves, until the commercial "break" arrives and a large grey elephant or a superannuated Scouse cynic appears to insult our intelligence. In desperation we grab the *Radio* and *TV Times* to look for an alternative, but once again those corny adverts leer out at us from the pages. We turn off in disgust and pick up a newspaper, but there's no getting away from it as everyone from the biggest hypermarket to the local greengrocer seems to be claiming that "you can't buy it cheaper elsewhere".

We are not sure of other people's reactions, but the current state of computer promotion certainly has us oscillating between hysterical laughter and sheer horror. We know that, to the entrepreneur, computers are "for selling, not for buying" and that all advertisers are given to hyperbole, but surely there must be a limit somewhere! If you regularly read *PCW* (and even Ziggurat!) you probably already have a micro of some sort (or at least have tinkered with your friend's) so you presumably have some idea about what the important features are in a home micro.

On the other hand, it seems that computer promotion has sunk to the depths of the car industry, where the whole point seems to be to extoll the importance of trivialities and to avoid the really important issues at all costs. So, who are they fooling?

Regrettably, the answer is usually the first time buyer who thinks Ram is a male goat and that Rom wasn't built in a day.

As Christmas approaches, and the stampede intensifies, all reason seems to vanish as Mum and Dad know that little Johnny (or Jenny) will be inconsolable if Santa doesn't deliver the goods. So, how do they choose and where do they go?

The answer usually lies in the relative importance of the bank-balance, "keeping up with the Joneses", and what name has been subliminally impressed on their mind.

Although every Tom, Dick and Harry now sells computers and every store seems to contain a "computer shop", it is regrettably true that the demand for qualified salespersons far outstrips the supply (one of the funniest sights this week was the pathetic "computer sales manager" of a local department store trying to pretend to a "real" dealer that he was a potential purchaser so that he could glean some information on the products to pass on).

Of course, Darwin might argue that natural selection will ensure the survival of the fittest, but the harsh world of reality seems to select more on the basis of brute force than technical excellence. What seems to count most in this market place is how much you can afford to spend on promotion, rather than how good your product is (or even more important, how good the back-up will be).

The last few months have seen the death-throes of a number of companies, yet more have retired in haste to lick their wounds, and the writing is on the wall for several more. After Christmas we are certain that there will be a lot of wailing and gnashing of teeth as many of the big stores wrap up their chips, get out the holiday brochures, and relegate computers to the store cupboard, leaving too many customers to find out for themselves that they have bought a pig in a poke. ■

Keith and Steven Brain

Egyptian code

Puzzle No 83

This interesting fragment of an ancient Egyptian clay tablet was recently unearthed by that eminent archaeological duo — Drs Diggett and Trowell. It is thought that it represents a multiplication sum but, unless it is shown that it is possible to satisfactorily substitute digits for the symbols shown, this theory cannot be proved. There is evidence that the sum is in decimal notation and the bird symbol was used to represent the digit '3'.

Can you make the archaeological breakthrough and confirm the theory?

Solution to Puzzle No 78

The program uses three variables, *N*, the number of the highest double of successively larger domino series, *P*, the number of pieces in the set and, *T*, the total number of spots.

Subsequent orders of sets, are calculated in the *For/Next* loop (Lines 40 to 70), and the program stops when the total number of spots exceeds 1983, the present date.

```
10 LET N = 0 20 LET P = 0 30 LET T = 0 40 FOR A =
N TO 0 STEP - 1 50 LET T = T + A + N 60 LET P =
P + 1 70 NEXT A 80 PRINT N;" ";P;" ";T 90 IF T>
1983 THEN STOP 100 LET N = N + 1 110 GOTO 40
```

The program gives the solution of a set with 120 pieces — up to a double-fourteen, giving a total of 1680 spots, the year required by the puzzle. The previous set, up to a double-thirteen, can be ruled out because of the number of spots. This gives the year as 1395 and it seems too close to the date of the set itself, manufactured by "distant" ancestors in the 14th century.

Winner of Puzzle No 78

The winner is: E Oakley, South Road, Northfield, Birmingham, who receives £10.

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"PIMANIA" for B.B.C. 32K	£10 ☐
"PIMANIA" for DRAGON 32	£10 ☐
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WE CELEBRATE our cartoon strip's successful tour of the Orient by releasing the gang's new program .... "YAKZEE" the authoratitive user-friendly computer version of the lateral-thinking dice game. It runs on the Spectlum 48K or the Dlagon 32 (keep the Chinese verbals for the comic strip, OR ELSE!) and is part of our mission to spread joy and happiness across the planet with non-violent and genuine entertainment. Pray it ... whoops' Play it.....!

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-PLUS-

THE PIMAN'S OWN C20 COMPUTER CASSETTE, a top quality blank tape, for saving your own programs, or your PIMANIA progress. (And if you pirate anything we'll send Lurch along to sort you out!)

-PLUS-

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read all about it here next week!!!!!!

MEANWHILE, BACK AT THE AUTOMATA COMIC STRIP..