POPULAR Computing WEEKLY

FREE GAMES CASSETTES

35p 22-28 September 1983 Vol 2 No 38

This Week

Spectrum software
John Scriven looks at some of the latest games for the Spectrum including *Manic Miner* and *Jumping Jack*. See page 16.

Logan's Run
David Kelly talks to Ian Logan about Z80 machine code and the ZX Microdrive on page 15.

Rings of Saturn
Maurice Gavin presents a simulation program of Saturn and its rings on 16K Spectrum. See page 20.

New releases
All the latest software games including *Devils of the Deep* from Richard Shepherd and *Beta Basic* from Betasoft. See page 46.

★STAR GAME
Connect 4 on Commodore 64.
See page 10.

News Desk

An enterprising move from Elan

ELAN Computers last week announced details of its first two home computers.

Called the Enterprise 64 and 128 — the two models differ only in Ram capacity — both will be in the shops in April 1984. Prices will be £199.95 and £299.95 for the two models.

The Enterprise is Z80A-based with 32K Basic Rom and either 64K or 128K Ram. Rom and Ram are both expandable to 3.9M. Main features of the machine are a full-travel keyboard, high-resolution display in up to 256 colours, 8-octave four-voice stereo sound, built-in word-processing software and a built-in joystick for cursor control and games.

The Elan Enterprise has a complex system of 16 display modes which can be mixed on-screen. Explained Robert Madge, Elan's technical director: "I think everyone is going to be a bit bowled over by the speed of the machine's plotting." Text modes range from 42 × 28 characters to 84

Continued on page 5

Oric will compete with IBM Peanut

ORIC Products International will produce a new computer to compete with IBM's proposed low-cost Peanut computer.

"The IBM Peanut will be hugely successful and set a standard and we will be in there with it," said Oric's managing director Barry Muncaster. "Oric will produce a product which the Peanut will be compatible with," he added.

As usual with any new IBM product, secrecy surrounds its precise nature. A spokeswoman for IBM declined to comment on the new machine save to confirm its existence.

"It will be an 8086-based machine — that is our best guess at this point," said Tom Crotty of the US market analysts, Gartner Group.

"With IBM there is nothing sure until it is launched. There are a lot of rumours flying about that the Peanut will not be compatible with the 8088-based IBM PC.

Continued on page 5

Classified

6,000 free tapes to be given away —see page 45

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Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly,
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Editorial

Sinclair's flat-screen tv may, or may not, do for television what the transistor radio did for wireless. It will certainly do a lot for Sir Clive's reputation as Britain's 'golden boy' of electronics.

The flat-screen tv is not a new idea — scientists have long been speculating about tv screens just a ½in thick which could be hung on walls. Pocket-sized flat-screen tvs have also been mooted for some time. But, until this year, no one had really been able to produce a commercially viable flat-screen tv for general consumption.

Sony pipped Sinclair to the post with its Watchman flat-screen tv, due in part to industrial trouble at Timex's plant in Dundee. But the Watchman, brainchild of Sony designer Yasuo Kuroki, is bulkier and more expensive than Sinclair's offering. Even the improved Watchman II will cost about $200 in the US, compared to Sinclair's £79.95 in the UK.

Sinclair's flat-screen tv may not be the first, but it is the cheapest. It is also one of the most technically advanced, being able to receive signals in both the UK, US and Europe.

Once the problems of producing a colour flat-screen tv are solved, Britain's micro users will be able to dream of a new generation of computers that will be truly portable.

Next Thursday

Centipede, next week's star game for the 48K Spectrum, is a version of the arcade game and the object is to shoot all the bugs which attack you. By Jim Provan.

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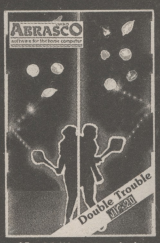

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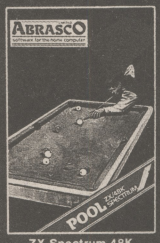

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Oric v Peanut

Continued from page 1

"I personally find it hard to believe that they would exclude themselves from all the PC's software.

"But, whatever. You can be sure that there will be artificial barriers in Peanut to make it non-upgradable to the PC," he added.

Barry Muncaster

The Peanut, Sinclair's new 'professional' compuer and now Oric's planned computer are all aimed at an as-yet untested market — straddling the gap between home and business systems. Some industry observers believe that this new market will prove to be by far the biggest of the lot.

● Oric's disc system for the Oric 1 computer has been delayed. The company plans to build 1,500 units in December. Said Barry Muncaster: "Realistically there won't be many in the UK before Christmas. We now have it all working — it just depends on the quantities of drives which Hitachi can supply.

"The numbers we have been promised from January look very promising ramping up from 2,500 to 4,000 in three months."

Enterprising Elan

Continued from page 1

× 28. Up to four pairs (foreground and background) or colours chosen from the 256-colour pallet can be used in text modes.

Graphics modes go up to the highest resolution of 672 × 256 pixels with a limit of two colours on each horizontal line. The number of colours which can be used in one line from the 256 possible squares every time the number of pixels in a line is halved. For example up to 16-colours can be used in one line for a 168 × 256 display.

Commands exist in the Basic — Elan's own — for taking blocks of memory and loading them directly on to the screen.

The machine has a cartridge port capable of taking a 64K Rom pack, twin cassette ports, twin joystick ports, Centronic and RS423 interfaces, tv, monitor, cassette and headphone connections are also provided.

An expansion bus gives access to additional memory packs and twin 3½ inch microfloppy disc drives or other peripherals. The Enterprise is CP/M compatible. Memory organisation on the Elan is in 16K pages. Additional memory can be stacked up in 64K units.

The Basic is organised such that extensions to the software to control peripherals are automatically hooked into the standard Basic when the additional module is connected. A 'base unit' — providing additional power — is however necessary to connect the first unit. The first of these peripheral units is scheduled for June 1984, two months after launch. Software for the Elan machines is being written by Intelligent Software and a number of other software houses have expressed interest in producing material. Lisp and Forth will both be available as alternative languages.

Elan Computers is a new company (see *Popular Computing Weekly*, August 17), formed by software house Intelligent Software and Hong Kong electronics manufacturers Domicrest. The Elan computers will be 75 percent manufactured and assembled at two factories in the UK.

The idea for Elan apparently came from an unnamed international finance consortium which then approached Intelligent and Domicrest to carry out the project.

Flat-screen unmasked by Sir Clive

SIR Clive Sinclair unveiled his flat-screen tv in London last week. Slightly larger than a cigarette packet, the black and white tv is the result of a six-year development programme which cost £4m.

The tv set runs off a lithium based flat battery developed by Polaroid, though it can also be run off the mains with the aid of an adaptor. Key to the new tv is a flat-screen cathode ray tube and a single integrated circuit, which allows the tv to work in the US and Europe as well as in the UK.

Priced at £79.95, including VAT, Sinclair's flat-screen tv is considerably cheaper than Sony's Watchman tv launched earlier this year.

Sinclair regards his flat-screen tv as "a major breakthrough" and said, "I believe it, and its successors, can achieve for television what the transistor radio did for wireless."

Sir Clive is currently working on a colour flat-screen tv, but is unwilling to commit himself to any completion dates.

Microcomputer owners will be disappointed to learn that it is not really feasible to link a micro with the new tv. The 2in screen is simply too small for program lines to be legible.

Initially, Sinclair's flat-screen tv will be available by mail order only. Application forms are available on request from Sinclair Research Ltd, TV Division, Stanhope Road, Camberley, Surrey (Tel: 0276 62111).

● Meanwhile, Japanese electronics giant, Matsushita has announced the development of a portable colour television set.

The device, about the size of a handbag, uses back projection on to a pop-up translucent screen 16cm across.

ZX81 and Spectrum taken to task

MULTI-TASKING on the ZX81 and Spectrum is now possible, thanks to a Poole-based outfit called David Husband.

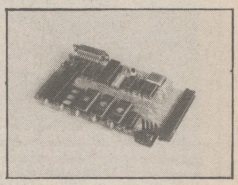
The company is now offering a Forth multi-tasking Rom replacement for the ZX81 for £28.75. A Spectrum plug-in cartridge module is also on the way, in a couple of weeks for £63.56.

"I'm hoping it will shake people up a bit," says company founder David Husband. "In the computer market the hardware has jumped forward while the software has stayed still.

"I see the Forth Rom as something fundamentally new — a very low cost multi-tasking system with a Z80 and 16K."

The 2K ZX81 Rom features a built-in editor with user-defined split screens and the multi-tasking which can schedule up to 10 tasks at predetermined times. Machine-code definitions are automatically threaded into the Forth.

The Spectrum cartridge version is more ambitious — a 12K fig-Forth with multi-tasking and built-in RS232 and Centronics interfaces.



The ZX81 Rom replacement can be undertaken by the user but it involves removing the existing Basic Rom which is soldered in. ZX81s complete with the Forth Rom in place and 16K Ram pack can be bought from Densham Computers, 329 Ashley Road, Parkstone, Poole.

Details of either the ZX81 or Spectrum multi-tasking systems from David Husband, 2 Gorleston Road, Branksome, Poole.

Barbican goes personal

THIS year's 6th *Personal Computer World Show* kicks off next week at the Barbican Centre, London.

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Martian error

Before we lay the Martians to rest (my letter, *PCW*, 25-31 August) would you please point out to readers that the Martian word for 'yes' is *qwl* not *gwl*. Otherwise my remarks do not make sense.

A W Rowe
69 Longley Lane
Huddersfield HO4 6PR

Apologies. I am afraid that our knowledge of Martian is such that the spelling error slipped through unnoticed.

Speedy reviews

Having just been introduced to your excellent weekly computer newspaper, I would like to comment on the impressive speed of your reviews. How do you do it? The reviews are always interesing, quoting your Microdrive review as an example.

I always turn firstly to your reviews and then your informative letters page. I have just read Philip Crawley of Buckwell, Salop's letter and I would like to inform him of my high score for *Orbiter*, 651,910. The completion of this took just over two hours — beat that.

Paul Holden
110 Crescent Road
Great Lever
Bolton BL3 2JR

Play fair, Dragon

The long wait for the arrival of Dragon Data's discs is over. However, the speed in which the Premier Delta system came onto the market must have taken a large share of the dedicated Dragon user's, who now might want to run Dragon based disc software on their already bought ⅔in high Cannon drive.

It seems that, at first glance, Dragon Data has built a type of non-compatibility into its system — the one half height drive (with a location for the second) is a standard drive and can be run with the Delta controller, but only allows you 110 bytes, not the 185 allowed by the Dragon controller. What Dragon Data has in fact done is to put a small saw cut into the disc side of the controller's connection board, which allows a small piece of plastic located in the connector of the controller/drive lead to mate up with, allowing only a Dragon lead to be used with a Dragon controller. This in fact can be removed and will fit onto the Delta controller.

Dragon has also moulded its controller cover so that you cannot get the Delta lead on the Dragon controller without having an extension board or cable made up. Another point is that Dragon Data appears to have no intention of selling the controller separately.

Come on, Dragon, play fair — sell the controller separately and save the dedicated user from unnecessary expense.

Hywel Francis and
Dave Barrell
TWM Software
8 Azalea Close
Cyncoed
Cardiff

Random statement

If any Dragon owners are upset with the apparent lack of a *Randomize* statement, or its equivalent, so that "random" numbers are always generated from the same starting point, resulting in the same game of *Mastermind* or whatever on power-up, try the following:

```
10 Input "Random number seed"; A
20 A = RND (-A)
```

Any numbers subsequently generated may be considered random and the same sequence can be generated by using the same "seed" value for *A*.

For an unrepeatable sequence, try:

```
10 A = RND (- Timer)
```

I hope this will be of benefit to any frustrated Dragon owners.

David Harcourt
34 Old Ballymony Road
Ballymena
Co Antrim
N. Ireland

Debugging exercise

The program from T Choy, *The Root of the Problem* (*PCW*, 8-14 September) was excellent stuff — can I put in a plea for even more actually intelligent material, such as this and the recent astronomical programs, in future issues — preferably at the expense of the ceaseless round of Zap-the-Alien drivel (may I also, en passant, add my vote to the requests for a Spectrum machine code series).

However, Mr Choy's program, as printed, contains a few bugs which prevent it, for example, from solving:

$x^4 - 16 = 0$!

Also, while it will tackle:

$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$ (1)

successfully, the related equation

$x^4 + 3x^3 + 3x^2 + 3x + 2 = 0$ (2)

whose roots are simply minus the roots of (1), has it completely flummoxed. Debugs follow:

(a) Omit line 538 entirely. Its only purpose is to prevent you demeaning the dignity of your machine by giving it trivial cubics to solve. The snag is that the cubic routine, as well as solving cubics in its own right, also gets called by the quartic routine; and a perfectly genuine request to solve a non-trivial quartic, can snarl up on the program's sense of dignity as to what cubics are worthy of it.

(b) Line 620, as printed, will fail if *R* is negative, since the Spectrum uses logs to do this calculation. Change it to read:

```
620 LET X2 = -(B = SGN R * (ABS
    R) ↑ T)/A:LET X3 =
    -X2:GO TO 730
```

(c) Line 1018 is a classic *If..Then* snarl up. Amend to read:

```
1018 IF M < 1 THEN LET M = 1
1019 IF M > 2 THEN LET M = 2:
     REM Whoops!
```

(d) (The big one) Line 850 includes *Let V = Sqr P2*. The snag is that the machine will always take the positive square root, while sometimes the negative root is required (this is why equation (2) fouls up). To debug, change line 857 to:

```
857 DIM A(2,2): IF 2 * U * V < > RD
    - RM * Y1 THEN LET V =
    -V
```

All in all, an excellent debugging exercise: I thoroughly enjoyed myself. However, something in my water tells me that was not what you had in mind when you published it.

Jim Hind
5 Park Street
Southend
Essex

Plot to print solutions

With regard to the query in *PCW* 25-31 August, in your Peek and Poke feature, relating to conversion of *Plot* to *Print*, I offer the following solutions. I'm not certain what your correspondent had in mind, but I hope these are of some help.

In the case of *Plot* to *Print*, care should be taken that there is room on the screen for what it is desired to do. In the case of *Print* to *Plot*, the *Print* statement should be followed by ";".

With regard to the *Screen$* query, this in fact returns a character, and not a numeric value as stated.

Michael Kirkland
20 Batey Avenue
Rainhill
Prescot
Merseyside L35 8LT

Print to Plot

```
   10 REM GO SUB after any PRINT
statement.          On exit, PLOT
position is at the bottom right
of last PRINT pixel, and  is in
variables x and y.
1000 POKE 23677,7-PEEK 23688*8
1010 POKE 23678,(PEEK 23689-3)*8
1020 LET x=PEEK 23677
1030 LET y=PEEK 23678
1040 PLOT x,y
1050 RETURN
```

Plot to Print

```
   10 REM  GO SUB after PLOT  or
DRAW statement.  On exit, PRINT
AT x,y
1000 POKE 23688,PEEK 23677/8
1010 POKE 23689,21-PEEK 23678/8
1020 LET x=PEEK 23689
1030 LET y=PEEK 23688
1040 RETURN
```

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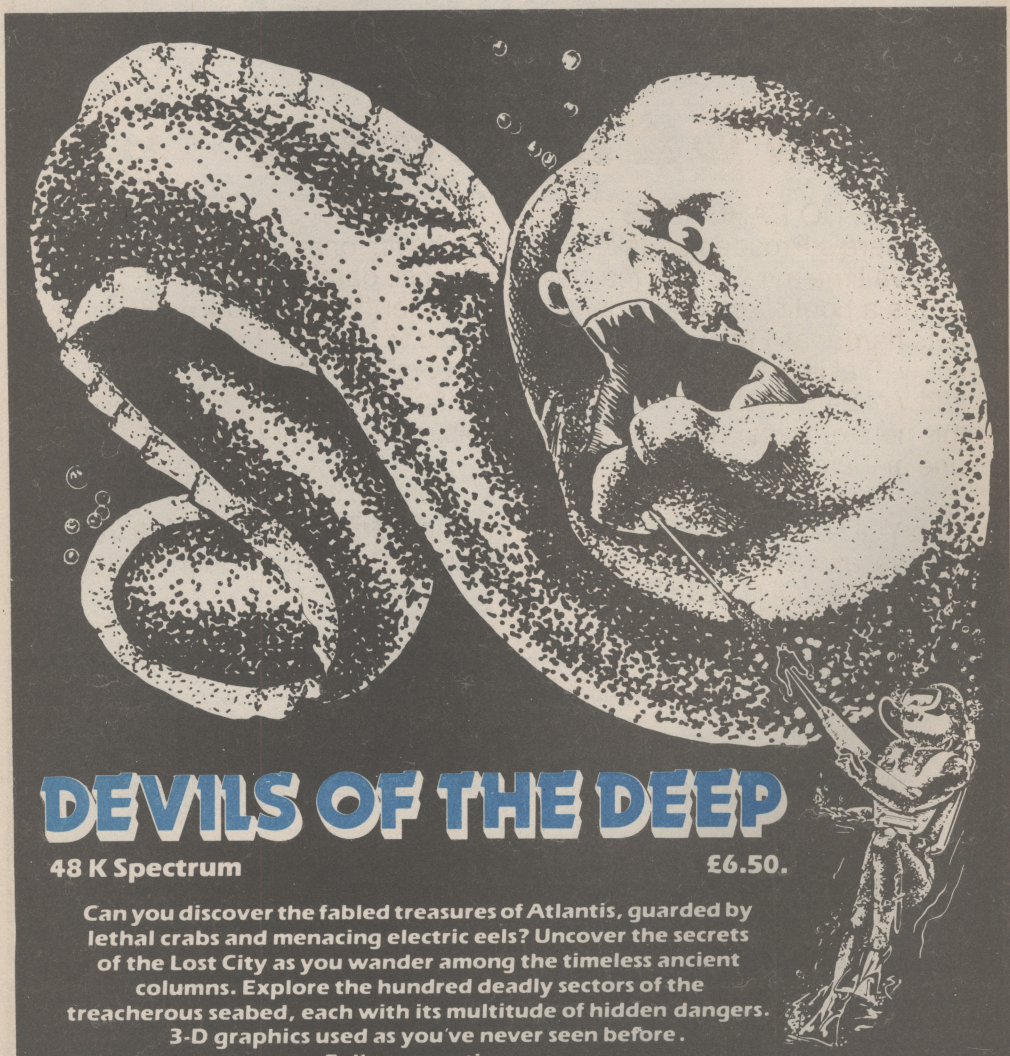

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This here's Prospector Jake, I sure am havin' one helluva time tryin' to peg ma claim with those damned Injuns a hootin' an a hollerin' all over this territory. Ma job gets harder as I move from one Gold Field to another. I know, that is me an' ma stubborn hornery ol' Mule here know of 24 rich an' I mean rich seams of pure Gold. All it needs to make this here ol' critter happy is that you help me peg every doggone last one of them claims.

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Connect Four

A new game for the Commodore 64 by Les Allan

Connect Four for the Commodore 64 utilises hi-resolution graphics to produce an on screen version of the popular board game of the same name. In order to make use of the full screen, each disc is made up of 4×3 characters and the graphics for the row numbers are arranged to be in the centre of each disc. Simon's Basic commands have been used throughout, but the program can be easily rearranged to run on the basic machine.

During play, the selected row for each disc is made by pressing keys *1* to *7*. Pressing *F1* resets a game, whereas *F7* recalls the instruction page prior to the start of each new game.

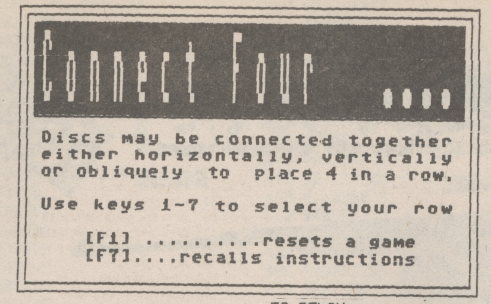
Variables used are as follows:

T ..... time delay
X ..... disc position (vertical)
Y ..... disc position (horizontal)
CS ..... screen position at top of selected row
DL ..... instruction delay
C$ ..... title C
E$ ..... title E
F$ ..... title F
N$ ..... title N
O$ ..... title O
R$ ..... title R
T$ ..... title T
U$ ..... title U
TI$ ..... timer

Rem statements and procedures within the program listing should provide a clear understanding of how the program works, but just in case here is a brief functional listing:

Notes

16 clear screen: colour black
18 highlight Simon's Basic: list every 22 lines
20 set timer to zero: instruction variable to 10
30-44 title characters
46-50 disc character and colour
60-88 print title page for first 18 secs.
90-124 print instructions for first 60 secs.
126 exec hi-res characters
136-140 set up game
150 keyboard entry
152 re-set game by pressing F1
154 re-calls instructions prior to new game
156 checks for valid keyboard entry
158-170 sets value of row and screen for key pressed
172 checks for free space at top of row
182-196 drop disc to one space above last position
202-208 delay procedure used during title
214-670 relocates screen memory and character set and generates user defined graphics
676-698 plays music at game start
704-720 plays extract at lower volume during play ■




```
10 :
12 REM **** CLEAR SCREEN/COLOUR
BLACK ****
14 :
16 PRINTCHR$(147):COLOUR0,0
18 OPTION10:PAGE22
20 DL=10:TI$="000000"
22 EXEC MUSIC
24 :
26 REM **** TITLE CHARACTERS
****
28 :
30 C$="■   ▚▚▚▚▚ ▚▚ ▚▚ ▚▚ ▚▚
▚▚ ▚▚▜▙   "
32 O$="■  ▜▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚
▚▚■▚▚▚▚▚TTTTTT▚▚ ▚▚ ▚▚ ▚▚ ▚▚
▚▚▜▙   "
34 N$="▟ ▜▚ ▚▚▚▚▚  ▜ ▚▚▚▚▚
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36 E$="▟     ▚▚▚▚▚ ▚▚ ▚▚ ▟▬▬▚▚▚
▚▚ ▬▬▚▚▚▚ ▚▚ ▚▚      "
38 T$="▟     ▚▚▚▚▚ ▟ ▚▚▚▚▚ ▟ ▚▚▚▚▚
▟ ▚▚▚▚▚ ▟ ▚▚▚▚▚ ▟ ▚▚▚▚▚ ▟ ▚▚▚▚▚ ▟ "
40 F$="▟     ▚▚▚▚▚ ▚▚ ▚▚ ▚▚
▚▚▚▚▚ ▚▚ ▚▚  "
42 U$="▟ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▜▚▚▚
▜▜▙▟  ▜■▚▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚ ▚▚  "
44 R$="▟   ▚▚▚▚▚ ▚▚ ▚▚▚▚▚ ▚▚
▚▚▚▚▚ ▚▚ ▚▚▚▚▚    ■▚▚▚▚▚▚  ▚▚▚▚
▚▚ ▜▙▟ ▚▚▚▚▚▚ ▜▜▙▟  "
46 X$="■■ABC▚▚▚▚▚DEEF▚▚▚▚▚GHIJ■"
48 Y$="    ▚▚▚▚▚      ▚▚▚▚▚      "
50 Z$=CHR$(150)
52 :
54 :
56 PROC PRINT TITLE
58 :
60 PRINTAT(0,3)CHR$(5)C$:EXEC
DELAY
62 PRINTAT(6,3)CHR$(28)O$:EXEC
DELAY
64 PRINTAT(12,3)CHR$(159)N$:EXEC
DELAY
66 PRINTAT(18,3)CHR$(156)N$:EXEC
DELAY
68 PRINTAT(24,3)CHR$(30)E$:EXEC
DELAY
70 PRINTAT(30,3)CHR$(31)C$:EXEC
DELAY
72 PRINTAT(36,3)CHR$(158)T$:EXEC
DELAY
74 PRINTAT(9,14)CHR$(129)F$:EXEC
DELAY
76 PRINTAT(15,14)CHR$(150)O$:EX
EC DELAY
78 PRINTAT(21,14)CHR$(153)U$:EX
EC DELAY
80 PRINTAT(27,14)CHR$(154)R$:EX
EC DELAY
82 PRINTAT(34,20)"▚BY▚▚▚LES▚▚
▚▚ALLAN";:EXEC DELAY
84 FORY=1TO10:EXEC DELAY
86 NEXT
88 IFTI$<"000018"THENPRINTCHR$
(147):CALL PRINT TITLE
90 IFTI$>"000060"THENCALL GAME
START
92 :
94 :
96 PROC INSTRUCTIONS
98 :
100 PRINTCHR$(147)
102 HIRES6,7:COLOUR7,7
104 TEXT20,20,"CONNECT FOUR",1,
6,16
106 TEXT250,50,"●●●●",1,2,13
108 TEXT20,100,"DISCS MAY BE CO
NNECTED TOGETHER",1,1,9
110 TEXT20,110,"EITHER HORIZONT
ALLY, VERTICALLY",1,1,9
112 TEXT20,120,"OR OBLIQUELY
TO PLACE 4 IN A ROW.",1,1,8
114 TEXT20,140,"USE KEYS 1-7 TO
SELECT YOUR ROW",1,1,9
116 TEXT50,160,"[F1] .....
RESETS A GAME",1,1,8
118 TEXT50,170,"[F7]....RECALLS
INSTRUCTIONS",1,1,8
120 REC5,5,310,190,1:REC10,10,3
00,180,1
122 BLOCK15,15,305,70,2
124 PAUSEDL:NRM
126 EXEC HI-RES DATA
128 :
130 :
132 PROC GAME START
134 :
136 PRINTCHR$(147):COLOUR0,0
138 X=0:CS=0:DL=2
140 PRINTAT(1,24)"■■KL▚▚▚▚"CHR$
(150)"MN▚▚▚▚▚OP▚▚▚▚▚QR▚▚▚▚▚ST▚▚
▚▚"CHR$(154)"UV▚▚▚▚▚WX";
142 :
144 :
146 PROC KEYBOARD
148 :
150 GETK$
152 IFK$=CHR$(133)ANDCS<>0THENP
RINTCHR$(147):CALL PRINT TITLE
154 IFK$=CHR$(136)THENCALL INST
RUCTIONS
156 IFK$=""ORK$<"1"ORK$>"7"THEN
CALL KEYBOARD
158 IFK$="1"THENCS=52306:Y=0
160 IFK$="2"THENCS=52312:Y=6
162 IFK$="3"THENCS=52318:Y=12
164 IFK$="4"THENCS=52324:Y=18
166 IFK$="5"THENCS=52330:Y=24
168 IFK$="6"THENCS=52336:Y=30
170 IFK$="7"THENCS=52342:Y=36
172 IFPEEK(CS)<>32THENCALL KEYB
OARD
174 EXEC PLAY
176 :
178 REM **** DROP DISC ****
180 :
182 REPEAT
184 IFX>0THENPRINTAT(Y,X-1)Y$;
186 PRINTAT(Y,X)Z$X$;
188 X=X+1:CS=CS+40
190 FORT=1TO25:NEXT
192 UNTIL PEEK(CS+40)<>32
194 IFZ$=CHR$(150)THENZ$=CHR$(3
0):ELSE:Z$=CHR$(150)
196 POKE198,0:X=0:CALL KEYBOARD
198 :
200 :
202 PROC DELAY
204 :
206 FORT=1TO75:NEXT
208 END PROC
210 :
212 :
214 PROC HI-RES DATA
216 :
218 MEM
220 DESIGN2,$E000+128*8
222 @........
224 @........
226 @.......B
228 @......BB
230 @....BBBB
232 @...BBBBB
234 @..BBBBBB
236 @.BBBBBBB
238 DESIGN2,$E000+129*8
240 @.......B
242 @..BBBBBB
244 @BBBBBBBB
246 @BBBBBBBB
248 @BBBBBBBB
250 @BBBBBBBB
252 @BBBBBBBB
254 @BBBBBBBB
256 DESIGN2,$E000+130*8
258 @B.......
260 @BBBBBB..
262 @BBBBBBBB
264 @BBBBBBBB
266 @BBBBBBBB
268 @BBBBBBBB
270 @BBBBBBBB
272 @BBBBBBBB
274 DESIGN2,$E000+131*8
276 @........
278 @........
280 @B.......
282 @BB......
284 @BBBB....
286 @BBBBB...
288 @BBBBBB..
290 @BBBBBBB.
292 DESIGN2,$E000+132*8
294 @.BBBBBBB
296 @BBBBBBBB
298 @BBBBBBBB
300 @BBBBBBBB
302 @BBBBBBBB
304 @BBBBBBBB
306 @BBBBBBBB
308 @.BBBBBBB
```

Continued on page 13

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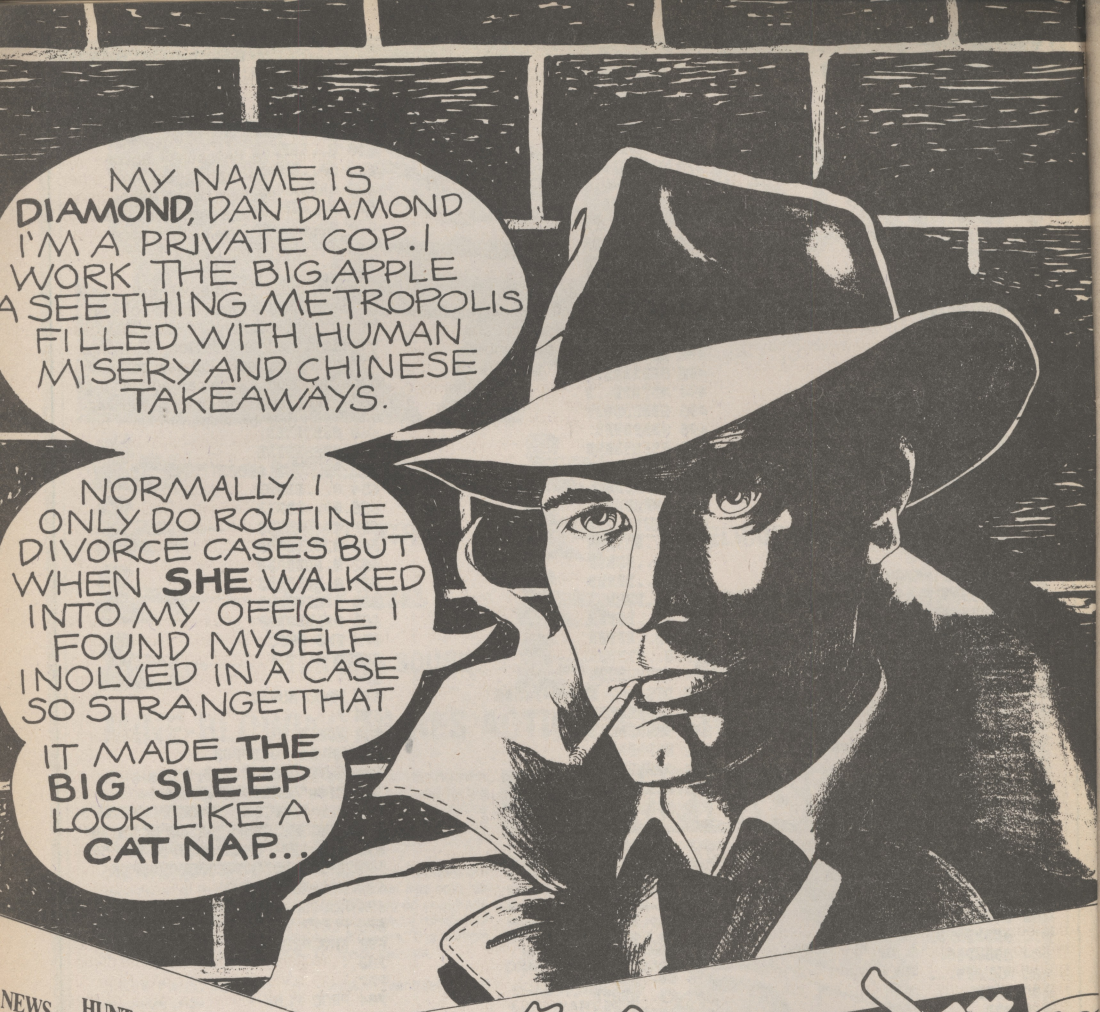
```
310 DESIGN2,$E000+133*8
312 @BBBBBBBB
314 @BBBBBBBB
316 @BBBBBBBB
318 @BBBBBBBB
320 @BBBBBBBB
322 @BBBBBBBB
324 @BBBBBBBB
326 @BBBBBBBB
328 DESIGN2,$E000+134*8
330 @BBBBBBB.
332 @BBBBBBBB
334 @BBBBBBBB
336 @BBBBBBBB
338 @BBBBBBBB
340 @BBBBBBBB
342 @BBBBBBBB
344 @BBBBBBB.
346 DESIGN2,$E000+135*8
348 @.BBBBBBB
350 @..BBBBBB
352 @...BBBBB
354 @....BBBB
356 @......BB
358 @.......B
360 @........
362 @........
364 DESIGN2,$E000+136*8
366 @BBBBBBBB
368 @BBBBBBBB
370 @BBBBBBBB
372 @BBBBBBBB
374 @BBBBBBBB
376 @BBBBBBBB
378 @..BBBBBB
380 @.......B
382 DESIGN2,$E000+137*8
384 @BBBBBBBB
386 @BBBBBBBB
388 @BBBBBBBB
390 @BBBBBBBB
392 @BBBBBBBB
394 @BBBBBBBB
396 @BBBBBB..
398 @B.......
400 DESIGN2,$E000+138*8
402 @BBBBBBB.
404 @BBBBBB..
406 @BBBBB...
408 @BBBB....
410 @BB......
412 @B.......
414 @........
416 @........
418 DESIGN2,$E000+139*8
420 @BBBBBBB.
422 @BBBBBBB.
424 @BBBBBB..
426 @BBBBBBB.
428 @BBBBBBB.
430 @BBBBBBB.
432 @BBBBB...
434 @RBBBBBBB
436 DESIGN2,$E000+140*8
438 @.BBBBBBB
440 @.BBBBBBB
442 @.BBBBBBB
444 @.BBBBBBB
446 @.BBBBBBB
448 @.BBBBBBB
450 @...BBBBB
452 @BBBBBBBB
454 DESIGN2,$E000+141*8
456 @BBBBBB..
458 @BBBBB..B
460 @BBBBBBBB
462 @BBBBBBBB
464 @BBBBBB..
466 @BBBBB..B
468 @BBBBB...
470 @BBBBBBBB
472 DESIGN2,$E000+142*8
474 @..BBBBBB
476 @B..BBBBB
478 @B..BBBBB
480 @..BBBBBB
482 @BBBBBBBB
484 @BBBBBBBB
486 @...BBBBB
488 @BBBBBBBB
490 DESIGN2,$E000+143*8
492 @BBBBBB..
494 @BBBBB..B
496 @BBBBBBBB
498 @BBBBBBB.
500 @BBBBBBBB
502 @BBBBB..B
504 @BBBBBB..
506 @BBBBBBBB
508 DESIGN2,$E000+144*8
510 @..BBBBBB
512 @B..BBBBB
514 @B..BBBBB
516 @..BBBBBB
518 @B..BBBBB
520 @B..BBBBB
522 @..BBBBBB
524 @BBBBBBBB
526 DESIGN2,$E000+145*8
528 @BBBBBBBB
530 @BBBBBBBB
532 @BBBBBBB.
534 @BBBBB..B
536 @BBBBB...
538 @BBBBBBBB
540 @BBBBBBBB
542 @BBBBBBBB
544 DESIGN2,$E000+146*8
546 @B..BBBBB
548 @...BBBBB
550 @...BBBBB
552 @B..BBBBB
554 @...BBBBB
556 @B..BBBBB
558 @B..BBBBB
560 @RBBBBBBB
562 DESIGN2,$E000+147*8
564 @BBBBB...
566 @BBBBB..B
568 @BBBBB...
570 @BBBBBBBB
572 @BBBBBBBB
574 @BBBBB..B
576 @BBBBBB..
578 @RBBBBBBB
580 DESIGN2,$E000+148*8
582 @...BBBBB
584 @BBBBBBBB
586 @..BBBBBB
588 @B..BBBBB
590 @B..BBBBB
592 @B..BBBBB
594 @..BBBBBB
596 @BBBBBBBB
598 DESIGN2,$E000+149*8
600 @BBBBBB..
602 @BBBBB..B
604 @BBBBB..B
606 @BBBBB...
608 @BBBBB..B
610 @BBBBB..B
612 @BBBBBB..
614 @BBBBBBBB
616 DESIGN2,$E000+150*8
618 @..BBBBBB
620 @B..BBBBB
622 @BBBBBBBB
624 @..BBBBBB
626 @B..BBBBB
628 @B..BBBBB
630 @..BBBBBB
632 @BBBBBBBB
634 DESIGN2,$E000+151*8
636 @BBBBB...
638 @BBBBB..B
640 @BBBBBBBB
642 @BBBBBBB.
644 @BBBBBBB.
646 @BBBBBBB.
648 @BBBBBBB.
650 @BBBBBBBB
652 DESIGN2,$E000+152*8
654 @...BBBBB
656 @B..BBBBB
658 @..BBBBBB
660 @.BBBBBBB
662 @.BBBBBBB
664 @.BBBBBBB
666 @.BBBBBBB
668 @BBBBBBBB
670 END PROC
672 :
674 :
676 PROC MUSIC
678 :
680 VOL15
682 WAVE1,00010000
684 ENVELOPE1,8,8,8,0
686 M1$="▯IZ▮C5▮E5▮F5▮"
688 M2$="G5▮C5▮E5▮F5▮G5▮C5▮E5▮F5
▮G5▮E5▮C5▮E5▮D5▮E5▮E5▮D5▮C5▮C5▮"
690 M2$=M2$+"E5▮G5▮G5▮F5▮F5▮E5▮F
5▮G5▮E5▮C5▮D5▮C5▮C5▮C5▮E5▮F5▮"
692 M3$="C5▮C5▮C▯"
694 MUSIC8,M1$+M2$+M2$+M3$
696 PLAY2
698 END PROC
700 :
702 :
704 PROC PLAY
706 :
708 VOL3
710 WAVE1,00010000
712 ENVELOPE1,8,8,8,0
714 P$="▯IZ▮C5▮E5▮F5▮G5▮E5▮C5▮E
5▮D5▮C▯"
716 MUSIC8,P$
718 PLAY2
720 END PROC
722 :
724 :
726 REM ########################
728 REM ########################
730 REM ####                ####
732 REM #### CONNECT  FOUR ####
734 REM #### COMMODORE  64 ####
736 REM ####                ####
738 REM #### SIMON'S BASIC ####
740 REM ####                ####
742 REM ####  LES  ALLAN   ####
744 REM #### 26TH AUG 1983 ####
746 REM ####                ####
748 REM ########################
750 REM ########################
READY.
```



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HUNT WINS GRAND PRIX

At yesterday's Monaco Grand Prix, a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. "The whole place has gone to the dogs," one driver was reported as saying. The race was restarted; riders and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since).

PLAYER WINS OPEN

Eagle eyed spectators were privileged to see [illegible] score a [illegible]

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PRIVATE DETECTIVE DISAPPEARS

Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details, buy FRANKLINS TOMB, a new adventure game for the DRAGON 32 and 48k ORIC-1. This adventure comes complete with a 24-page illustrated Case File. £9.95 from BOOTS, SPECTRUM, COMPUTERS FOR ALL, WEB- and all other purveyors

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[illegible]

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The Everest Expedi
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plunged down a cr
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the expedition
was quoted as
"Yuk". *Continued o*

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Logan's run . . .

***David Kelly** talks to Ian Logan, author and machine code expert*

Despite an enviable reputation as an authority on Z80 machine-code, Ian Logan still regards himself as an amateur enthusiast.

A graduate in medicine from Sheffield, he qualified as a GP. But, his first attempt to get involved with computers was a failure — he was turned down for a job as a doctor for ICL. "They gave me a nice lunch, but I didn't get the job."

After that, he spent nine years working as a GP — still with a faint hope of somehow, someday, becoming involved in computers.

In 1980, he joined the Lincolnshire Microprocessor Society. Through the group he met people who had Pets and Tandys. "I borrowed a Pet for a fortnight — and it sat on the table downstairs. I didn't really know what to do with it."

Then he bought a ZX80. "Bob Maunder of Linsac put an advertisement in one of the magazines, saying he wanted ZX80 programs," says Ian. "I phoned him up and discovered I knew more about the machine than he did."

The two decided to produce a book for the machine — which became Ian's first book. A small spiral-bound handbook called *The ZX80 Companion*. Ian wrote about one third of it — the rest was written by Bob and another writer, Terry Trotter. It came out in September 1980.

All of Ian's knowledge of the ZX80 is self-taught. Back in 1980 there were no introductory tutorial books on machine code programming, such as there are now.

"At that time, I always used to think that somebody, somewhere, knew all there was to know about machine code programming. Now I have found out there never were any — there still are no experts."

Bob Maunder was unable to publish Ian's next book, on ZX80 machine code, and suggested he try to find another publisher. "There I was, a week after the ZX81 was launched, going round this micro show trying to get someone to publish a manuscript written for the ZX80.

"After a couple of people turned me down, I answered an advertisement from Melbourne House.

"I got a phone call from Australia when I was over at the village hall mowing the lawn and my wife came running across to tell me. The call was from Fred Milgrom and that is how I started writing for Melbourne House."

Fred Milgrom asked Ian to convert his book for the ZX81: "Melbourne House apparently made a lot of money out of some sensational book published in Australia about female sex hormones. But Fred has a great interest in computers — and in particular he loves adventure games.

"And he has some very good programmers out there with him now — like Philip Mitchell who wrote *The Hobbit*."

Ian's first book for Melbourne House was published in September 1981 — almost exactly a year after his first.

Next came a chance meeting with Frank O'Hara — a government statistician. "Frank thinks and lives numbers," says Ian. "And he understands all the mathematics which I don't." Together they wrote *Understanding Your ZX81 Rom*. "I started ZX81 disassembly from the front, and he started from the back. We met in the middle."

Then the Spectrum came out — Ian and Frank have recently written *The Complete Spectrum Rom Disassembly* for it. "The book is doing very well — because nobody else has attempted anything like it."

For the last couple of months Ian has been preparing yet another book: *The Spectrum Microdrive Book*. This book is a departure for Ian — for the first time he is writing about his own work.

From Christmas until Easter, Ian worked two days a week for Sinclair, writing software for the Interface 1, which is necessary to connect the Microdrive to the Spectrum.

Ian's book on the Microdrive and Interfact 1 will be published in either late September or early October.

Since working on, and writing a book about, the Microdrive, Ian has become something of an authority on the device. "People don't seem to be as excited about the networking possibilities as I thought they would be — there is no reason why you cannot join up Spectrum Net to other computers. Networking is great fun.

"The other thing people don't seem to have realised is that you can pass anything on the RS232 and store it on Microdrive — if you are prepared to use the Spectrum as a controller. You could easily save software from a BBC onto Microdrive.

"It remains to be seen if anyone will build Microdrive controllers for other machines to use them direct. Although not difficult technically, it might be difficult to manufacture it at a low enough price — the Microdrive has a big ULA in it, doing a lot of work."

One of the most interesting things Ian has discovered is the existence of a set of software 'hooks' to enable users to access routines in the Interface Rom. This means that anyone can now add new commands to the Spectrum. "You can add what you like — add new languages if you want." These can only be written in Ram but, if stored on Microdrive, they could be loaded in each time before using the machine.

When Ian was working at Sinclair, he met Scott McCourt. Scott was in charge of writing the system software for the Timex 2000 machine, the US Spectrum equivalent. He asked Ian to help — to go over to the US and write software for them.

"They wanted to add new commands to the Spectrum," says Ian. "The machine was a 1981 design and requirements for a 1983 computer have evolved since then. They were going to have to redo the Spectrum printed-circuit board for the TS2000 to satisfy the US FCC regulations, and to make it compatible with the NTSC tv standard. So, while they were about it, they decided to produce an enhanced version, with extra commands.

"I'm not sure if Timex made the right decision — maybe they should have just put out the Spectrum, more or less as it is and got it out over there earlier."

During his two weeks stay with Timex, Ian showed them how to add new commands and routines. He extended the syntax checking and corrected some of the small bugs in the Spectrum's own Rom. "I wouldn't want to make too much of the Spectrum's faults. It is a very successful machine," he says. "After all, it is not often you need to use the number — *Int*65536."

After the Microdrive book comes probably a TS2000 version of Ian's best-selling *Complete Spectrum Rom Disassembly*, again with Frank O'Hara. "I don't know what I will do next — at the moment I'm sort of drifting from one thing to another. I had a Vic20 all last winter — the plan was to write a book for it — but I got so frustrated at the way the machine software was organised.

"Perhaps I ought to sit down and write some programs — but I don't like writing games very much. I am going to have to learn a bit about 16-bit machine language. That's going to be all the rage next year.

"What I have found is that I like problem solving. I enjoyed my work with Sinclair and Timex — and I'd like to do more. I'd like to continue to be involved with the computer industry and I don't feel as though I am at present. People like me don't get employed by a company if they can do it themselves." ■

Hitchcockian nightmare

***John Scriven** picks his way through another selection of Spectrum software*

In the months since the Spectrum first nosed its way on to the market, there has been a drastic improvement in the available software.

The first games were mainly coloured copies of ZX81 favourites, with a lot of slow Basic programs thrown in for good measure. When programmers had got the hang of smooth movement in machine code, the standard began to improve. Even without the definition of the BBC and the sprite facilities of the Commodore 64, there is probably now a larger selection of good Spectrum software on the market than for any other machine.

Having spent several months with other machines, it was a pleasant surprise to be presented with a pile of games software for the Spectrum that was generally of a good standard. Although the old favourites were there and some novel but ultimately boring games, there was some of the best TV entertainment since Anne Diamond first graced my early morning screen.

Invaders from Artic includes the copyright notice and instructions on the loading screen, a good idea that many companies seem to employ nowadays. There are options at the start to choose game difficulty (1-9), the number of players (1-2) and game variation (1-4). This latter choice can provide you with mutant invaders and bombs from different angles. Should you be one of the seven people left in this country without your own copy of this game, then you will find this version reasonable enough, and with plenty of varieties to keep you amused for some time.

Gobble-a-Ghost from CDS Micro Systems and *Muncher* from Silversoft are both *Pacmen* in slightly different guises. *Gobble-a-Ghost* with four ghosts and four power pills provides instructions in the packaging but nothing on screen to help you. The controls used are *1* and *Q* for up and down, and *9* and *O* for left and right, a comfortable combination and slightly preferable to Muncher's use of *N* for down and *K* for up. At least manufacturers seem in the main to have stopped using the cursor control keys, apparently logical, but in fact the worst choice.

Gobble-a-Ghost is reasonably difficult in the first frame, but there are no little extras that we have come to know and love, such as cherries, strawberries and names for the ghosts. *Muncher* has all these and a beautiful demonstration game at the start. Unfortunately, although the program loaded with no difficulty, the game itself refused to start, so I can't say how good it was in action.

Jawz from Elfin Software started off with some promise. The title page is good, and you can select the number of players and the difficulty level. The game is set off the coast, with a view from the seabed to the surface. You are provided with a base that can be moved left and right across the sand, firing at sharks that swim between you and the surface. Hanging just below the water-line are jelly-fish that drop poison pellets on to you.

The idea itself is novel and could have resulted in an interesting game. However, the sharks only swim left and right and you can even control how close to the surface they swim. Once you've destroyed one layer, another appears. Perhaps I missed some hidden subtlety, but the game rapidly became boring and yawningly predictable. If you suffer from insomnia this could be the ideal program for you.

Firebirds from Softek produces waves of flapping cosmic vultures that either crash into your base or drop unpleasant things (!?) on your head. If you kill enough of them, white motor-cycle helmets progress down the screen and generally get in the way. Apparently, a mother-ship makes an appearance at some stage if you can put up with this Hitchcockian nightmare.

The screen has a wrap-around feature which is irritating; although the vultures zoom off to the left and reappear on the right, you cannot do the same. There are pretty little multi-coloured displays in between individual games and this package is probably worth considering if you like alternative versions of space-zapping. If you prefer the real thing, try riding round Trafalgar Square on the back of a moped for half an hour . . .

Embassy Assault from Sinclair/ICL is another game that starts off with much promise. "You are one of the country's best agents and have been given the task of acquiring some top secret codes from the strong-room of a foreign embassy."

3D views inside the building are displayed, although not in great detail, and the game is rather slow, particularly in generating the maze of rooms (20 seconds for level one and three minutes for level nine). There are maps positioned on some of the walls, and stairs lead you to three other storeys.

When you reach the code room, there is an envelope on the wall. You don't have to pick it up, open it, decode it, or in fact, do anything — you simply retrace your footsteps and leave the building. There are no guards to stop you and the only thing you play against is the clock, so there is little challenge in this game.

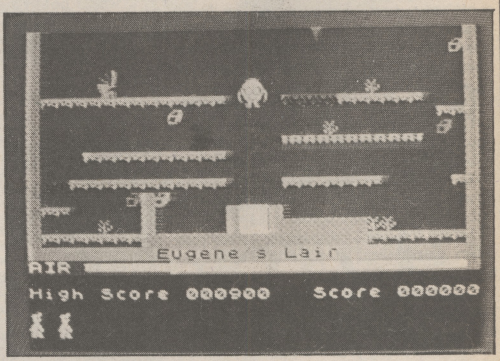
Yet another program that appears to offer a great deal at the start is *Schizoids* from Imagine. The cassette blurb invites you to be a space dustman and to help shove all the galaxy's garbage into the nearest black hole with your Space-dozer. The main disappointment is in the display, which is in black and white. Not an easy game to master, it is reminiscent of *Asteroids* in the type of controls you have for you craft; eg, rotate left and right, thrust, etc.

Usually, you end up being splatted by some strange-shaped piece of rubbish, or else fall into the black hole yourself. One wonders which unfortunate part of the galaxy is at the receiving end for all this junk (come to think of it, I seem to have seen something like it in *PCW*'s offices — perhaps that's why they've changed their address recently).

Sentinel from Abacus is original and entertaining if you like space arcade games. A cross-shaped mother ship appears in the centre of the screen containing four rockets that you can launch and use to protect the main base. You can fire missiles and photon cannons as you steer the mini-rockets round the screen. There is even a force field that will temporarily repel invading aliens. Fast-moving and using clear, high-resolution graphics for the space-craft, this game proved to be above the usual standard of space games.

Another game that shows evidence of careful thought is *Spectra Smash* from Romik Software. Although it is only a version of *City Bomber*, it can be played with a variety of joysticks. There are nine different levels, not to mention anti-aircraft fire.

The buildings that have to be bombed away before you can land are much too pretty — they look like a typical street in Amsterdam, complete with gable ends. If



you succeed in clearing the screen, you can make your touchdown in what must be the Dam square. A fuel truck comes to your assistance and lets you take off to attack yet another area of Amsterdam (I know the Dutch are generous, but this is ridiculous).

Although illogical in concept and dubious in morality, it's fun to play. Also included is a copy of *Breakout*, which is just as boring as it was when it first appeared in pubs six or seven years ago — but one shouldn't complain about a freebie game, even if you'll rarely want to play it, unless you're feeling nostalgic.

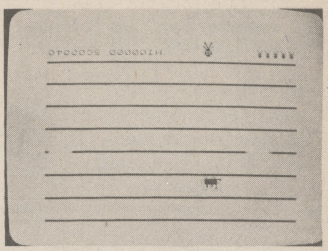
Having looked at a rather weak game from Imagine, it was a pleasure to find one of theirs that has appeared on the market more recently called *Jumping Jack*. This is great fun, original in concept and very addictive.

On the surface a simple game, at higher levels it requires great concentration and the ability to keep a straight face while being pursued across the screen by a dinosaur, a jumbo-jet and a person with a shot-gun. There are eight moving lines on the screen, each one containing gaps that move in both directions. You start at the bottom of the screen with eight lives and have to jump through the gaps to the next level.

Although the holes are essential for moving up the screen, they also drop you back should you be running in the wrong direction. If you fall to the bottom you lose a life. Each time you reach the top, a fresh screen appears, identical except for the addition of a hazard (jumbo-jets, etc). Each screen cleared results in an extra hazard to avoid, so the 20th screen has 19 of these things rushing about. To make it more interesting, in between screens two lines of a verse appear.

I greatly enjoyed this game and would recommend it whole-heartedly to anyone who can face frustration and horror as poor *Jumping Jack* misses the gap and crashes his head against the ceiling. I suppose this is only to be expected — after all, *Jumping Jack* and *Yossa Hughes* both originate from Liverpool.

I have left until last what must be the most intricately conceived piece of software for the Spectrum since the first *Horace* game appeared on the market. *Manic Miner* from Bug-Byte has an amusing setting — Miner Willy has found a hidden mine in south London and has to bring out all the treasure that he discovers there. Willy can walk to the left and right and also jump. This last movement is most essential, for the system is full of unpleasant creatures just out to get him.



The first cave is the central cavern, and jumping from level to level up the display (while negotiating one-way conveyor belts and disintegrating floors) enables him to collect several keys positioned in awkward places. Should you manage to guide him to success before his air supply runs out, he has to make his way to the bottom of the screen again and exit through a flashing door.

If the game had been limited to this, it would have provided a few hours fun and would have been as good value as several other cassettes reviewed here. However, on passing through the door, poor Willy enters another cave — the Cold Room, with different levels and angry penguins guarding it. Leaping over them is the only way to achieve success. This cave is by no means the last however — and there is a total of 20 different screens, each one with different creatures and different techniques to solve before they can be mastered.

The names chosen for the caves are very tongue-in-cheek and will be instantly recognised by arcade freaks — *Attack of the Mutant Telephones* and *Wacky Amoebatrons* being two examples. My favourite cave is called *Eugene's Lair*, clearly aimed at a certain well-known programmer. This cave is full of malevolent WC's, complete with flapping seats.

In addition to the excellent game format, there is on-screen scoring, a musical opening title with moving piano keys and a demonstration of all the caves in the system. Accompanying music can be turned off at any time.

This game is so original, amusing and habit-forming, it will probably be voted No 1 Spectrum game this year. If I ever meet Matthew Smith, the author of this game I shall complain most bitterly about the program being released during the summer. Were it not for this game, I would certainly be more sun-tanned than I am at present! ■

Supplier	Program	Price	Value (1-10)
Artic Computing Main Street Brandesburton Driffield YO25 8RG	*Invaders*	£4.95	4
Bug-Byte Mulberry House Canning Place Liverpool L1 8JB	*Manic Miner*	£6.95	10
CDS Micro Systems 10 Westfield Close Tickhill Doncaster S Yorkshire DN11 9LA	*Gobble-a-Ghost*	£5.95	7
Abacus Programs 716 Llangyfelach Road Swansea SA5 9EL	*Sentinel*	£5.00	8
Elfin Software Hudsons House Battery Road Great Yarmouth Norfolk NR30 3NN	*Jawz*	£4.95	5
ICL/Sinclair Stanhope Road Camberley Surrey GU15 3PS	*Embassy Assault*	£4.95	5
Imagine Software Masins Buildings Exchange Street East Liverpool Merseyside L2 3PN	*Schizoids* *Jumping Jack*	£5.50 £5.50	6 10
Romik Software 272 Argyll Avenue Slough S11 4HE	*Spectra Smash*	£6.99	6
Silversoft London House 271/273 King Street London W6	*Muncher*	£5.95	—
Softek 12/13 Henrietta Street London WC2	*Firebirds*	£5.95	7

Single ship combat

***Peter Bartley** presents Alien Destroyer in the final part of his gameswriting series*

To round off the series, here is a games program utilising many of the ideas we have been considering over the past few weeks.

The object of the game is to destroy as many of the alien fleet as possible in single ship combat. You have a limited fuel supply and need one unit of energy to get back to your home base. However, your laser is solar-powered and hence uses none of the ship's energy (ie: you have unlimited firing). A five second warning sounds before you have to retire from the game.

Your ship's sensors can give you certain information: a tone sounds and the sights align when the enemy ship is within firing range. When the ship can be hit, the vulnerable portion is illuminated in green. The ship turns red when in line of fire, but cannot be hit. When you are close enough to the enemy ship, your navigation system will take over the aiming for you and "lock-on".

The controls of your ship are difficult to master. They are: *P=up, L=left, colon=right, full stop=down, K=fire, @=track* (tracking mode: the ship will always be moving in the last direction indicated, unless in tracking mode, when the ship will remain relatively stable). The difficulty lies in the fact that the motion of your craft is relative. For example, if you made the ship veer left, the enemy would appear to move right, and so on. It's easier to just think of hitting the key which corresponds to the relative position of the enemy on the screen.

The first program is a "loader" — it simply defines the characters we'll be using in the game. *Run* the "loader" first, then *New* it and *Load* the second program (though not before *Saving* them both first, of course). Line 10 reduces the amount of memory Basic thinks it has, and line 20 reads the character data.

The second program is the game itself. Lines 10-110 are the initialisation. The reversed *H* in line 10 is a special print character: for those who missed the section in the fourth article of the series, here's how to obtain it. When typing the line for the first time, leave a space where the *H* should be. Return the line, and move the cursor up and onto the space you left. Type *"[RVS ON]"* and then hit *H*. A reversed *H* should have appeared. This character prevents lower case letters from being printed by accident. Line 20 defines the direction array for the enemy ship. Line 110 colours the lines of fire and starts the timer. Lines 120-310 are the main loop.

Many of the lines in this program can be considered as working in pairs. Lines 130 and 300 sound the alarm when the fuel is used up, lines 170 and 200 move the ship and lines 205 and 290 move the direction arrow. There are three subroutines (although two only are true subroutines). They are lines 400+ (final routine and highscore), 500+ (firing routine) and 600+ (the "lock-on").

Other lines of importance: 210 checks whether there is a target in the sights. Lines 540-590 create the explosions. I always prefer it when print statements are explained so: line 140 has three spaces and three *[CSR BACK]*s in it. Line 640 is:

"[10 CSR RT] [3 CSR DN] [SHIFT @] [SPACE] [SHIFT L] [CSR DN] [3 CSR LFT] [3 SPACES] [CSR DN] [3 CSR LFT] [SHIFT P] [SPACE] [SHIFT O]"

Line 670 is:

"[10 CSR RT] [3 CSR DN] [SPACE] [SHIFT –] [SPACE] [CSR DN] [3 CSR LFT] [SHIFT +++] [CSR DN] [3 CSR BK] [SPACE] [SHIFT –] [SPACE]"

Note that both lines have *[RVS ON]* commands contained in them. This is true of all the *Print* statements in the program, except those contained in any of the lines 400-470 (remember the third article: we haven't read their character data into Ram, only our data from the loader program).

Main variables: *A* gives the position of the ship, *F* the position of the guidance arrow and *B* is the "general-purpose" variable.

This program shows how simple ideas can produce a very playable game — try to add "little extras" to it and then get to work on your own "pet" ideas.

If you do have a playable game, or simply an interesting routine, please don't hesitate to send it to *Popular Computing Weekly*, following the instructions given at the beginning of each Open Forum. Think of all those other Vic users out there, starved of programs. And if that doesn't warm your heart, there's always the chance to make a bit of ready cash from your effort. You have nothing to lose but your postage. ■

Program 1

```
10 POKE52,27:POKE56,27:CLR
20 FORA=7168TO7231:READB:POKEA,B:NEXT
30 FORA=7424TO7431:POKEA,0:NEXT
40 DATA16,56,16,16,16,16,56,16
50 DATA60,66,153,231,165,153,90,60
60 DATA2,4,6,5,5,6,4,2
70 DATA64,32,96,160,160,96,32,64
80 DATA0,0,66,255,66,0,0,0
90 DATA0,0,0,193,34,20,8,0
100 DATA0,32,66,255,66,32,0,0
110 DATA52,65,181,66,149,132,105,86
```

Program 2

```
10 POKE36879,8:POKE36878,15:PRINT"■H■"
20 POKE36869,255:D(0)=-22:D(1)=22:D(2)=-
   1:D(3)=1:TI$="000000"
100 PRINT"■":A=7702+INT(RND(1)*484):
    POKE7701,230
110 FORB=38643TO38662:POKEB,2:NEXT:
    POKE38653,5
120 POKE7911,0:POKE7955,0:POKE38421,INT
    (RND(1)*7)+1
130 IFVAL(TI$)>=55THENPOKE36874,200:IFTI
    $>="000100"THENGOTO400
140 PRINT"■■■ENERGY:   ■■■"60-VAL(TI$)
150 PRINT"■"TAB(11)"■HITS:"SC
170 POKEA,32:POKEA-1,32:POKEA+1,32
180 A=A+D(INT(RND(1)*4))+E:IFA<7680+22
    THENA=A+484
190 IFA>8164+22THENA=A-484
200 POKEA,1:POKEA-1,2:POKEA+1,3
205 F=INT((A-7680)/22)*22+7701:IFA+1<>
    FANDA<>FANDA-1<>FTHENPOKEF,6:POKEF
    +30720,4
210 IFPEEK(7933)<>32THENPOKE36876,240:
    POKE7911,4:POKE7955,4:POKE36876,0
215 IFPEEK(7933)=1THEN600
220 P=PEEK(197)
230 IFP=13THENE=22
240 IFP=45THENE=-1
250 IFP=37THENE=-22
260 IFP=21THENE=1
270 IFP=53THENE=0
280 IFP=44THENGOSUB500:IFX=1THENX=0:
    GOTO100
290 POKEF,32:POKEF+30720,1
300 IFVAL(TI$)>=55THENPOKE36874,0
310 POKE198,0:GOTO120
```

```
400 POKE36874,0:FORB=0TO253:POKE7933+B,
    170:POKE38653+B,5:POKE7933-B,170:
    POKE38653-B,5
410 NEXT:POKE198,0:POKE36869,240:PRINT"
    YOU SCORED:";SC
420 IFSC>HSTHENHS=SC:PRINT"YOU HAVE THE
    HIGHSCORE.PLEASE TYPE YOUR NAME":IN
    PUTC$
430 PRINT"";C$;" HAS THE"
440 PRINT"HIGHSCORE WITH";HS
450 PRINT"HIT A KEY TO RESTART "
460 GETA$:IFA$=""THEN460
470 SC=0:GOTO20
500 FORB=0TO8
510 POKE7923+B,5:POKE7942-B,5:POKE36876,
    241-B:NEXT
520 FORB=0TO8:POKE7923+B,32:POKE7942-B,32
    :POKE36876,241-B:NEXT:POKE36876,0
530 IFPEEK(7933)=32THENRETURN
540 A$=TI$
550 FORB=0TO9:POKE36877,141-B:POKE7933+B,
    7:POKE7933-B,7:POKE7933-22*B,7:
    POKE7933+22*B,7
560 POKE7933+B,32:POKE7933-B,32:POKE7933
    -22*B,32:POKE7933+22*B,32:NEXT
570 SC=SC+50:X=1
580 FORB=15TO0STEP-.1:POKE36877,150-B:
    POKE36878,B:NEXT:POKE36877,0:
    POKE36878,15
590 TI$=A$:RETURN
600 B$=TI$
610 FORB=0TO8:POKE7923+B,4:POKE7943-B,4:
    POKE38643+B,1:POKE38663-B,1:POKE
    36877,225+B*2
620 POKE7923+B,32:POKE7943-B,32:NEXT:
    POKE7931,4:POKE7935,4:POKE36877,0
630 PRINT"        LOCKED ON
    ":POKE36876,0:FORB=1TO20:NEXT
640 IFINT(G/5)=G/5THENPRINT"
650 IFPEEK(197)=44THENGOSUB500:SC=SC-20:
    TI$=B$:X=0:GOTO100
660 PRINT"
    ":POKE36876,240:FORB=1TO20:NEXT
670 IFINT(G/10)=G/10THENPRINT"
680 G=G+1:GOTO630
```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The rings of Saturn

***Maurice Gavin** presents the rings of Saturn for 16K Spectrum*

Through the telescope, Saturn is the beautiful ringed planet that never fails to impress — be it beginner or expert alike. This program does the next best thing and probably represents the most accurate computer simulation of Saturn ever attempted on a home micro. It is possibly superior to many mainframe efforts, with the known exception of NASA's Planetary Laboratories!

It features a full screen solid image, with all hidden lines deleted and the globe and ring system drawn accurately to scale. The user may tilt the planet and ring system at any angle up to 90°. If 0° is *Input*, the planet is drawn as viewed directly over its equator with the rings shown edge-on. If 90° is *Input*, a polar view is presented with the ring system completely encircling the planet. You may select a northern or southern aspect for the tilt. An *Input* of *s* will show the underside of the rings and the equator and visible pole correct for this aspect.

The sequence of drawing the planet is as follows:

1) Check image size; rescale if tilt >43°
2) Draw globe correcting apparent oblateness for tilt
3) Draw equator correcting apparent oblateness for tilt
4) Draw semi-transparent ring system
5) "Trace" nearest edge of rings across globe according to N/S aspect
6) Draw Cassini Division through ring system: clockwise for N aspect
7) Delete Cassini Division if "behind" planet
8) Plot visible pole position correcting apparent oblateness for tilt

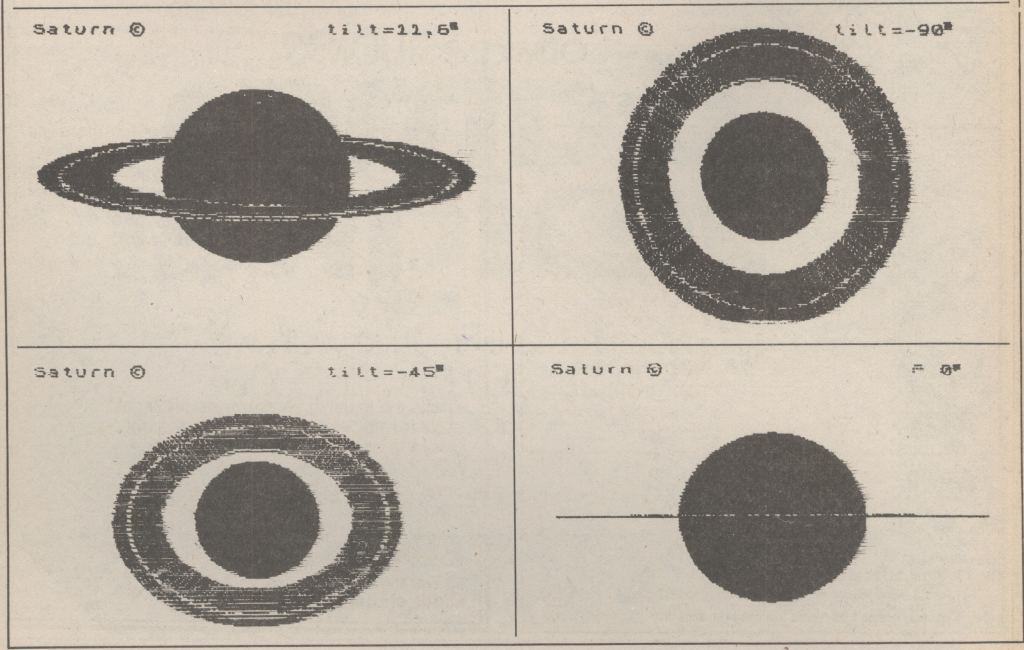
The program contains an option to *Copy* the completed picture to the ZX printer or to *Save* the image onto tape with the *Screen* command. The latter is simplicity itself — it is only necessary to press "p" (for picture) and start the recorder to *Save* the picture you have created. The angle of tilt is automatically *Saved* in the file name; eg, *"sat –23.4"*. To recreate the picture, enter *Load "sat –23.4"Screen* and the Spectrum will search and display the appropriate image off of tape.

Unlike some uninformed computer presentations of this planet, the globe is not circular (except for the polar view) and so the *Circle* command cannot be used to draw the planet. This oval (or correctly termed oblate spheroid) shape is due to Saturn's rapid axial rotation in 10h 14m (Saturn's day), causing the equatorial "bulge" and polar "flattening". The Spectrum *Draws* the globe and ring system via the *Plot* command, using a rapid ellipse routine. In the case of the globe, the reduction in oblateness, as it is called, from 10 percent to zero (full circle) is applied progressively through the change of tilt from 0° to 90°. Similarly, the position of the equator and visible pole are correctly located according to the tilt of the planet and the oblateness as presented.

As seen from Earth, the appearance of the planet is limited to a maximum tilt of 26.73° (ie, Saturn's axial tilt to its orbit about the Sun) in both north or south directions, plus or minus 0.49° depending on the relative positions of Earth and Saturn in their orbits at the time. Thus, any tilt in excess of 28° will represent a viewpoint other than from Earth!

The Rem statements show the general structure of the program. In the case of *Drawing* the globe and rings, it is only necessary to calculate the outline of one quadrant of the ellipse and to mirror this in the remaining three quadrants by *Drawing* each quadrant sequentially. Such a routine ensures the *Drawing* is executed rapidly, with the minimum of calculation to slow the program down. In the case of the routine to *Draw* the Cassini Division in the ring system, I have chosen to *Plot* one complete ellipse and you will note how relatively slow, though satisfying, this proves to be.

Because the whole of the above programs relies on the ability to *Draw* ellipses rapidly I have included as an addendum routine the short program called *Solid Ellipse*. It can easily be incorporated into your program if you wish to *Draw* these precise shapes. The variable *y* is used here to control both the vertical *y* co-ordinate *Plot* position and the maximum radius of the ellipse (called the semi-major axis). The routine is short enough to "tinker with" and find out precisely how it works, perhaps with your own value in place of *y* in lines 110 and 120. ■



```
  10 REM The Rings of Saturn ©
       by Maurice Gavin
 ------------------------------
  20 LET sc=1: BORDER 0: PAPER 0
: INK 6
  30 CLS : PRINT "Saturn ©";
  40 INPUT "tilt(0° to 90°)";z
  50 IF z>43 THEN LET sc=.66
  60 INPUT "n or s tilt(n/s)";a$
  70 LET ob=1.1*z/100
  80 LET oe=.89+(.11*ob)
  90 IF a$="s" THEN LET z=-z
 100 PRINT TAB 21;"tilt=";z;CHR$
 130
 110 LET e=1/SIN ((.1+z)/180*PI)
 115 LET p=COS ((.1+z)/180*PI):
IF a$="s" THEN LET p=-p
 120 LET x=255/2: LET y=88
 130 LET r=54*sc: LET h=126*sc
 140 GO SUB 360
 150 REM ■draw ring system
 160 FOR f=0 TO 1.58 STEP .01
 170 LET c=INT (SIN f*h)
 180 LET d=INT (COS f*h/e)
 190 PLOT x+c,y+d
 200 DRAW -c/3,-d/3
 210 PLOT x-c,y+d
 220 DRAW c/3,-d/3
 230 PLOT OVER 1;x-c,y-d
 240 DRAW c/3,d/3
 250 DRAW OVER 1;0,1
 260 PLOT OVER 1;x+c,y-d
 270 DRAW -c/3,d/3
 280 DRAW OVER 1;0,1
 290 NEXT f: GO SUB 460
 300 REM ■menu-COPY/CONT/SCREEN$
 310 PRINT #0;"Press x to COPY,c
 to CONTinue"
 320 PRINT #1;TAB 6;"s to SAVE "
"sat ";STR$ z;"""": PAUSE 0
 330 IF INKEY$="x" THEN COPY : I
NPUT "": GO TO 310
 340 IF INKEY$="s" THEN INPUT ""
: SAVE "sat "+STR$ zSCREEN$ : IN
PUT "": GO TO 310
 350 RUN
 360 REM ■draw oblate globe
 370 FOR f=0 TO 1.420 STEP .019
 380 LET a=INT (SIN f*r)
 390 LET b=INT (COS f*r*oe)
 400 PLOT x+a,y+b: DRAW 0,-b*2
 410 PLOT x-a,y+b: DRAW 0,-b*2
 420 NEXT f
 430 REM ■draw equator
 440 FOR f=PI*.5 TO PI*1.5 STEP
.1: PLOT OVER 1;x+SIN f*r,y+COS
f*r/e: NEXT f: RETURN
 450 REM ■draw Cassini Division
 460 LET cd=2.1
 470 FOR f=0 TO PI*2 STEP .03: P
LOT OVER 1;x+SIN f*r*cd,y+COS f*
r*cd/e: DRAW OVER 1;2,0: NEXT f
 480 REM ■delete CD behind globe
 485 IF ABS z>26 THEN GO TO 570
 490 FOR f=0 TO 1.42 STEP .01
 500 LET a=INT (SIN f*r)
 510 LET b=INT (COS f*r*oe)
 520 IF a$="s" THEN LET b=-b
 530 PLOT x+a,y: DRAW 0,b
 540 PLOT x-a,y: DRAW 0,b
 550 NEXT f
 560 REM ■plot visible pole
 570 PLOT OVER 1;x,y+r*p*oe
 580 RETURN
9990 SAVE "saturn1"
```

```
   5 PRINT "solid ellipse ©"
  10 REM    by Maurice Gavin
 ------------------------------
  20 INPUT "tilt";z: PRINT "tilt
=";z;"■"
  30 LET e=SIN ((.1+z)/180*PI)
  40 LET x=255/2: LET y=175/2
 100 FOR f=0 TO PI/2 STEP .012
 110 LET a=INT (SIN f*y)
 120 LET b=INT (COS f*y*e)
 130 PLOT x-a,y+b: DRAW 0,-b*2
 140 PLOT x+a,y+b: DRAW 0,-b*2
 150 NEXT f
 200 OVER 1: PLOT 0,y: DRAW 255,
0: PLOT x,0: DRAW 0,175: OVER 0
```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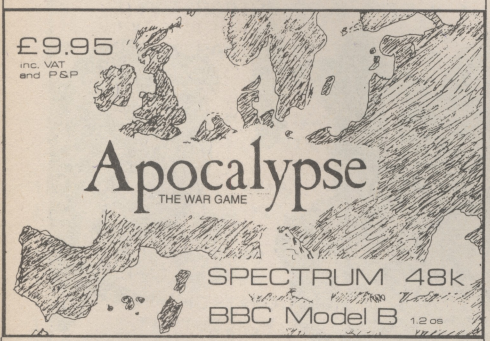

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Circular logic

***Michael Batty** shows how to draw circles and ellipses in the first of a three-part series on computer graphics*

Let's begin with some ideas about how to draw regular shapes such as circles and ellipses which comprise the basic elements of computer art. The usual way to draw a circle is to calculate points around its circumference and draw between them. The X, Y co-ordinates of each point are given by the formulas

X = R★COS(TH) and Y = R★SIN(TH)

where R is the radius and TH the angle from the horizontal measured counter-clockwise. If we vary TH regularly from 0 to 360 degrees (or 2★PI radians), we trace out the points which lie on the circumference.

A circle is really a special form of ellipse where the vertical and horizontal axes are the same length. If we change these lengths by replacing R in the above formulas by XX, the 'radius' of the X axis and YY, the 'radius' of the Y axis, we generate points defining an ellipse. Program 1 enables you to do this.

Try values for XX and YY between 100 and 300 to start with. If you wish to leave each image on the screen, delete line 180.

Program 1 is really too slow for computer art where speed is of the essence. This is because the sine and cosine functions have to be evaluated for each set of X, Y co-ordinates. It is possible, however, to compute these functions only once for a small fixed angle (DT) and to then use a recursive formula based on trigonometric addition rules to generate the sequence of X, Y values. This technique is used in Program 2. Run it and see that the same shapes are drawn over three times as fast as in Program 1.

We now need to paint or fill these shapes and we can make use of the triangle fill command *PLOT85* of BBC Basic. If you insert line 120 *MOVE 0,0* and replace line 150 with *PLOT85,X,Y* in Program 1 and 2, these programs become the conventional ellipse filling algorithms used in most simple graphics.

However, these are also too slow and a faster technique is to fill the shape in the same way you might shade it manually, using vertical up and down strokes. In Program 3, this technique is used. Note that the fill is from right to left, as though you were left handed, because of the way circular angles are measured.

Also, observe that only the points defining the top half of the shape are computed. Faster fill routines exist even in Basic, but this technique is necessary for later work.

We now have quite a fast method for filling an ellipse and we can already generate some interesting computer art. Program 4 paints random sized ellipses in random colours at random positions on the screen, and the illustration shows what can be achieved. To get some weird and wonderful effects, alter the operation of the *Gcol* statement in line 90 and use MODE2 to generate 16 colours.

Next week, we will show how these shapes can be rotated to generate more formal designs. ■

PROGRAM 1

```
 10 REM Slow Ellipse Drawing
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=60:DT=2*PI/N
 90   MOVE XX,0:TH=0
100   FOR I%=1 TO N
110     TH=TH+DT
130     X=XX*COS(TH)
140     Y=YY*SIN(TH)
150     DRAW X,Y
160     NEXT I%
170   PRINT"TIME TAKEN = ";TIME
180   A=GET:CLS
190   UNTIL FALSE
200 END
```

PROGRAM 2

```
 10 REM Fast Ellipse Drawing
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=60:DT=2*PI/N:A=XX/YY
 90   X=XX:Y=0:MOVE X,Y
100   C=COS(DT):S=SIN(DT):SS=S/A:
      S=S*A
110   FOR I%=1 TO N
130     T=X*C-Y*S
140     Y=Y*C+X*SS:X=T
150     DRAW X,Y
160     NEXT I%
170   PRINT"TIME TAKEN = ";TIME
180   A=GET:CLS
190   UNTIL FALSE
200 END
```

PROGRAM 3

```
 10 REM Fast Draw,Fast Fill
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=30:DT=PI/N:A=XX/YY
 90   C=COS(DT):S=SIN(DT):SS=S/A:
      S=S*A
100   X=XX*C:Y=YY*S
110   MOVE XX,0:MOVE X,Y:PLOT85,
      X,-Y
120   FOR I%=2 TO N-1
130     T=X*C-Y*S
140     Y=Y*C+X*SS:X=T
150     PLOT85,X,Y:PLOT85,X,-Y
160     NEXT I%
170   PLOT85,-XX,0
180   PRINT"TIME TAKEN = ";TIME
190   A=GET:CLS
200   UNTIL FALSE
210 END
```

PROGRAM 4

```
 10 REM Random Ellipses
 20 REM (C)Michael Batty,1983
 30 MODE1
 40 VDU19,0,4;0;19,1,5;0;
 50 VDU19,2,6;0;19,3,7;0;
 60 VDU5
 70 DT=PI/30:C=COS(DT):S=SIN(DT)
 80 REPEAT
 90   VDU29,RND(1279);RND(1023);
100   GCOL0,RND(3)
110   XX=20+RND(150):YY=20+RND
      (150)
120   PROCSHAPE(XX,YY,C,S)
130   UNTIL FALSE
140 END
150 DEFPROCSHAPE(XX,YY,C,S)
160 A=XX/YY:SX=S/A:SY=S*A
170 X=XX*C:Y=YY*S
180 MOVE XX,0:MOVE X,Y:PLOT85,X,-Y
190 FOR I%=2 TO 29
200   T=X*C-Y*SY
210   Y=Y*C+X*SX:X=T
220   PLOT85,X,Y:PLOT85,X,-Y
230   NEXT I%
240 PLOT85,-XX,0
250 ENDPROC
```

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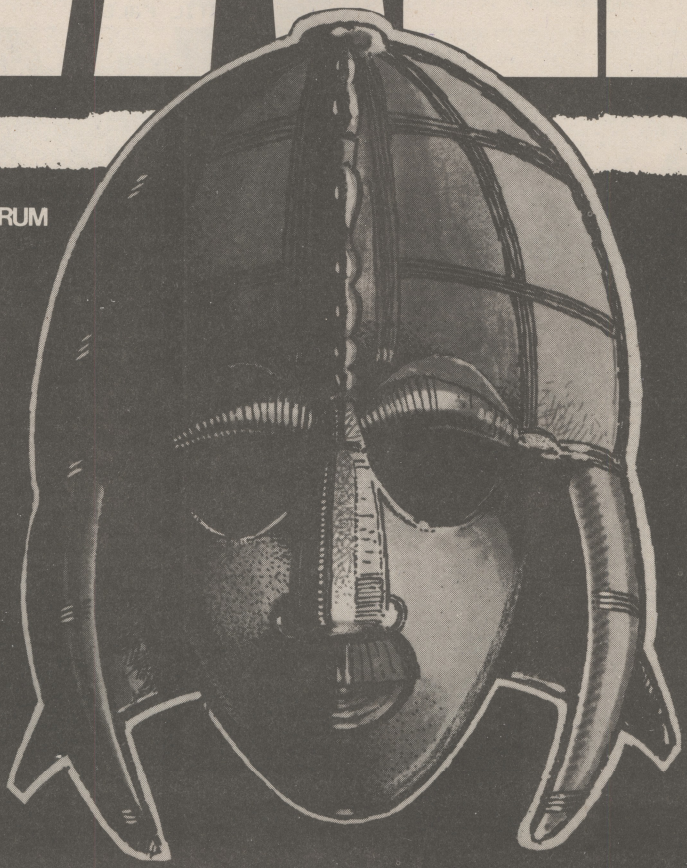

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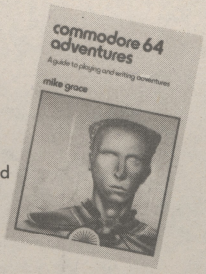

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A bit-mapped screen

The first in a two-part series on hi-res graphics

Though the possibilities provided by user-defined characters and sprites are almost limitless, the 64 does provide yet another major graphics mode, bit-mapped graphics. What this means is that rather than being able to address a minimum of one of the 1,000 character squares on the normal screen, the user is able to set any individual pixel (short for picture element) or dot on the screen. In this mode line drawings and curves can be drawn on the screen, though to make the fullest use of it you will need to get hold of the graphics extension cartridge for the 64, which will provide you with a variety of flexible graphics commands.

To understand the program given here it is necessary to know a little about the way the bit-mapped screen is set up. The screen itself contains 320*200 separate positions, a total of 64,000. In order to store each of these separately, 8,000 bytes of memory are needed, providing 64,000 individual bits. Each of the standard character positions requires eight bytes (the 8*8 grid that we used for user-defined graphics). Starting from the top left-hand corner of the screen, the first 8 (0-7) bytes of the screen memory are used to create what would be on the normal screen the first character position. The second eight bytes form the second 8*8 grid and so on along the line. Since there are 40 character positions in a line, each line takes 320 bytes. In actual fact, because the bit-mapped mode enables individual pixels to be addressed, this line of 8*8 grids is capable of holding eight single pixel thickness lines (though if you drew them all it would look like a solid bar).

The 8K of memory necessary to hold the bit-mapped screen is obviously not storable in the normal 1K screen memory nor, in fact, can it even use that area as a part of its area, since 1024 to 2023 is used to store colour information for the bit-mapped screen. The solution adopted in the program that follows is to locate the screen beginning at 8192, leaving 6K of memory for the Basic program, with the option of relocating Basic if the program is developed and lengthened. Using the program given here you will be able to use the bit-mapped screen as a sketch-pad, using either the cursor move arrows or a simple line-drawing algorithm to create a design on the screen.

Hi-Res: Table of Variables

DX	Distance between ends of line along X axis.
DY	Distance between ends of line along Y axis.
FN PE	The value that must be POKEd into PP to erase pixel X,Y.
FN PP	The location of the byte in which pixel X,Y falls.
FN PV	The value that must be POKEd into PP to set pixel X,Y.
MO	The current mode of the program.
SC	Start of screen.
SL	The slope of the line to be drawn.
X1,X2	X co-ordinates of ends of line to be drawn.
Y1,Y2	Y co-ordinates of ends of line to be drawn.

Module 3.4.1

This module configures the screen memory for the bit-mapped mode, defines some useful functions and clears the high resolution screen.

Commentary

Line 10025: The POKEs in this REM statement are not necessary for the running of this program. They are included in order that if you wish to expand the program in such a way that it may overrun the screen at 8192 and onwards, you will have the necessary information to relocate Basic. As with the Sprites program, the POKEs should be included in a loader program which is run BEFORE the main program. The program as given here works happily within the 6K of memory up to 8192 — there is no necessity even to set a limit to the top of Basic.

Lines 10027-10029: The use of these functions is given in the table of variables.

Line 10030: 53272 is the register normally used to control where the VIC II looks for character data, in this case it will dictate the beginning of the bit-mapped screen. POKEing 8 in here sets the screen start to 8192. POKEing 53265 with 32 sets the bit-mapped mode.

Lines 10035-10040: In Line 10022, the user was given the option of clearing the screen. During the development of the program, when the program is stopped and RUN-RESTORE pressed, alterations can be made to the program without affecting the contents of the screen at all. On running the program again it saves time not to have to clear the 8000 bytes.

Line 10050: This line clears the normal screen memory area, which is now employed to hold the colour data for each of the 1000 normal character positions.

Testing Module 3.4.1

On first running the program, the screen should immediately fill with garbage. Gradually this will clear, leaving a screen which may still be covered with coloured squares corresponding to the position of characters on the normal mode screen. These too should then begin to clear and the screen be set to white. When the module is finished, press RUN and RESTORE to return to normal mode. ■

Continued next week

This is an extract from *The Working Commodore 64* by David Lawrence, published by Sunshine Books.

MODULE 3.4.1

```
10000 REM******************************
10010 REM INITIALISE HI-RES SCREEN
10020 REM******************************
10022 CL$="":INPUT "CLEAR SCREEN (Y/N)
:";CL$
10025 REM POKE 44,64:POKE 43,1:POKE 1638
4,0:CLR
10027 DEF FNPP(X)=SC+320*INT(Y/8)+8*INT(
X/8)+(Y AND 7)
10028 DEF FNPV(X)=PEEK(FNPP(X)) OR (2↑(7
-(X AND 7)))
10029 DEF FNPE(X)=PEEK(FNPP(X)) AND (255
-2↑(7-(X AND 7)))
10030 POKE 53272,(PEEK(53272))OR 8:POKE
53265,PEEK(53265) OR32:SC=8192
10035 IF CL$="N" THEN 10050
10040 FOR I=SC TO SC+7999:POKE I,0:NEXT
10050 FOR I=1024 TO 2023:POKE I,6*16+12:
NEXT
10060 MO%(0)=2:MO%(1)=5:MO%(2)=10
```

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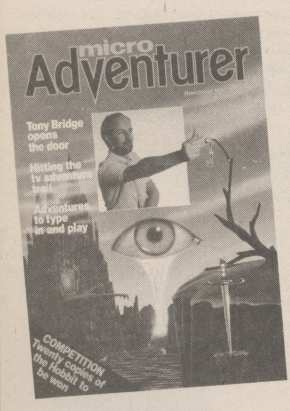

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Functioning well . . .

***David Prins** presents a numerical analysis technique for approximating functions*

This program uses a numerical analysis technique, known as the Newton polynomial interpolation method, in order to approximate a function by a polynomial.

In general, if data is known about a function at *N* different points, then a unique polynomial exists of degree ($N-1$), which models the function exactly at the *N* given points and approximately at other points. This approximation is very good for functions which are 'well behaved' (ie, continuous, polynomial-like) and works best in the neighbourhood of the given data. But, if data is only known at, for instance, $x = 1, 2, \ldots 10$, you should not rely too much on the polynomial approximation at say $x = 1000$, which is nowhere near the given points.

The data points you enter will probably have been obtained from a science experiment of simulation, but the program can also be used to answer school maths questions regarding straight lines and quadratic curves which pass through given points.

It is important to note that approximations given by the program are only useful for "well behaved" polynomial or polynomial-like functions and for approximations in the region where the original data was given. Also, you must not enter any point more than once in any one set of data.

Program notes

40-210	Set up required arrays and input the known data
220-340	Make any corrections required
500-610	Calculate the polynomial coefficients, checking that all points entered are different
620	Call the evaluation subroutine
630-650	See if another evaluation is required — if yes, then *Goto* 620, else *Stop*
700-790	The Evaluation subroutine — this asks for input of the evaluation point and prints the result
1000-1010	Simple subroutine to get "Y" or "N" from the keyboard

Variables

N	Number of data points given
X(N),F(N),C(N)	Arrays to hold data points, function values at data points and polynomial coefficients respectively
I,J	Used as loop counters and array subscripts
A$	Holds result of INKEY$
X,F	Hold correction data — *X* is later re-used as the value at which approximation occurs
L,D	Used in polynomial coefficient calculation
V	The value which is the result of the program ■

```
10 REM APPROXIMATION USING INTER
   POLATING POLYNOMIALS.
20 REM ALL POINTS ENTERED MUST BE
   DIFFERENT.
30 REM
40 CLS:PRINT"HOW MANY DATA POINTS"
50 PRINT"DO YOU WANT TO ENTER";
60 INPUT N
70 CLS:PRINT"WHEN PROMPTED, ENTER A
   POINT AND"
80 PRINT"THE VALUE OF THE FUNCTION AT"
90 PRINT"THE POINT, SEPARATED BY A
   COMMA.":PRINT
100 PRINT"FOR EXAMPLE, TO ENTER THAT
    THE"
110 PRINT"FUNCTION HAS THE VALUE
    4.2 AT"
120 PRINT"THE POINT 2.0"
130 PRINT"ENTER      2.0,4.2":PRINT
140 PRINT"IF YOU MAKE A MISTAKE YOU
    CAN"
150 PRINT"CORRECT IT AT THE END."
160 REM
170 DIM X(N),F(N),C(N)
180 FOR I=1 TO N
190 PRINT:PRINT"POINT NO.";I;
200 INPUT X(I),F(I)
210 NEXT I
220 PRINT:PRINT"DO YOU WANT TO MAKE"
230 PRINT"ANY CORRECTIONS? (Y/N)":
    GOSUB 1000
240 IF A$="N" THEN 500
250 PRINT"WHEN PROMPTED, ENTER
    CORRECTIONS"
260 PRINT"BY TYPING THE NO. OF THE
    POINT"
270 PRINT"YOU WANT TO CORRECT AND ITS"
280 PRINT"CORRECTED VALUE AND
    FUNCTION"
290 PRINT"VALUE, SEPARATED BY COMMAS.
    ":PRINT
300 PRINT"TO END CORRECTIONS,
    TYPE 999,0,0"
310 PRINT:PRINT"POINT NO.";
320 INPUT I,X,F
330 IF I=999 THEN 500
340 X(I)=X:F(I)=F:GOTO 310
500 FOR I=1 TO N:C(I)=F(I):NEXT I
510 IF N=1 THEN 620
520 FOR I=1 TO N-1
530 L=C(I)
540 FOR J=1 TO N-I
550 D=X(I+J)-X(J)
560 IF D=0 THEN PRINT"YOU ENTERED THE
    POINT",X(J);"MORE THAN ONCE.":STOP
570 C(J)=(C(J+1)-L)/D
580 L=C(J+1)
590 NEXT J
600 C(N-I+1)=L
610 NEXT I
620 GOSUB 700
630 PRINT:PRINT"DO YOU WANT ANOTHER
    EVALUATION"
640 PRINT"USING THE SAME DATA POINTS?
    (Y/N)":GOSUB 1000
650 IF A$="Y" THEN 620 ELSE STOP
700 CLS:PRINT"ENTER THE VALUE AT
    WHICH YOU"
710 PRINT"WANT TO APPROXIMATE THE
    FUNCTION";
720 INPUT X
730 V=C(1):IF N=1 THEN 770
740 FOR I=2 TO N
750 V=C(I)+(X-X(I))*V
760 NEXT I
770 PRINT"APPROXIMATE FUNCTION VALUE"
780 PRINT"AT";X;"IS";V
790 RETURN
1000 A$=INKEY$:IF A$="" THEN 1000
1010 IF A$="Y" OR A$="N" THEN RETURN
     ELSE 1000
```

***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.**

Target Practise

on Dragon

This is a simple target shooting game in which a cowboy has to fire at a moving target. The target randomly moves from top to bottom and vice-versa. Both the cowboy and the target are stored in arrays 'A' and 'B' respectively, since using the command *'Poke* 65495,0' to speed up the game disables the cassette interface. Unless you escape from the program in the method allowed within the program itself you will have to press the reset button before using the interface to either save or load programs directly after playing.

There are 20 targets to hit and you are marked according to how many you manage to hit. The up/down arrows move the cowboy up and down. The 'shift' keys are used to fire. It does not matter if you let the target pass, as it will reappear again with no penalty. If your Dragon will not accept the *Poke* leave it out.

Variables

S	Speed of the target
F	Determines direction of target travel
H	Number of target
K	Score out of 20
X,Y	Co-ordinates of cowboy
o,G	Co-ordinates of Bullet
P,T	Co-ordinates of target
ARRAY A	Cowboy
ARRAY B	Target

```
10 REM
20 REM
30 REM
40 REM
50 REM
60 REM
70 REM
77 CLS
80 PRINT @ 64,“ SHOOTING PRACTICE”:PRINT
   @ 128,“ BY D. HASWELL”
90 SCREEN0,1
100 FOR T = 1 TO 2000:NEXT
110 CLS8:PRINT @ 64,“THE UP AND DOWN
   ARROWS MOVE THE
   COWBOY”:PRINT:PRINT“TRY TO HIT THE
   MOVING TARGET”:PRINT:PRINT“YOU ONLY
   HAVE 1 SHOT PER TARGET”:PRINT:PRINT
   “THERE ARE 20 TARGETS TO HIT”
   :PRINT:PRINT“YOU NEED NOT HIT THE
   TARGET FIRST TIME!”, “THERE IS NO
   PENALTY FOR LETTING IT
   PASS.”:PRINT“USE
   ‘SHIFT’ TO FIRE.”
130 SCREEN 0,1
140 FOR T = 1 TO 8000:NEXT
150 POKE 65495,0
160 K = 0
170 DIMA(20,38)
180 DIMB(30,30)
190 PMODE,1:PCLS
200 DRAW“BM3,5;R5D2L7R9L2D6L5NU6L2D10
   R7U10D3L4R10L2U2R4BM2,24;
   R3D12R3L6U12”
210 GET(0,0) – (17,40),A,G
220 PCLS
230 CIRCLE(10,10),3
240 GET(0,0) – (30,30),B,G
244 REM BOTH COWBOY AND TARGET NOW
   STORED
250 PCLS
260 SCREEN1,1
270 FOR H = 1 TO 21
280 PCLS
290 LINE(4,4) – (250,186),PSET,B
295 REM BORDER
300 X = 8:Y = RND(50) + 50:P = RND(100) + 50
310 O = 17
320 L = 0:F = RND(10000) – 5000
330 F = F/1000
340 REM DETERMINE DIRECTIONS OF TARGET
350 IF F < 0 THEL = 190 ELSEL = 0
370 S = RND(3) + 3
380 S = (SGN(F) * S)
390 FOR T = L TOABS(L + ( – 190))
400 PUT(X,Y) – (X + 17,Y + 40),A,PSET
410 IF PEEK(135) = 10 THEN Y = Y +3:PLAY
   “T155O3C”
420 IF PEEK(135) = 94 THEN Y = Y – 3:PLAY
   “T155O3C”
430 IF PEEK(65280) = 191 THEN L = 1:G = Y +
   14:PLAY“O5T155V30GV25FV20EV15DV10
   CV5C”
440 IF PEEK(65280) = 255 THEN POKE135,0
450 IF L = 1 THEN PSET(O,G)
460 IF Y > 144 THEN Y = 144
470 IF O > P – 2 AND O < P + 25 AND G > T AND
   G < T + 18 THEN K = K + 1:CIRCLE(P,T),10:
   CIRCLE(P,T),15:PLAY
   “T20O1V30GV25FV20EV15DV10
   CV5C”:PCLS:NEXTH:GOTO560
480 IF Y < 6 THEN Y = 6
490 IF O > 250 THEN O = 17:L =
   0:PLAY“O1T155CCCC”:NEXTH
500 PRESET (O,G)
510 IF L = 1 THEN O = O + 15
520 PUT (P,T) – (P + 30,T + 30),B,PSET
530 IF H = 21 THEN 560
540 NEXTT
550 GOTO320
560 CLS
570 PRINT @ 64,“YOU SHOT”K“TARGETS OUT
   OF 20!”
577 PLAY“T30V20CDEFGAB”
580 IF K < 10 THEN PRINT“YOU WOULD NEVER
   LIVE IF YOU HAD”,“TO DRAW FOR YOUR
   LIFE!”
588 IF K > 16 THEN PRINT“YOU DRAW ‘EM GOOD
   COWBOY!”
590 FOR J =1 TO 2000:NEXT
600 PRINT @ 480, “HIT ANY FOR ANOTHER
   GAME.”, “OR HIT ‘E’ TO END.”
610 POKE 135,0
620 A$ = INKEY$:IF A$ = “” THEN 620
640 IF A$ = “E” THEN POKE 65494,0:END
650 RUN
```

Target Practise
by D Haswell

Maze

on Vic20

The program prints a random maze and the player takes the form of a diamond at the top of the screen. The object is to reach the ball at the bottom of the screen without colliding with a wall in the least number of moves.

On most mazes that the computer forms it is impossible to reach the ball without pressing the 8 key; when this is pressed the maze immediately surrounding the diamond is demolished. However, using this feature increases your number of moves by four.

This function can only be used three times so that a level of skill is required from the player. When you reach the ball you are informed of your score and the lowest number of moves it has been completed in so far.

The program incorporates good colour and sound.

Program notes

10-160	Set screen, draw maze
176-300	Move player, play note
551-570	Plays musical notes if you hit a wall
600-640	Congratulates you when you have traversed the maze
1000-1046	Destroys maze
1049-2000	Plays music

All cursor controls are in lower case.

```
 1 rem*********maze*****
 2 rem written by a.morris
 3 rem  date:28/2/83
 5 rem
 6 rem
 7 rem
 8 rem   set variables
 9 rem*****************
10 print"■":s=100000
20 v=0:m=0
30 e=int(22*rnd(1)+7702)
40 h=int(22*rnd(1)+8164)
49 rem print heading
50 print"*********■maze■*********"
60 print"   n:-down    u:-up"
70 print"   h:-left    j:-right"
75 print"       8:-demolish"
80 print"**********************"
90 fort=0to5000:nextt:print"■"
99 rem   draw maze
100 poke36879,0
110 fora=1to250
120 b=int(462*rnd(1)+7724)
130 pokeb,91
140 nexta
150 pokeh,81:gosub1100:geta$
151 pokeh,81:geta$
160 pokee,90
170 ifa$="n"theng=22:goto250
180 ifa$="u"theng=-22:goto250
190 ifa$="h"theng=-1:goto250
200 ifa$="j"theng=1:goto250
210 ifa$="8"thengosub1000
220 goto151
250 m=m+1
251 poke36878,15:poke36875,215
252 fort=1to200:next:poke36878,0
260 pokee,32:e=e+g
270 ifpeek(e)=91then551
280 pokee,90
290 ife=hthen600
300 goto151
551 poke36878,15:forw=1to6
552 readn:poke36875,n:forr=1to200:
    next
553 data135,143,147,151,159,163
556 nextw
557 poke36878,0:restore
558 poke36879,27
559 print"■you hit a wall!"
560 input"another game(y/n)";g$
570 ifg$<>"y"thenprint"■thanks for
    the game":end
580 print"■"
590 goto20
600 poke36879,27:print"■■■■■■■■■■■■
    well done!you made it!"
601 poke36878,0:poke36878,15
602 ford=1to20
603 hj=int(rnd(1)*50)+175
604 poke36875,hj:poke36879,hj
605 fort=1to100:nextt
607 nextd
608 poke36878,0
609 poke36879,27:print"■■well done!
    you made it!"
610 print"in "m" moves."
620 ifm<sthens=m
630 print"least moves= "s
640 fort=1to1000:next:goto560
1000 ifv<3thengoto1020
1010 goto151
1020 pokee+1,32:pokee-1,32
1021 pokee+22,32:pokee-22,32:v=v+1:
     m=m+4
1022 poke36878,15:poke36875,255
1023 fort=1to400:nextt
1024 poke36878,0
1040 return
1049 rem***************
1050 rem*play tune****
1051 rem***************
1100 forty=1to27
1110 poke36878,15
1120 readc,z
1130 poke36875,c
1140 fort=1toz:nextt
1150 poke36878,0
1160 nextty
1170 restore:return
1180 data217,400,213,400,223,400
1190 data227,200,234,200,230,400
1200 data227,200,234,200,230,400
1210 data223,400,227,400,217,400
1220 data213,600
1230 data223,400
1240 data227,200,234,200,230,400
1250 data227,200,234,200,230,400
1260 data223,400,227,400,217,400
1270 data213,600,227,400,217,400,
     213,600
2000 end
3000 rem***************
```

Maze
by A Morris

Harrier Pilot

on Spectrum

The cockpit of the aircraft is filled with rows of flashing lights, silently signalling their vital messages to you, but your steel blue eyes are darting from your Artificial Horizon/Altimeter to your Radarscope as you fight for control of your £7m craft. Your fuel gauge indicates that you have only 60 seconds fuel remaining and the cross that indicates the ship's position, only 85ft below you, won't keep steady.

Only 20ft altitude now, and your breath quickens as your Artificial Horizon/Altimeter shows you to be steady, level and slowly dropping. Suddenly your eyes widen in disbelief; your Radarscope shows that a gust of wind has blown you to one side, can you bring your Harrier back above the small ship before you crash into the sea . . .?

Program notes

40	Zero best score
50-100	Draw screen display
110	Set variables
120-170	Read keyboard
180	Erase previous screen image
190-200	Wind random factor
210-250	Set new values for new screen display
260	Fuel gauge
270-320	Check for end game
330	Print new screen image
340-370	Set new incr/decr factors
380-410	Screen image subroutine
420-510	Different endings to game.

Variables

fu — fuel
rd — rate of side drift
m — x (Radarscope)
n — y (Radarscope)
ra — rate of ascent
p — degree of tilt (0-level)

```
  5 REM **********************
 10 REM *** HARRIER PILOT ***
 20 REM ***  BY C5 JONES   ***
 30 REM **********************
 40 LET bs=0
 50 BORDER 0: PAPER 0: INK 7: C
LS
 60 RESTORE 70: FOR c=21 TO 0 S
TEP -2: READ a$: PRINT AT c,6;a$
: NEXT c
 70 DATA "=000=","-010-","-020-
","-030-","-040-","-050-","-060-
","-070-","-080-","-090-","-100-
"
 80 PLOT 135,0: DRAW 0,175: DRA
W 120,0: DRAW 0,-175: DRAW -120,
0
 90 PLOT 136,83: DRAW 118,0: PL
OT 195,0: DRAW 0,174
 100 FOR a=10 TO 12: PRINT AT a,
23;"    ": NEXT a
 110 LET fu=21: LET rd=0: LET m=
190: LET n=83: LET ra=0: LET cy=
140: LET p=0: GO TO 230
 120 LET a$=INKEY$
 130 IF a$="" THEN GO TO 180
 140 IF a$="5" THEN GO TO 350
 150 IF a$="6" THEN GO TO 340
 160 IF a$="7" THEN GO TO 370
 180 GO SUB 380
 190 LET z=INT (RND*100): IF z<3
0 THEN LET p=p-.05: LET rd=rd-1
 200 IF z>60 THEN LET p=p+.05: L
ET rd=rd+1
 210 LET m=m-rd
 220 LET cy=cy+ra
 230 LET x=103+15*(COS (p+2*PI))
 240 LET y=cy+15*(SIN (p+2*PI))
 250 LET a=103-x: LET b=cy-y
 260 LET fu=fu-.17: INK 2: PRINT
 AT 21-fu,15; INVERSE 1;"▮": INV
ERSE 0: INK 7
 270 IF y+2*b<0 THEN LET y=0
 280 IF y<=1 AND m<185 OR y<=1 A
ND m>195 THEN GO TO 490
 290 IF y<=1 AND ra<-2 THEN GO T
O 420
 300 IF y<=1 THEN GO TO 430
 310 IF m<135 OR m>245 OR n<10 O
R n>155 THEN GO TO 480
 320 IF fu<=0 THEN GO TO 500
 330 GO SUB 380: GO TO 120
 340 LET p=p+.05: LET rd=rd+1: G
O TO 160
 350 LET p=p-.05: LET rd=rd-1: G
O TO 160
 360 LET ra=ra-1: GO TO 180
 370 LET ra=ra+1: GO TO 180
 380 PLOT OVER 1;x,y: DRAW OVER
1;2*a,2*b: DRAW OVER 1;b,-a
 390 PLOT OVER 1;x-72,y: DRAW OV
ER 1;2*a,2*b: PLOT OVER 1;x-72,y
: DRAW OVER 1;b,-a
 400 PLOT OVER 1;m,n: DRAW OVER
1;10,0: PLOT OVER 1;m+5,n+5: DRA
W OVER 1;0,-10
 410 RETURN
 420 INVERSE 1: CLS : PRINT " YO
U CRASHED INTO THE SHIP ": BEEP
2,5: GO TO 510
 430 LET fu= INT fu: PAPER 2: IN
K 6: FLASH 1: CLS
 440 PLOT 0,0: DRAW 255,175: PLO
T 255,0: DRAW -255,175: FOR a=20
 TO 80 STEP 10: BEEP .1,20: CIRC
LE 127,87,a: NEXT a: PRINT AT 10
,13;"LANDED";AT 11,13;"SAFELY":
FLASH 0
 450 FOR a=1 TO 20: BEEP .1,20:
BEEP .1,30: NEXT a
 460 PAPER 0: INK 7: INVERSE 1:
CLS : PRINT " YOU LANDED SAFELY
": PRINT : PRINT " SALVAGE COSTS
 AGREED AT £7m. ": IF fu>bs THEN
 LET bs=fu
 470 GO TO 510
 480 INVERSE 1: CLS : PRINT " YO
U HAVE MOVED OUT OF RANGE ": BEE
P 2,5: GO TO 510
 490 INVERSE 1: CLS : PRINT " YO
U HAVE CRASHED INTO THE SEA ": B
EEP 2,5: GO TO 510
 500 INVERSE 1: CLS : PRINT " YO
U HAVE RUN OUT OF FUEL ": BEEP 2
,5
 510 PRINT : PRINT " YOUR BEST S
CORE IS NOW ";bs;" ": PRINT : PR
INT " ANOTHER TRY ? ": INVERSE 0
: INPUT b$: IF b$="y" THEN GO TO
 50
```

Harrier Pilot
by Colin Jones

Colour Sin

on Oric

This program illustrates how impressive graphic effects can be achieved with only a few lines of program.

```
10 HIRES
20 FOR I=1 TO 199:CURSET0,I,0
25 IF I<100 THEN FILL 1,1,18
30 FILL 1,1,17
35 NEXT
40 FOR A=-PI TO PI STEP.01
50 CURSET A*38+120,SIN(A)*99+99,1
53 IF A>.5*PI AND A<0 THEN FILL 1,1,18:
   GOTO60
54 IF A<PI AND A>.5*PI THEN FILL1,1,17:
   GOTO60
55 FILL 1,1,RND(1)*5+19
60 NEXT
```

Colour Sin
by Allison Dowey

Space Eggs

on BBC Micro

This type of program has been around for quite a long time. The idea is to destroy the eggs before they land. If they land many aliens come out of the eggs and destroy you. The eggs fall from the sky, first one at a time, and then several at a time. You control a fast-moving gun base, but you will still only get one shot at each alien.

In entering the program the main problem will be getting the character definitions exactly right. To make it easier to type in, the program has been renumbered, so that the *Auto* command may be used.

PROGRAM OF THE WEEK

```
 10 REM ****************************
 20 REM ***                      ***
 30 REM ***       SPACE EGGS     ***
 40 REM ***        32k BBC       ***
 50 REM ***     BY Eddie Hold    ***
 60 REM ***                      ***
 70 REM ****************************
 80MODE4
 90NUM=0
100 QW=0
110ON ERROR RUN
120DIMAX%(10),AY%(10)
130PROCINIT
140CLS:MODE 7:PROCINSTRUCT
150 MODE4
160PROCTUNE
170PRINTTAB(12,0)"0000"
180PRINTTAB(5,0)"SCORE"
190VDU 23;8202;0;0;0;
200PROCBASE
210PROCWAIT(100-SC%*2)
220PROCALIEN
230PROCBULLET
240PROCBASE
250ON ERROR  GOTO 10
260PROCBULLET
270PROCBASE
280GOTO200
290DEFPROCINIT
300BX%=19:SC%=0:YB%=0:XB%=-1
310FORCO%=1 TO 10
320AX%(CO%)=1+RND(36):AY%(CO%)=3
330NEXT
340AY%(1)=-20
350VDU23,224,0,0,0,0,127,127,127,127
360VDU23,225,16,56,124,254,255,255,255,255
370VDU23,226,0,0,0,0,252,252,252,252
380VDU23,250,15,31,63,255,255,63,31,15
390VDU23,251,240,248,252,255,255,252,
    248,240
400VDU23,227,16,16,16,16,16,56,16,56
410VDU23,228,1,3,7,15,255,255,255,240
420VDU23,229,255,255,255,255,255,255,
    255,255
430VDU23,230,128,192,224,240,255,255,
    255,15
440VDU23,231,240,255,255,255,157,3,1
450VDU 23,232,255,255,255,255,195,255,
    255,255
460VDU23,233,15,255,255,255,240,224,192,
    128
470ENVELOPE2,1,-2,0,0,100,0,0,0,0,0,0,0,0
480ENVELOPE1,2,0,0,0,0,0,0,9,0,-2,-2,
    120,80
490ENVELOPE3,129,2,4,6,28,14,7,0,0,0,-80,
    80,80
500ENDPROC
510DEFPROCBASE
520B1%=BX%
530IF A$<>"K" THEN IF ADVAL1>44000 AND
   BX%>1 BX%=BX%-1
540IF A$="K" THEN IF INKEY(-26)AND BX%>1
   BX%=BX%-1
550IF A$<>"K" THEN IF ADVAL1<2200 AND
   BX%<37 BX%=BX%+1
560IF A$="K" THEN IF INKEY
   (-122)AND BX%<37 BX%=BX%+1
570PRINTTAB(B1%-1,31);SPC(3);
580PRINTTAB(BX%-1,31);:VDU224,225,226
590ENDPROC
600DEFPROCBULLET
610 IF A$<>"K" THEN GOTO650
620IF YB%=0 AND NOTINKEY(-1) ENDPROC
630IF YB%=0 XB%=BX%:SOUND0,1,7,5:SOUND1,
   2,20,9
640 GOTO670
650IF YB%=0 AND  NOT ADVAL0 AND 1 ENDPROC
660IF YB%=0 XB%=BX%:SOUND0,1,7,5:SOUND1,
   2,20,9
670PRINTTAB(XB%+1,30-YB%);:VDU127,11,227
680IF YB%=28  THEN YB%=0:VDU127,11:ENDPROC
690YB%=YB%+1
700ENDPROC
710DEFPROCALIEN
720SOUND2,-8,((SC%+1)DIV4)MOD255,1
730FOR N1%=1 TO SC%/10+1
740IF ABS(XB%-AX%(N1%)) <2 AND ABS(30-YB%
   -AY%(N1%)) <2 PROCSHOT
750IF AY%(N1%)<3 THEN 780
760PRINTTAB(AX%(N1%)-1,AY%(N1%));CHR$250;
   CHR$251:PRINTTAB(AX%(N1%)-1,AY%(N1%)-
770IF AY%(N1%)>30 THEN PROCALMOVE:
   PROCDEAD
780AY%(N1%)=AY%(N1%)+1
790NEXT
800ENDPROC
810DEFPROCSHOT
820PRINTTAB(AX%(N1%)+2,AY%(N1%)-1);:VDU
   127,127,127,11,9,9,9,127,127,127
830SC%=SC%+1
840AY%(N1%)=-RND(50):AX%(N1%)=RND(36)+1
850PRINTTAB(XB%,30-YB%);SPC(1):YB%=0:
   XB%=-1
860SOUND3,3,50,10
870PRINTTAB(14,0);SC%;"0"
880ENDPROC
890DEFPROCWAIT(WT%)
900FOR WA%=1 TO WT%:NEXT
910ENDPROC
920DEFPROCDEAD
930SOUND0,-10,7,25
940FOR C1%=150 TO 1 STEP -5:SOUND1,-
   7,C1%,1:NEXT
950 PROCTUNEA
960PRINTTAB(9,15)"Another game?"
970*FX 15,1
980A1$=GET$
990IF A1$="N" CLS:END
1000CLS
1010GOTO 140
1020PROCTUNE
1030PRINTTAB(12,0);"0000"
1040BX%=19:YB%=0:XB%=-1:SC%=0:N1%=10
1050FOR CO%=1 TO 10
1060AX%(CO%)=1+RND(36):AY%(CO%)=3
1070NEXT
1080AY%(1)=-20
1090ENDPROC
1100DEFPROCINSTRUCT
1110PRINT TAB(14,3)CHR$141;"SPACE EGGS"
1120PRINTTAB(14,4)CHR$141;"SPACE EGGS"
```

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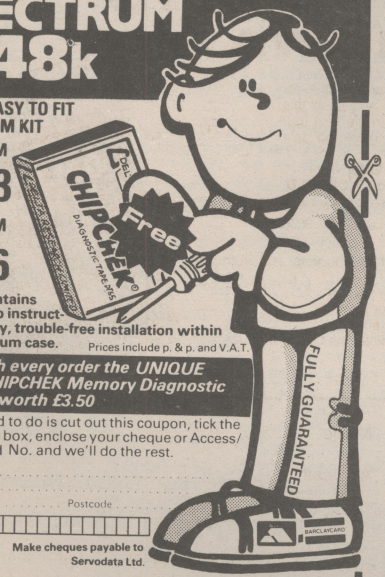

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```
1130PRINTTAB(14,5)CHR$141;"----------"
1140PRINTTAB(14,6)CHR$141;"----------"
1150PRINTTAB(1,8)"The Earth is";
1160PRINT" being invaded by eggs "
1170PRINT" that are being dropped from an
          alien"
1180PRINT" spacecraft that is out of
          sight."
1190PRINT" Only you can save the ";
1200PRINT" Earth by using "
1210PRINT" the following"
1220PRINT'" A laser gun - press 'SHIFT'
          to use"
1230PRINT'" Use the cursor keys ";
1240PRINT" to move left/right"
1250PRINTCHR$136;CHR$146" WARNING";CHR$
         135;CHR$137" - If the eggs land";
1260PRINT" aliens "
1270PRINT" run out of them and kill you
          instantly."
1280PRINT" So be warned!"
1290PRINT'"Press"CHR$133;CHR$136;" 'K'";
1300PRINTCHR$135;CHR$137" for keyboard or
    ";CHR$133;CHR$136;"'J'";CHR$135;CHR$1
    37;"forjoystick to start"
1310*FX15,1
1320A$=GET$:IF A$="K" THEN CLS:ENDPROC
1330IF A$="J" THEN CLS:ENDPROC
1340 GOTO 1320
1350ENDPROC
1360DEFPROCTUNE
1370RESTORE 1460
1380FOR O=1 TO 6
1390READA,B
1400READC,D
1410SOUND1,-15,A,B
1420SOUND2,-15,C,D
1430NEXT
1440FOR C=1 TO 3700:NEXT
1450ENDPROC
1460DATA129,10,33,10,149,5,53,5,145,5,49,
     5,129,10,33,10,149,10,53,10,129,20,33,
     20
1470DEFPROCTUNEA
1480FORW=1 TO 4000:NEXT
1490RESTORE 1570
1500FOR O=1 TO 7
1510READE,F
1520READG,H
1530SOUND1,-15,E,F
1540SOUND2,-15,G,H
1550NEXT
1560ENDPROC
1570DATA149,5,53,5,129,5,33,5,137,5,41,5,
     145,5,49,5,149,5,53,5,157,5,61,5,149,2
     0,53,20
1580DEFPROCALMOVE
1590VDU23,254,60,126,219,255,126,60,36,66
1600FF=1
1610FOR CF=1 TO 30
1620PRINTTAB(AX%(N1%)-CF,29)CHR$254;
1630 NEXT
1640LET FF=FF+1
1650PRINTTAB(AX%(N1%)+FF,29)CHR$254;
1660IF (AX%(N1%)+FF)>38 THEN ENDPROC
1670GOTO 1640
1680ENDPROC
```

Space Eggs
by Eddie Hold

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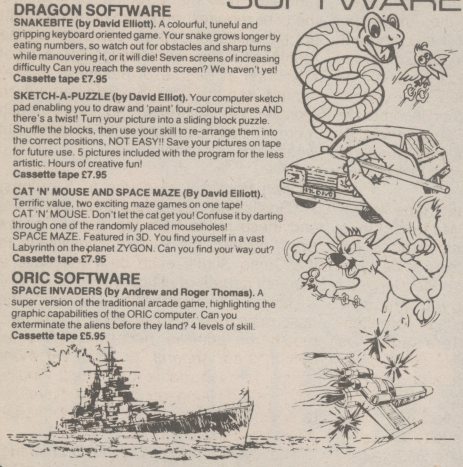

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Dungeon Master

This week, a Spectrum review (yes, another, I'm afraid, but I have to reflect in this column the popular feeling, which at the moment is toward Adventure programs for the good old Sinclair machine — outselling others by a factor of, I'd guess, 10!)

Many of the letters we receive are from D & Ders. This section of the Adventuring community are those souls who once used to sit around a large piece of graph paper, with other like-minded people, indulging in Role-Playing Games (RPGs for short). The best-known of these was, and is, Dungeons and Dragons, hence D & D.

Created by the venerable Gary Gygax and Dave Arneson in the 1970s, this game is played, typically, by several people, who attempt to solve the mysteries of a complex of Dungeons (originally, but as often as not, nowadays, a network of streets in post-nuclear New York, or a spaceship in the staggeringly distant future, or . . .). This complex is the brainchild of the Dungeon Master, who maps out the playing-area before the players arrive, and populates the complex with Monsters, Treasures, Traps, and so on. He takes no part in the exploring of the caves, except as a divine presence, giving the players guarded information as to what they can currently see, or how they are faring in battle. A large amount of information, rules, and scenarios has been built up over the years, until now a whole world of details may be experienced when playing RPGs.

It seems a fairly obvious area of exploration, as far as computer games are concerned — the computer, after all, would be the most unbiased referee, and the least likely to forget anything in the heat of the battle. Merely program all the details of your latest creation into the computer, and then lean back and let it take over as mediator.

Software companies seem to have been very slow in taking up the challenge, however, and the only real D & D program that I have seen is *Dungeon Master*, from Crystal Computing. Several other programs, from other companies, take certain aspects of the D & D rules, and incorporate them into programs, but *Dungeon Master* is a system which the budding Dungeon Master can use to create his or her own Dungeon.

The first program on the tape is the eponymous *Dungeon Master*. Once *Loaded*, the program will ask the player if a previously created character is to be introduced to the system. If not, the *Dungeon Master* will create one for you. The attributes, in true D & D fashion, are constructed from parameters such as Strength, Intelligence, Agility and Charisma (there are a couple of others). Then the player ventures into the Dungeon set up by the program. In the Dungeon, the usual Adventure commands, such as *Look*, *Keep*, *Drop*, and so on are recognised, and the Adventure continues as usual.

The Dungeon on this side of the tape is merely an example, however. The second side of Crystal's tape contains a program called *Dungeon Creator*, which is as good as its word, in allowing the user to create a Dungeon of their own.

This program is really powerful, and a great boon to anyone vaguely interested in D & D. *Dungeon Creator* provides all the facilities you need to enter and modify, or edit, your customised Dungeon for use with *Dungeon Master*. The menu contains: *Create*, *Inspect*, *Extend*, *Modify*, *Append*, *Load*, *Save* and *Quit*.

These are all fairly obvious — *Create* assumes that the user has, first of all, planned the Dungeon on paper. The program asks how many rooms, or locations the user requires, and then goes on to set up the exits and then contents of the rooms, all at the user's instigation. A list of Monsters, in degree of nastiness is presented, and the user may stipulate which Monster he wishes to appear in each room. The same procedure is adopted with weapons and potions.

Apart from the Monsters and Potions, Spells may also be put into each room, and these range from the Astral Escape Spell, through the Rod of Annihilation to the Curse Scroll, each of which have a different degree of difficulty.

Having thus created the Dungeon, the user may then *Inspect* each room, and modify or edit as necessary. Another option is to *Append*, or add, yet more rooms, in a 3D matrix if required. Finally, the created Dungeon may be *Saved* to tape, and then *Loaded* into the *Dungeon Master* and explored.

The system, from Crystal Computing, will prove to be a welcome friend to the D & D enthusiast who may well be making his first foray into the world of micros. *Dungeon Master*/*Creator* is from the same stable as *The Halls of the Things*, which I enthused about a few weeks ago, and although the people behind Crystal Computing are rather deprecatory of *Dungeon Master*, I very much enjoyed using the system. It's probably a bit too complex to be anything other than an amusing way of filling a few spare moments, but the characters that can be created woudl be easily transportable to your own Dungeon.

Next week, I shall be looking at more of your problems. ■

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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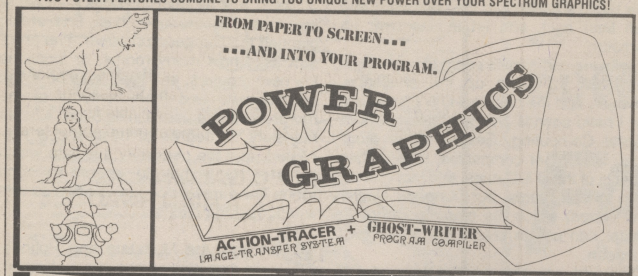

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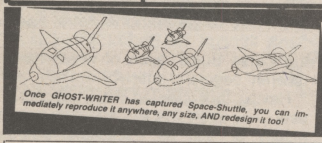

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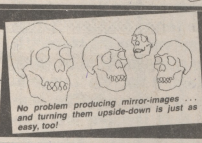

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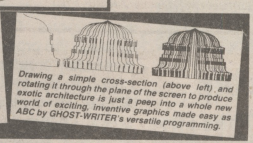

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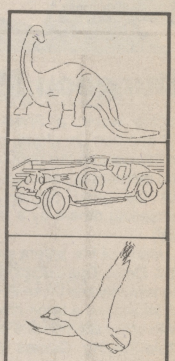

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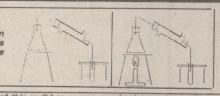

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PROGRAMMERS WANTED (Basic/Machine) for most home micros to develop own and house progs. Write Computer Shop Software, PO Box 29, London, SE3 7AU.

WANTED Vic20 cartridges, Submarine Commander and Outworld, also software to swap. Tel: (0706) 44003 or 353719.

PROGRAMS WANTED urgently for Spectrum, must have interesting graphics, excellent prices, royalty paid on acceptance. M. Ram, 10 Boscombe Road, SW17. 01-672 1094.

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Sunshine: Publishers of Popular Computing and Dragon User.

Computer Swap 01-734 3454

Free readers entries to buy or sell a computer. Ring 01-734 3454 and give us the details.

ZX81s for sale

ZX81 + 16K + over £40 of software + manual, leads, etc, excellent condition, £50. Tel: Paul on 01-394 0083 (evenings).

ZX81 16K, leads and manuals, magazines, complete with console and keyboard, £80 ono. Tel: 01-505 1720.

FULLER ZX81 KEYBOARD, few months old, hardly used, offers; £26 of magazines, for £12. Tel: 041-632 9325 (5 pm).

ZX81 GAMES, £2 each, Sinclair Ram pack, boxed, £20. Tel: Boldon 372943 (after 5 pm).

ZX81 + 16K Ram, magazines, programs, pre-recorded games cassette, including Flight Simulator. All boxed and in very good condition. Reason for sale — upgrading to bigger system — £45. Tel: Southampton 454979.

ZX81 16K + £10 worth magazines + Scramble software, £45 ono. Tel: 0332 670468.

ZX81 1K, tape recorder, magazines, still boxed, £30. Tel: Cockermouth 824202.

ZX81, 16K, leads and manual, £30 software, recorder, magazines, £70 ono. Tel: Newton Abbot 60077 (6 pm).

ZX81 16K, sound pack, £50 software, plenty of mags, sell for £75. Tel: Rochdale 352966.

COMPUTER SWAP COMPUTER SWAP

Computer Swap entries are limited to 30 words. Either fill in the accompanying form and send it to Computer Swap, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD or telephone 01-734 3454.

All software offered through computer swap must be in original condition and for private sale only.

Warning: It is illegal to advertise pirated software.

Please write your copy in capital letters on the lines below.

Name.....

Address.....

.....

Telephone.....

ZX81, Memotech 64K memory, DK'Tronics keyboard, Q Save, Battpack, machine code manual, sell for £60. Tel: 01-801 3019.

ZX81 16K, with soldered Ram pack, hence no program crushers. Complete with leads, manual, etc, + graphics manual and film, + games books, + six cassettes, including Flight Simulation, 3D Monster Maize, 3D Defender, £65. Tel: 968 7556.

ZX81, 16K Ram pack, sound bi-pak, two books, £15 worth of magazines, £80 software (15 tapes), leads, manual, etc, very good condition, worth £250 will sell for £105 ono. Tel: Basingstoke 58522.

ZX81, 16K Ram, two manuals, offers over £30, also games cassettes. Tel: 0725 20289 after 5 pm.

ZX81, 16K Memotech keyboard, AGF joystick, 18 pre-recorded cassettes, two books, graphics jotter, £95 ono. Tel: 01-301 0422.

ZX81 16K, computer, PSU, Ram and motherboard, fully cased in DK'Tronics keyboard, includes over £60 software, book, manual, and leads. Altogether cost over £200. Reasonable offers. Tel: Chesterfield (0246) 863035.

Commodores for sale

VIC20 + two slot mother boards (8K) + joystick + £1,500-worth of software and cassette deck, £350 ono. Tel: 01-840 63610.

VIC20 + cassette + joystick, £95; 16K switchable Ram pack, £25. All in good condition and boxed. Tel: Heathfield (East Sussex) 3857 (evenings and weekends).

VIC20 + C2N cassette deck + 16K Ram pack + super expander cartridge + two joysticks + three games cartridges (including Jelly Monsters) + £100-worth of other software + many books and magazines for Vic, only £225 ono. Tel: 01-551 2708.

Adventure competition

THE winner of our recent adventure competition is C Woodward with his program *The Falls of Shalor*. Although a text only adventure, it was sufficiently imaginative to just beat off the competition. C Woodward receives a Commodore 64.

A Vic20 was also awarded to Mrs K Hildick-Smith for her adventure scenario set on board a space ship orbiting an unknown planet.

VIC20 + cassette unit + 16K Ram pack + £200-worth software including Garf and Omega Race + two others + books, great condition, cost over £800, sell for £200 ono. Tel: Ashford (Middlesex) 55378.

VIC20 + C2N, joystick, 32K, £200 of software, both Ram and Rom + magazines, £180 ono. Tel: Cheltenham 45021.

VIC20, CZN, £90 of software, joystick, Introduction to Basic manual, boxed as new, £125 ono. Tel: Thetford 5665.

Acorns for sale

ACORN ATOM, fully expanded + games + books and magazines, £80 ono. Tel: Nottingham 224066.

BBC MODEL A + 32K. All offers considered for this excellent package, including monitor, cassette recorder, software, books etc, all as new, worth £550. Tel: Kidlington 6880 (phone John, evenings).

BBC MODEL B + twin floppy drives, word processing monitor + lots of software + Rom-based software, £1,000. Tel: Stevenage (0438) 68624.

Dragons for sale

DRAGON 32, two weeks old, hardly used, guarantee card, Pac-man, two cassette games, joystick, books, £140 ono. Tel: 01-776 1033 (6 pm).

DRAGON 32, boxed as new, still under manufacturers guarantee + joysticks + £60 worth of software, £135. Tel: 556-5482 (after 6 pm).

DRAGON 32, manuals, PSU, one month, joystick, £50 of software, books, £100+ magazines, including Dragon User 80 + listings, large b/w television, blank cassettes, proven cassette recorder, £225 ono. Tel: 0908 616840.

UNUSED DRAGON 32, tape recorder, joysticks, M/C book, 30 programs, book, cassettes, Donkey King, Shuttle, Planet Invasion, Black Sanctum, Defence + others, worth over £290, will accept £240. Tel: Little Wick Green 2518.

Ataris for sale

ATARI 800 48K BASIC, manuals, joystick, £285. Tel: 01-560 7749.

ATARI 400 computer for sale + basic, 3 months old, £110. Tel: 907 1582.

ATARI 400 48K BASIC cartridge, £200 ono. Tel: 267 8636.

ATARI 400 16K, in box with warranty, £105 ono. Tel: Whitney (0993) 75479.

ATARI 800 48K, six months, in box, £210 ono. Tel: Whitney (0993) 75479.

ATARI VCS with four cartridges plus paddles and joysticks, will sell for £50, less than third of cost price. Will delivery anywhere in London. Phone Vince on 01-886 2931.

ATARI VCS, nine cartridges, keyboard cont, hardly used, worth £300, sell for £90. Tel: 01-337 8080 (5 pm).

ATARI 800 48K BASIC CARTRIDGE + 810 disc drive, manuals + joystick + two disc software + recorder, six cartridges, brand new, one year guarantee, quick sale, £550. Tel: 864 5613.

Spectrums for sale

SPECTRUM 48K, still under guarantee + printer, £120 ono. Tel: Tonbridge (0732) 361920.

SPECTRUM 48K, mint condition, hardly used + software, only £100. Tel: 051 3365537.

SPECTRUM 48K, £80. Tel: John on 01-941 4761 (Hampton).

SPECTRUM 48K, manuals, ZX Printer, seven paper rolls, custom case, tv to Spectrum changer. Good software including Hobbit, Time Gate, Hungry Horace, good condition, £150. Tel: 0206 240426.

SPECTRUM 80K with boxes — Fuller keyboard + tape recorder + approx 50 games including Hobbit, Penetrator, Time Gate + amplifier + five books and magazines, £240. Tel: Uxbridge 53521.

Tandys for sale

TANDY TRS 80 16K extended basic colour computer + books, leads, cover etc, cost over £300, sell for £225. Tel: Sheffield 454739.

TANDY TRS 80 LEVEL I, 16K with software, light pen and manuals, any reasonable offer. Tel: 01-692 8095.

TRS 80 LEVEL 2, 16K green monitor + numerous tapes and books, £160 ono. Tel: Leamington Spa 26506.

TRS 80 MODEL 3, 48K, two drive model with internal monitor with 20 discs and much software and magazines, cost £1,700 in November 1982, sell for £975 ono. Tel: 01-572 2917. Ask for Bill (upgrading).

For sale

TO SELL OR SWAP. Planet of Death, Planetoids, Set Pac, Tranz Am, Cookie, Jumping Jack, Ah Diddums, Schizoids, Football Manager, Horace Goes Skiing, 3D Tunnel and loads of magazines. Write to: 13 Ward Avenue, Cleveleys, Lancs FY5 1BL (private sale).

SWAP YOUR USED SOFTWARE. Tel: Merstham (07374) 2824.

JUPITER ACE 3K, with all leads and manual, demonstration tape and software, £55. Tel: Watford 30218.

SPECTRUM GAMES, £3 EACH: Time Gate (48K), Meteorstorm (16K), Spectral Invaders (16K), Orbitor (16K), Arcadia (16K), Scramble (16K). Tel: 06076 60927 (after 4 pm) (private sale).

Wanted

WANTED. Hardback carrying case for the Vic20 where the computer can be worked without removing from case. Tel: 061-7738426.

SWAP five volumes of *Knack* magazine for Vic20 motherboard or any other add-on extra. Tel: 061-7738426.

WANTED. Single 100K disc drive for BBC, must be in good condition. Tel: Hull 849517.

WANTED. BBC compatible printer and disc drive, will pay £100 for each item. Tel: Harpenden 69152.

CB plus Ariel plus Microphone plus SWR metre plus power pack, swap for 16K Spectrum. Tel: Nottingham 875117.

WANTED. Zoom (cassette by Imagine Software), swap for KNOT in 30, Terrordaktil 40. Tel: Adam, Chesham 785285.

WANTED. BBC Model A, will pay £200. Tel: 0278 732355.

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MONSTER MINE by W. E. MacGowan. Escape from the mine with as much money as you can, but don't get closed in or caught by the prowling monsters. An addictive machine code game, with superb graphics and save facility. Price (LYNX & DRAGON) **£7.95.** Price (SPECTRUM & ZX81) **£4.95.**

GOLF by Pete Allen. An excellent Basic program, giving you an 18-hole course, with handicaps and choice of clubs. A golfing weakness must be specified. Amazing graphics and sound!! Price (LYNX & DRAGON) **£7.95.**

CHATEAU by Pete Allen. A new type adventure, in which you must wander the Count's old mansion in search of treasure! Of course, when the Count hid his treasure, then died, he left lots of unpleasant surprises for those brave enough to try and seek out his riches!! Come face to face with Ghouls and Ghosts, Vampires and Trolls; do you run or fight? Will the mysterious Travel Agent suddenly appear and whisk you away to far off places? Where can you find the key or the lamp? Is the clock booby-trapped? Will you die a cold and lonely death, or will you win through to claim the fantastic treasures of The Chateau? Price (DRAGON) **£7.95.**

GAMES PACK III by Christopher Hunt.

REVERSI. Pit your wits against the Lynx with this easy to learn, yet extremely demanding board game. Five skill levels, from novice to grand master.

SNAKE. Guide the snake to the food, but watch out, he will grow and must not eat the wall or himself.

PONTOON. An excellent implementation of a favourite card game in full colour with sound. Lynx is a mean Banker. Price (LYNX) **£7.95.**

GEMPACK IV by W. E. MacGowan. Two great machine code games, with full colour graphics. In **Sea Harrier** you must land your plane on the aircraft carrier, after dispersing the clouds with chemical bombs, but don't hit the ship! In **Sub Chase** you must depth charge the wolf pack without being sunk. Both with four levels of play from easy to kamikaze! Price (LYNX & DRAGON) **£7.95.**

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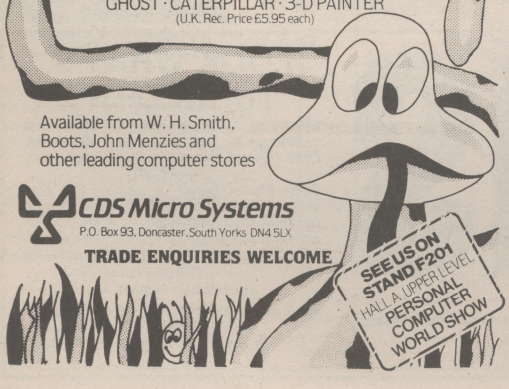

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(ZX81 programs also in stock)

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HALF THE SIZE

Apart from finding different subjects for books, publishing houses seem also to be producing different sizes of book to distinguish theirs from all the others and keep prices down.

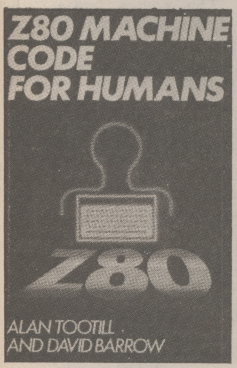
As part of its Q+A series Newnes technical books has issued *Basic Programming* by Peter Lafferty.

Without criticising the actual content the book has two things to distinguish it, the fact that it is about half the usual size of a book, and its format.

The latter is interesting — a general introduction to Basic is given in the form of Questions and Answers. Eg, What is a loop? What are User defined characters? This should make it easier for people to get a specific point answered without searching through a mass of text.

Book *Basic Programming*
Price *£2.50*
Micro *General*
Publisher *Newnes Technical Books*
Borough Green
Sevenoaks
Kent TN15 8PH

MACHINE CODE



If you look at *Popular Computing Weekly*'s book charts (and I'm sure you do) you will have noticed that it's actually the more technical computer books that are selling well — everyone, it seems, wants to learn machine code.

The problem is, of course, that machine code is not easy and, particularly to begin with, most people find the going pretty tough.

With *Z80 Machine Code for Humans* Granada is trying to simplify the task without being machine specific. The book is designed for the novice — it gradually builds up machine code skills by using short routines.

Book *Z80 Machine Code for Humans*
Price *£7.95*
Micro *General (Z80 processor)*
Publisher *Granada Publishing*
PO Box 9
Frogmore
St Albans
Herts AL2 2NF

INSOMNIAC

Ian Sinclair's output is astonishing; every week we seem to get another book — does the man ever sleep?

The latest addition is *Inside Your Computer* which is designed to introduce novices to the bits and pieces 'under the bonnet' of their machine.

Chapters discuss The Basic Interpreter, Inputs and Outputs and the Microprocessor.

One useful section illustrates the correct way to add additional chips to your computer (a 48K upgrade on your Spectrum, for example) which can be surprisingly difficult, and infuriating if you get it wrong.

Book *Inside Your Computer*
Price *£4.95*
Micro *General*
Publisher *Granada Publishing*
PO Box 9
Frogmore
St Albans
Herts AL2 2NF

NOVICE

The Epson HX-20 tends to be forgotten amongst all the Spectrums, Dragons and BBCs of this world, but it has sold well.

Getting Started with the Epson HX20 is actually one of only a few books on the machine.

As the title suggests it is intended for the absolute novice. The various terms of Basic are introduced and illustrated — in view of the fact that the Epson was first sold as a portable business machine, it is perhaps not surprising that the examples and programs are geared towards serious uses rather than games.

Book *Getting Started with the Epson HX20*
Price *£5.95*
Micro *Epson HX20*
Publisher *Phoenix Publishing*
14 Vernon Road
Bushey
Herts WD2 2JL

ADVENTURES

The first of what is likely to be a veritable surge of books on Adventure games has been issued by . . . well, by us actually.

Tony Bridge, grand inquisitor and elf most high of our adventure department, has written a book called *Spectrum Adventures.*

The first section of the book examines the history of adventures and discusses the themes common to all of them. Subsequent sections take you through the development of your own graphic adventure, constructing mazes, creating monsters, and so on.

I should add that the 48K program contained within the book was programmed by Roy Carnell.

Book *Spectrum Adventures*
Price *£5.95*
Micro *Spectrum (Adventure needs 48K)*
Publisher *Sunshine Books*
12-13 Little Newport Street
London WC2R 3LD

EXPENSIVE

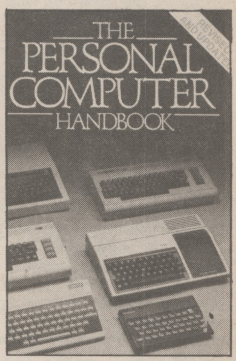
Whatever else American-produced computer books are, they are expensive — £15.95 for 214 pages and only black and white diagrams is quite a price.

Pascal programs for games and graphics consists of 22 programs designed for the Apple with UCSD Pascal.

The author Tom Swan has written a number of books specialising in Pascal and in this book his intention is to teach the language through the games — perhaps if you have a 64K Apple and twin disk drives (which is more or less the minimum requirement) you may not find nearly £16 for a book so hard to bear.

Book *Pascal Programs for Games and Graphics*
Price *£15.95*
Micro *Apple 64K + Disc + Pascal*
Publisher *John Wiley & Sons*
Shipney
Bognor Regis
West Sussex PO22 9SA

INTRODUCTION



The Personal Computer Handbook is designed both to be a general introduction to the subject of what a computer is and also a practical buyers' guide to what's on the market and how they compare.

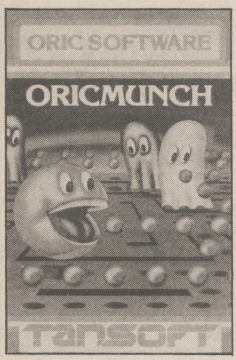
If that weren't a large enough subject, it ends with some programs and various lists of computer clubs and other books.

Obviously, it's not possible to go into very much depth — the machine reviews are two pages each — and there are some surprising omissions and more inevitably errors of fact.

Perhaps the disparate elements look a bit cobbled together, but it's cheap and potential buyers may find it useful.

Book *The Personal Computer Handbook*
Price *£3.95*
Micro *General*
Publisher *Virgin Books*
61/62 Portobello Road
London W11 3DD

MONSTERS



Believe it or not there was no version of *Puckman* for the Oric — until now.

Oricmunch appears to offer all the features of the original arcade game, including the prizes for good scores like cherries and lemonade.

Although usually you have a fighting chance against the monsters, should you eat two of them they double in speed. The game is the first of an intended series of arcade games to be released by Tansoft over the next few months.

Program *Oricmunch*
Price *£7.95*
Micro *Oric 16/48K*
Supplier *Tansoft*
3 Club Mews
Ely
Cambs CB7 4NW

SADISTIC

Brilliant software is a company specialising in adventure games. *Way Out West* is for the Dragon 32.

Your task is to make your fortune in a gold mine, armed only with your trusty 32 and an enigmatic clue "Having a sadistic nature helps".

The game is said to be highly complex and so a *Save* instruction is included.

Program *Way Out West*
Price *£6.95*
Micro *Dragon 32*
Supplier *Brilliant Software*
10 Newlands Drive
Gedling
Nottingham NG4 3HU

KEYWORDS

A whole range of additional Keywords to Spectrum Basic are made available by *Beta Basic* from Betasoft.

The program includes 26 new Keywords and 10 new Functions. The Keywords include *Alter*, for extensive manipulation of the attributes file, *Dpoke* for a double *Poke*, *Rnum* to renumber the program, etc.

The Functions allow for decimal/hex conversion and number formatting.

All Keywords are simple entry, with full syntax check on entry. The program, which also provides for a Trace facility, comes complete with an extensive manual.

Program *Beta Basic*
Price *£11.00*
Micro *Spectrum 48K*
Supplier *Betasoft*
92 Oxford Road
Moseley
Birmingham B13 9SQ

VICIOUS

The first part of a "multiplayer fantasy adventure game" is called *Usurper* and is for the 48K Spectrum.

The game is for up to 10 players who compete (viciously) against one another until one becomes strong enough to tackle the King.

As each player spins out their Machiavellian plots, instructing the computer where to move, who to kill, fate may intercede in the dread form of Vampires, ghouls and other beasts.

Program *Usurper*
Price *£6.00*
Micro *Spectrum 48K*
Supplier *Assassin Software*
10 Ash Road
Leeds LS6 3JF

LILY LIVERED

If the gory cover and the warning "Parental guidance recommended for children under 16 years" are anything to go by, *Hells Temple* (excuse the pun) is one hell of a program.

The game claims to have over 70 monsters, the setting is *Hells Temple* where "only courage, sorcery and a strong sword arm rules" (can you imagine an adventure game where lily liveredness, running away and quaking with fear hold sway?).

Within *Hells Temple* are various riches as well as the aforesaid monsters — at each stage your computer gives you a 3D view of the Temples catacombs. The producers of the game have incorporated a nice idea — they have set up a club for *Hells Temple* enthusiasts to correspond together, swap notes, etc.

Program *Hells Temple*
Price *£12*
Micro *Oric 1 48K*
Supplier *Kenema Associates*
1 Marlborough Drive
Worle
Avon SB22 0DQ

GNASHERS

Richard Shepard Software has produced games which have consistently been in the top ten Spectrum charts.

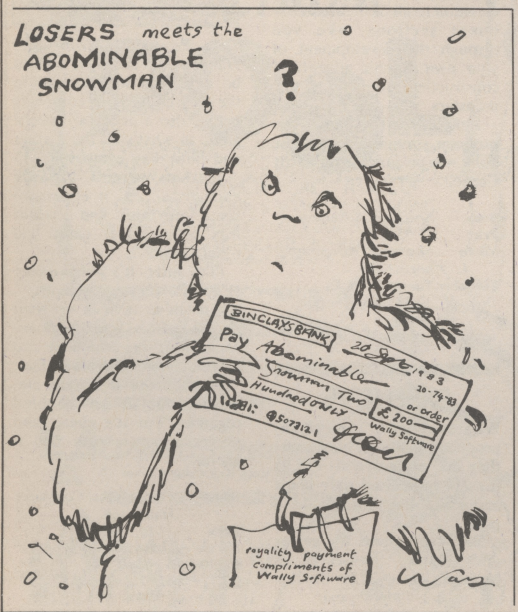
The latest program is described as a "3D graphic adventure" and is entitled *Devils of the Deep*. You must explore the lost city of Atlantis, locate its treasure and bring it back to your boat.

The games boasts 100 screens, each depicting a different section of sea bed. The monsters of the title are giant electric eels whose one weak spot is their gnashing jaws.

Around the ocean bed are various objects including a harpoon gun, harpoons, spade and a knife. Sophisticated game players may have to face giant crabs.

Program *Devils of the Deep*
Price *£6.50*
Micro *Spectrum 48K*
Supplier *Richard Shepard*
Elm House
23-25 Elmshott Lane
Cippenham
Slough
Berks

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.



Ziggurat

Study studies

My comments a few issues ago, about the "child", and 'A' levels, prompted one particularly interesting response.

The reader, about to choose his 'A' levels, commented: "Your saying that Computer Science 'A' level has no real use has only made me more confused about a confusing subject — the types of jobs in computing and the qualifications required for each."

My correspondent asked if I would discuss what jobs, opportunities and qualifications exist in computing, as he would like to work with computers. He is starting 'A' levels this September.

Incidentally, the academic renegade saw my piece, recognised himself, and still disagreed.

Many of the jobs I might have wanted as a youth no longer exist. When I was "deciding" (or having decided for me) my 'O' level subjects, there were no more than 200 computers in Britain, and I had not heard of any of them.

Within two years, in personal computing, we have seen the rise of the software house whose output is basically games. We have recently seen the promise (if "promise" be the correct word) of cable software, and software over the telephone. The opportunities are changing all the time.

My 'O' levels fitted me perfectly for the computer age, even though the "computer age" was not to come for several years. The reason they fitted so well was the range of subjects I had to take.

We all had to take Mathematics, one foreign language, English Language, and English Literature. Those four subjects should be the basis of any selection of 'O' level subjects. I then took two science subjects, and two arts subjects.

These 'O' levels enabled me to pick and choose from any subject at 'A' level, not based on some silly idea that I was either a "science" or an "arts" person, because of my 'O' levels. It also meant that I was not already funnelled into some career at an incredibly early age.

Given the syllabus of most of the Computer Science 'O' level courses I have examined, the value of the subject as a preparation for 'A' levels in general seems almost nil. The academic content of Computer Science 'O' levels appears far too low.

What is usefully learnt with 'O' level Computer Science that cannot be learnt from playing with computers, and reading magazines?

A very similar attitude should influence your choice of 'A' levels. At 'A' level you have a chance to study fewer subjects in greater detail. How you study, and what you study, are influenced by how you see education.

If you see education merely as a means to an end, the end being a job, then I think that is being short-sighted. The Government's "training" initiatives are of this nature, youngsters — who do not know better — foregoing education to be trained in "vocations" which might not last beyond a few years.

Education should be about helping people to learn to be adaptable, to learn to think, and learning a basis of knowledge which will help, whatever the future might bring.

Essentially, choose the subjects at 'A' level which interest you, as long as the subject has a strong academic (usually non-vocational) content. If you are interested in languages, take languages at 'A' level; if you are interested in the humanities, take humanities 'A' levels; or, if, as I was, you are interested in maths and the sciences, take those 'A' levels.

Computer Science 'A' level is basically a non-academic, vocational subject, and is not a preparation for computing. Indeed, it is not accepted on many computer science degrees.

There again, computer science degrees are no easy way into computing either.

If you are interested in computing, then compute. Write programs, and try to sell them; try to extend your knowledge by reading widely; and try to see if you can use a computer to do new things, other than zap.

In computing, and related areas, you are judged by what you know and what you can do — not by your qualifications. ■

Boris Allan

Puzzle

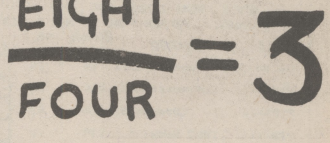
Eight divided by four

Puzzle No 74

"What's eight divided by four?"

This unexpected question from my daughter came as a bit of a surprise. "Two of course!" I replied and then instantly realised this was no ordinary question. "No!" she exclaimed "eight divided by four is three."

And so it was, as she was able to demonstrate. By writing down the division sum in words it was possible by substituting digits for the letters to make the sum correct:



Each of the letters represents a different digit, but no zero is used. Also 'eight' and 'four' are (of course) both even numbers.

Solution to Puzzle No 69

There is one slight catch in the problem. By convention, O! is equal to 1, not zero as might be supposed.

Consequently, line 210 of the program treats any zero as though it were a 1 (thus having a factorial value of 1).

One program which gives the right answer is:
10 LET N + 1 **20** LET N$ = STR$ N **30** LET T = 0 **40** FOR A = 1 TO LEN N$ **50** LET M = VAL (N$(A)) **60** GOSUB 200 **70** IF T>N THEN GOTO 100 **80** NEXT A **90** IF T = N THEN PRINT N **100** LET N = N + 1 **110** GOTO 20 **200** LET Q = 1 **210** IF M = 0 THEN LET M = 1 **220** FOR P = 1 TO M **230** LET Q = Q ★ P **240** NEXT P **250** LET T = T + Q **260** RETURN

This program produces the only other number, apart from 1, 2, and 145, which is the sum of the factorials of its digits. This number is: 40,585.

Winner of Puzzle No 69

The winner is: Francisco Santos, Rua Bartolomeu Dias, 2900 Setubal, Portugal, who receives £10.

Top 10

Atari

1	(2)	Miner 2049er	(Big Five)*
2	(1)	Diamonds	(English)
3	(4)	The Curse of Crowley Manor (Adventure International)	
4	(—)	Paris in Danger	(Avalon Hill)‡
5	(—)	Golden Baton	(Channel 8)
6	(—)	Astro Chase	(First Star)†§
7	(10)	Zaxxon	(Datasoft)
8	(—)	Jumpman Junior	(Epyx)*
9	(—)	Mountain King	(CBS)*
10	(9)	The Blade of Blackpoole	(Sirius)

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

BBC*

1	(—)	Hunchback	(Superior)
2	(3)	Danger UXB	(Program Power)
3	(1)	Felix in the Factory	(Program Power)
4	(6)	Starship Command	(Acornsoft)
5	(7)	Centipede	(Superior)
6	(—)	Snooker	(Acornsoft)
7	(—)	Frogger	(A + F)
8	(5)	Great Britain Limited	(Simon W Hessel)
9	(10)	Alien Swirl	(Program Power)
10	(—)	Chess	(Computer Concepts)

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

ZX81*

1	(1)	Chess	(Psion)
2	(2)	Space Raiders	(Psion)
3	(4)	Flight Simulation	(Psion)
4	(6)	Football Manager	(Addictive Games)
5	(5)	Fantasy Games	(Psion)
6	(—)	QS Scramble	(Quicksilva)
7	(9)	Asteroids	(Quicksilva)
8	(3)	Espionage Island	(Artic)
9	(—)	Defender	(Quicksilva)
10	(—)	Ship of Doom	(Artic)

*All run in 16K.
(Figures compiled by Boots & Co, London)

Dragon

1	(1)	The King	(Microdeal)
2	(2)	Frogger	(Microdeal)
3	(3)	Talking Android Attack	(Microdeal)
4	(6)	Space War	(Microdeal)
5	(4)	Night Flight	(Salamander)
6	(8)	Ring of Dark	(Wintersoft)
7	(10)	Planet Invasion	(Microdeal)
8	(—)	Quest	(Dragon Data)
9	(7)	Morocco Grand Prix	(Microdeal)
10	(—)	Dragon Trek	(Wintersoft)

(Figures compiled by Boots & Co, London)

Spectrum

1	(—)	Tranz Am	(Ultimate)
2	(8)	The Hobbit	(Melbourne House)*
3	(1)	Jet Pac	(Ultimate)
4	(2)	Scrabble	(Psion)*
5	(3)	Flight Simulation	(Psion)*
6	(6)	Horace Goes Skiing (Psion/Melbourne House)	
7	(—)	3D Tanx	(DK 'Tronics)*
8	(4)	Horace and the Spiders (Psion/Melbourne House)	
9	(9)	Ah Diddums	(Imagine)
10	(—)	Test Match	(Computer Rentals)*

*Requires 48K.
(Figures compiled by W H Smith and Sons, London)

Books

1	(4)	Structured Programming with BBC Basic, *Atherton*	(Horwood)
2	(—)	Commodore 64 Programmer's Reference Guide, *Commodore*	(Commodore)
3	(4)	Assembly Language Programming for BBC Micro, *Birnbaum*	(Macmillan)
4	(1)	Complete Spectrum Rom Disassembly, *Logan and O'Hara*	(Melbourne House)
5	(—)	Programming the 6502, *Zaks*	(Sybex)
6	(—)	Basic Programming on the BBC Micro, *Cryer*	(Prentice Hall)
7	(2)	Commodore 64 Machine-code Master, *Lawrence and England*	(Sunshine)
8	(10)	Anatomy of the Dragon, *James,*	(Sigma)
9	(5)	Complete Forth, *Winfield*	(Sigma)
10	(8)	Spectrum Hardware Manual, *Dickens*	(Melbourne House)

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

Vic20

1	(1)	Aracadia	(Imagine)
2	(3)	Wacky Waiters	(Imagine)
3	(2)	Sky Hawk	(Quicksilva)
4	(8)	Cosmiads	(Bug-Byte)
5	(9)	Catcha Snatcha	(Imagine)
6	(4)	Cosmic Crunch	(Commodore)*
7	(5)	Grid Runner	(Llamasoft)
8	(7)	Sargon II Chess	(Commodore)*
9	(10)	Frantic	(Imagine)
10	(6)	Panic	(Bug-Byte)

*Cartridge.
(Figures compiled by Boots & Co, London)

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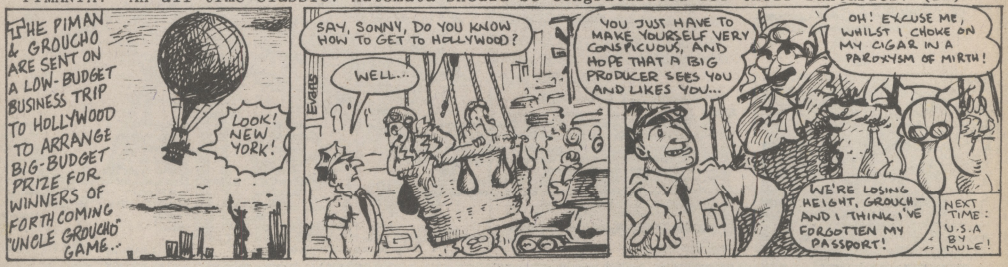
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GO TO JAIL: "This excellent simulation of the famous board game is unique! There are other versions, but this is real fun. A triumph of the programmer's art. Full marks. Another superb game from Automata."(PCWorld)
PIMANIA: "The best evidence that computer gaming has come of age. The complete entertainments package. An adventure enthusiast's dream."(C&VG)
PIMANIA: "A real treasure, dripping with gold and diamonds!"(PCN)
PIMANIA: "I have been reduced to a gibbering Pimaniac by a crazy cartoon character called the PiMan, and the free hit single by Clair Sinclive."(Interface)
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PIMANIA: "At last...the alternative to death and destruction games."(Which Micro)
PIMANIA: "Should carry a Government Health Warning - this game can damage your brain! Try it. You'll love it." (PCWorld)
PIMANIA: "A real life treasure hunt meets Monty Python. Well worth seeking out."(PCWeekly)
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