

# POPULAR Computing WEEKLY

35p 16-22 February 1984

BRITAIN'S BEST-SELLING MICRO WEEKLY

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START  
HERE

I'm An  
**URBAN  
UPSTART**  
Are You?  
RICHARD SHEPHERD SOFTWARE

**AQUARIUS**  
SEE PAGE 49

**VALHALLA**

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Free readers entries to buy  
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★ **STAR**  
Z-Fred on Spectrum.  
See page 10.  
**GAME** ★

## News Desk

### MoD bans software protection

A BARNESLEY-based cassette duplication company has come up with an answer to the problem of software piracy. Yet the technique may never be used by software houses to protect their programs.

JLC Data has patented a unique system which prevents, not only commercial piracy, but also home tape-to-tape copying. However, the patent has had to be withdrawn and the idea shelved following a secrecy order which was served on JLC by the Ministry of Defence.

"We have had the secrecy order placed on us which spells it out in plain English" — explained JLC's Jim Lamont. "I can't tell anybody about it on pain of imprisonment and heavy fines."

"I must package up all information relating to the research we have carried out in the past eight months and send it to them. It must all go in an envelope marked 'secret' which is in turn put inside another envelope and then be sent by registered post to the MoD. It is all cloak and dagger stuff."

continued on page 5

### GEC breathes new fire into Dragon

DRAGON'S intention to diversify its range of products will mean a change of emphasis for the company.

A plan worked out by managing director Brian Moore will shortly expand the company's activities into business micros.

Last week Dragon relinquished marketing and distribution responsibilities to a GEC subsidiary, GEC McMichael, and also reduced the number of staff at its South Wales plant by 29. The redundancies, according to Brian

Moore, are designed to streamline the company.

Dragon has had its fair share of set-backs in recent months. In September, cash-flow problems forced its shareholders to put up £2.5m to bale it out. At the same time Brian Moore was appointed by the shareholders to replace Tony Clarke. Then, in November, one of its shareholders, the troubled Mettoy toy manufacturer, went into liquidation. Its holding has now been shared between the company's remain-

continued on page 5



Dragon managing director Brian Moore

## ○○○○○○○○○○ This Week ○○○○○○○○○○

● **Reviews** Barbara Conway looks at a selection of BBC adventures on page 16. ● **Spectrum** Trevor Toms continues his series on machine code, see page 21. ● **Dragon** C McGinley looks at the keyboard reading routine on page 24. ● **New Releases** included in this week's selection are Micro Drivin from Softel and Forty Niner from Software Farm, page 52.



# DEATHCHASE

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## MICROMEGA

Micromega, Personal Computer Division, Quantec Systems & Software Ltd, 230-236 Lavender Hill, London SW11 1LE.



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### How to submit articles

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

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your own program returned you must include a stamped, addressed envelope.

### Accuracy

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

## This Week

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## Editorial

Satellites are very much in vogue at the moment. First, the US space shuttle *Challenger* succeeded in losing two satellites within days of each other, then Sir Clive Sinclair announced he could produce a satellite tv adaptor for just £100.

Now, nobody is suggesting that these two items are linked in any way, but they do demonstrate that satellites are 'hot' at the moment.

However, while most people are thinking about satellites in terms of tv or radio communications, they also hold possibilities for computers. Project Universe, which was set up three years ago with funds from the Department of Trade and Industry, is looking at ways of linking together various local area networks via satellites. This would make it much easier for sophisticated computer systems to communicate with each other at high speed.

But, Project Universe is running out of money. It needs somewhere in the region of another £10m to develop a commercial system.

Since the project is an amalgamation of industrial, academic and governmental interests, theoretically there should be no problems in raising additional finance. However, research budgets are extremely tight at the moment, so the money may not be forthcoming.

But then building a universe never was cheap.

## Next Thursday

Can you land your commandos on the fort in Hot Drop — next week's star game for the BBC by Ken Swallow.

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# THE HOBBIT

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# THE HOBBIT

RUNNER-UP GAME OF THE YEAR

# MELBOURNE HOUSE

RUNNER-UP SOFTWARE HOUSE OF THE YEAR



1983 GOLDEN JOYSTICK AWARDS



## Software ban

continued from page 1

The technique developed by Jim Lamont uses an 'imprint' signal recorded together with the data signal on the tape. The imprint is added at the master stage of recording, so no specialised duplicating equipment is required.

The imprint remains invisible to the computer, unless any copy of the tape is made — either by breaking into the program or by a direct tape-to-tape transfer. Any attempt to copy the tape, corrupts the program.

The crucial aspect of the technique as far as the Ministry of Defence is concerned is that it is equally effective for protecting on-line data. Conceivably, the method could be used to prevent listening-in to either computer network links or other methods of data transfer, even via telephone lines.

Until the MoD action, JLC had been receiving around 70 calls a day from interested software houses. The company will receive some compensation for the loss of its patent. Said Jim: "Whether that compensation will be adequate I doubt very much."

He now plans to go ahead and try to interest software companies in an earlier version of his protection system not covered by the MoD's secrecy order. "The end result of the earlier method is about the same as the one we patented, but it is not so devious" he said. Trials of the less sophisticated system will begin this week when one software house begins a field test of the method.

## Dragon fire

continued from page 1

ing investors.

And, most recently, Dragon's link up with Tanno in the US has produced disappointing results. Tanno failed to reach its sales target of only 5,000 machines last year and Dragon's US sales director George Merchant has been sacked.

Future Dragon computer products are now expected to be directed towards the business computer market. Intense competition and price cutting in the home computer market forced Dragon to cut the cost of its Dragon 32 shortly before Christmas by £25 to £145.

## QL delays expected as orders grow

FIRST deliveries of Sinclair's new QL computer are now unlikely to be dispatched to customers until at least the beginning of March.

The 28-day period allowed for delivery in the company's mail-order advertisements will be up for the first would-be owners this Friday, February 17. Yet most of the first batch of machines expected at the end of this month will be sent to software authors for program

development and to magazines for review.

The delay is apparently due to continuing development of the ULA chip and work still being carried out on the QL's SuperBasic. The design of the QL Microdrives has however now been finalised — none were in evidence in the machines shown at the January launch — and work to make the four Psion software packages fully compatible with the

of this month and will sell for £17.95.

Other titles to follow throughout 1984 will include *Robin Hood*, *Space Colony* and *Isomer* priced under £10 and a budget range including *Block-it*, *Bluff-it* and *Catch-It*.

## Daisy wheel printer

PRICES for daisy wheel printers continue to fall. Star Computer Peripherals are launching a range of Silver-Reed printers with the basic model retailing for £344.

All the printers in the range support subscript, superscript and bold type — print speed on the basic model — the EXP 500 — is 12 characters per second.

More details from Star Computer Peripherals, Unit 6, Imperial Way, Worton Grange Industrial Estate, Reading, Berks.

## Hype is the name of the game

HYPE is the name given to the first boardgame to be launched by a computer software house — Virgin Games.

While other companies are abandoning traditional boardgames in favour of their video equivalents, Virgin plans *Hype* as the first of a whole range of packages.

Based on the internal workings of the music business, the object of the game is to assemble your ideal rock band and 'hype' it into the Number 1



slot. The game — conceived by an existing group, *The Technos* — will be launched at the end



drives should be finished at the end of this week.

Orders for the QL are now building up at an alarming rate and some sort of order backlog — traditional for any new Sinclair product — seems inevitable.

Around 6,000 QL orders (worth £2.4m) have so far been placed, and 3,000 of those have been taken in the last week.

## Micronet tapes

MRM Software is the first company to move from supplying programs on Micronet 800 — the database network — to producing them on cassette.

MRM's games *Q Man*, *Banana Man*, *Q Man's Brother*, *3D Munchy* and *Secret Sam* are all in Micronet's monthly BBC Top Ten.

## Satellite tv receiver

SINCLAIR has given UK television companies a strong incentive to go ahead with their direct broadcast satellite tv plans.

The micro manufacturer has told the BBC and the IBA that it plans to design and produce a satellite tv receiver for under £100.

The cost of such receivers has proved a major stumbling block in the development of satellite tv. Sinclair's price for the device is around a fifth of previous estimates.

The £100 tag would include both the receiving dish and the decoding equipment needed to make the signal intelligible to any ordinary domestic tv set.

Such a low-cost package could well influence the decision of the joint working party, presently deciding the future of satellite broadcasting, in favour of direct broadcast television. Last year the BBC shelved its ambitious satellite broadcasting programme, following the failure of the European broadcasting companies to agree transmission standards.

## Brother EP-44 printer



THE distinction between computers and typewriters blurs still further with the launch by Brother of its EP-44 personal printer.

The device is battery driven with full-size keyboard and 28x18 dot-matrix printer.

With 4K of Ram built-in, up to three A4 pages of text can be viewed on a 15-character liquid crystal display and edited before printing.

An RS232 interface allows it to communicate with other devices or to be used as a printer peripheral for a home computer.

The Brother EP-44 costs £253.





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# Letters

## Waiting for . . .

I would like to ask everyone who is waiting for ZX Microdrives the following question.

There is a company called Sinclair, Who brought out the Microdrive in despair.

A year and a half late,  
Was it worth the wait?  
Rumours were spread,  
I was beginning to dread.  
So when the Postman knocked on my door,  
In his hand a Microdrive I saw.  
I quickly signed the paper,  
And had it set up five minutes later.

In it the Demo cartridge, I did place,  
You should have seen the look on my face.  
It started to burr,  
The LED started to glow.  
Surely it can't be this slow?  
I waited a while,  
Away went my smile.

I tried to press BREAK,  
Was this a mistake?  
It appeared to work.  
The drive stopped with a jerk.  
The screen was just white,  
I nearly died of fright.  
My Spectrum had crashed,  
The cartridge was slashed.  
My fists were clenched,  
From the power supply, the plug was wrenched.  
I sat back and cried,  
Oh Sinclair, well they tried.  
For my pen I did race,  
Does anyone make a disc interface?

Gavin Monk  
Commonwealth Hall  
Cartwright Gardens  
London WC1H 9EB

PS. May I also take this opportunity to recommend Andrew Pennell's excellent book *Master Your ZX Microdrive* to all Microdrive users.

## Arcade freaks

I was delighted and relieved to read Steven Mason's letter (PCW, Letters, 19-25 January).

This page, in particular, was beginning to create the impression that this magazine was being published solely for the benefit of arcade freaks. Most of the Open Forum programs seem to be of the arcade variety and one becomes ex-

remely despondent to keep on reading high scores for this, that and the next thing, week in and week out.

At 40 years old I am not particularly into Zap-Pow-Shoot'em Down games and would much prefer to see some advice and programming for more intelligent uses of my Vic 20. I am especially interested in the creation and using of filing systems (I know this is tediously slow with cassette, but I cannot yet afford to uprate to a disc system).

Please don't spoil what is otherwise a very good magazine by allowing it to degenerate into a games-only publication.

Peter Swift  
22 Skippingdale Road  
Scunthorpe  
South Humberside DN 15 8NU

## Golden sundial

Dear Pimaniac — until the back page of *Popular Computing Weekly* informs the world that somebody has won my golden sundial it is still in the possession of my wicked bosses at Automata.

Keep reading the back page 'cause nobody's won it yet.

Yours Piously  
The Piman

## Ideal language

I was horrified to read Iain Stewart's letter (PCW 2-8 February) on the subject of "ideal languages". The fact that he mentions a "huge array of structures" on the BBC shows that he has little idea of

what structures actually are. To my knowledge, the only structures the BBC has are *Repeat/Until* and *For/Next*, which are not really adequate. Admittedly, the BBC has procedures and functions, but they are rather limited in their power since it is possible to pass parameters by value only, and procedures cannot be local.

To say that the "ideal language" should be capable of indirect jumps (*Goto* variable) is naive; indirect jumps make programs totally unreadable and difficult to debug, especially if they refer to line numbers, which they undoubtedly do in Basic hybrids. In any case, what is *Goto* doing in an ideal language? Structures such as *Repeat/Until*, *While/Do* and *Case* structures remove the need for complicated jumping. Obviously Iain Stewart has never heard of Pascal or Forth, both of which have a large number of structures.

Forth comes very close indeed to my "ideal language" because of powerful words which allow you to create your own structure. But it is worth bearing in mind that there is no "ideal language". For example, Logo, with its advanced list processing capabilities and friendly operating environment, is ideal for teaching the rudiments of programming and maths, but is totally unsuited for writing operating systems. If one language had all the desirable qualities of other languages, it would be too difficult to use. My suggestion to Iain Stewart is to buy a book on Pascal or Forth.

Do any other readers have views on structured programming or languages?

A Hegedus  
20 Ebrington Road  
Harrow  
Middlesex HA3 0LR

## Spectrum potential

The heading BBC & Education in the PCW index seems to suggest that it is only the BBC micro which has any serious educational uses.

I own a Spectrum and use it principally for learning about the intricacies of computer programming, although I must admit to playing the odd game

of the adventure type now and then. However, education is also an interest of mine, having two small children. More and more software houses, in conjunction with book publishers, are now producing excellent education packages for the Spectrum. Additionally, with a ratio of 1m to 200,000 over the BBC micro, the Spectrum's potential is immense and it is one of the leading computers in schools up and down the country.

While the Spectrum is an efficient 'games' machine, it is also a serious programmer's and educational machine. This, coupled with the networking possibilities with the QL, will make the Spectrum of interest to small business users.

In short, it is not just a games machine and I am sure many of your readers will feel the same. So, how about giving credit where credit is due: Spectrum — business, education and games.

Larry Walker  
16 Woodfield Close  
Redhill  
Surrey RH1 2DL

PS. What has David Hesketh's game on horse racing got to do with education?

## Manic Miner pages

I wonder if you can help me, one of your regular readers.

About two months ago, a reader's letter appeared in one of your issues giving a list of entries which could be typed into the Spectrum to gain access to all the pages of the excellent *Manic Miner* program. Sadly, I have now lost this particular copy and miss it greatly.

Could you possibly send me this list or, if necessary, a copy of the relevant issue of PCW which would be dated approximately late October or early November.

David Crafts  
Popeswood  
Limes Lane  
Buxted  
Uckfield  
East Sussex

No sooner said than done. For other readers who may be interested, the issue concerned is PCW 3-9 November.



"He's fixing the dish on the roof for satellite television."



# AGF

# PROGRAMMABLE JOYSTICK INTERFACE for Spectrum or ZX81

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Eight directional movement, with or without the fire button being pressed, can be achieved by only programming the left, right, up, down and fire keys required by the game.

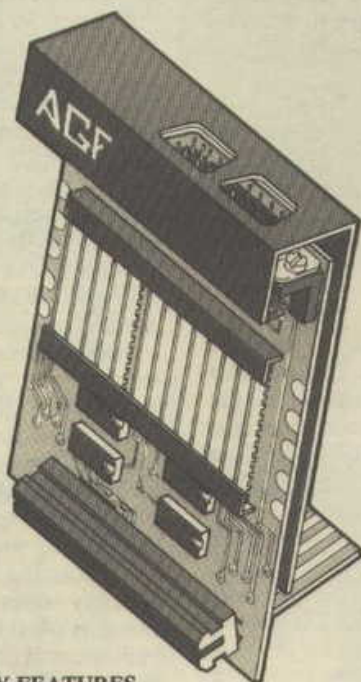
Programming is achieved by a two-digit code, which is looked up on the Programming Chart supplied, for each direction and firing button. These two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked onto a Quick Reference Programming Card for storing with the game. As the programming is not power dependent the interface can be immediately used when next switched on.

The keyboard remains fully functional and can be used simultaneously with the joystick.

An integral rear expansion connector means there is no need to remove the interface to connect other peripherals.

NB. A recent design improvement now means that the AGF Programmable Interface works with the new Quickshot II rapid "Auto Fire" feature.



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- ★ Free demo program and instructions.

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**VALHALLA**



# Z-Fred

A new game for 16/48K Spectrum by Nicky King

This is a version of the arcade game Q-Bert for the 16/48K Spectrum. Full instructions are included in the program.

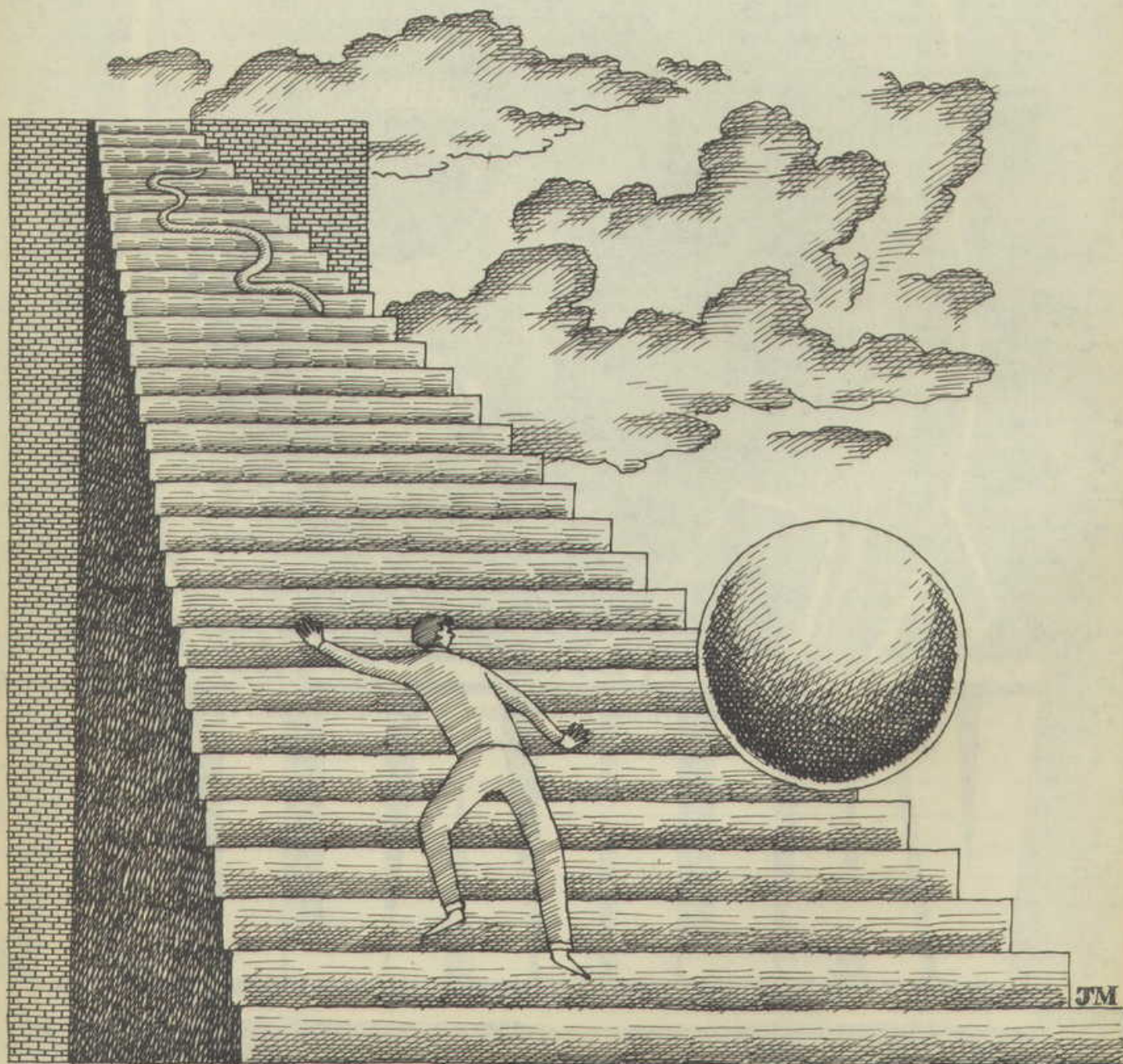
The program was written on a 48K machine — in order to convert the program for a 16K Spectrum, the machine code sound effects have to be removed. This

is done by deleting lines 125-131, 102, 68, and deleting the *Usr* calls in lines 33, 42, 89.

Line 106 contains the data for the empty pyramid graphics, these are *Poked* and subsequently printed on the screen. Line 122 holds the same data as the empty

pyramid, but with the tops filled in, so that Z-Fred can fill in a blank top quickly (since UDG's already displayed can be redefined without altering the screen display).

The program consists of 10 main sub-routines, all of which are clearly labelled with *Rem* statements.





```

1 BORDER 0: PAPER 0: INK 7: 1
2 DATA 1,1,12,3,0,1,2,4,192,1
3 152,224,128,64,32,16,3,7,14,1
4 16,15,7,3,192,224,112,48,176,2
5 124,124,192,0,0,0,15,15,79,32,31,
6 32,80,240,0,0,240,4,240,4
7 RESTORE 2: FOR f=USR "a" TO
8 USR "f": READ a: POKE f,a: NE
9
10 GO SUB 94
11 LET hi=0
12 REM SET UP GAME
13 LET sc=0: LET li=3
14 sheet=1
15 REM HI SCORE
16 LET x=15: LET y=15
17 GO SUB 104
18 LET box=0
19 LET level=1
20 LET a=4: LET b=15
21 LET wait=0: LET count=0
22 LET a=15: LET p=5
23 LET level=1
24 PRINT AT 0,0:"HI-SCORE: ";h
25 PRINT AT 0,0:"PYRAMID: ";she
26
27 PRINT AT 2,0:"LIVES: ";li
28 PRINT AT 1,0:"SCORE: ";sc
29 REM
30 IF sheet=13 THEN PRINT AT 3
0:"PYRAMID: 1" LET sheet=1: LE
T li=li+1: PRINT AT 2,0:"LIVES:
";li: PRINT AT 2,13: FLASH 1:"BON
US:" FOR f=-20 TO 20: BEEP .01:f
: BEEP .01:10:f: NEXT f: FOR f=1
TO 100: NEXT f: LET sc=sc+1000:
PRINT AT 2,13: FLASH 0:""
26 LET change=sheet-5
28 GO SUB 31
27 IF sheet<5 OR sheet>8 THEN
30 SUB 44
26 IF sheet<4 THEN GO SUB 66
28 PRINT AT 1,0:"SCORE: ";sc
30 GO TO 23
31 REM SCORE YOU
32 PRINT AT x,y: INK 3: PAPER
5:"AB"
33 IF POINT (a,n)=0 THEN LET s
c=sc+10: LET z=USR 60035: LET b
=x+box+1: GO SUB 57: IF box=21 TH
EN GO TO 2
34 LET x1=x: LET y1=y
35 IF INKEY$="i" AND y=15+(5-l
evel)*2 OR INKEY$="e" AND y=5+le
vel*2 OR INKEY$="f" AND level=0
OR INKEY$="j" AND level=0 THEN G
O TO 67
36 IF INKEY$="i" THEN LET x=x+
2: LET y=y+2: LET level=level+1:
LET a=-15: LET n=n+15
37 IF INKEY$="e" THEN LET x=x-
2: LET y=y-2: LET level=level+1:
LET a=-15: LET n=n+15
38 IF INKEY$="f" THEN LET x=x+
2: LET y=y+1: LET level=level-1:
LET a=-15: LET n=n-15
39 IF INKEY$="j" THEN LET x=x+
2: LET y=y+2: LET level=level-1:
LET a=-15: LET n=n-15
40 PRINT AT x,y: INK 3: PAPER
5:"AB"
41 IF x1<x AND y1<y THEN PRI
NT AT x1,y1: INK 7: PAPER 5:""
42 IF box=21 THEN LET z=USR 60
059: LET sc=sc+100: LET sheet=she
et+1: GO TO 9
43 RETURN
44 REM
45 IF wait=1 THEN GO TO 54
46 LET d=INT (RND*2)
47 PRINT AT a,b: INK 2: PAPER
5:"CD"
48 IF x=a AND y=b THEN GO TO 6
7
49 LET a1=a: LET b1=b
50 LET a=a+2: LET b=b+12 AND d
=0: (-2 AND d=1)
51 PRINT AT a,b: INK 2: PAPER
5:"CD": AT a1,b1: PAPER 5:""
52 IF a=x AND b=y THEN GO TO 6
7
53 IF a=15 THEN LET wait=1: L
T count=(20 AND sheet=1)+(10 AND
sheet=2)+(5 AND sheet=3)+(1 AND
sheet=4)+(30 AND sheet=5)+(20 A
ND sheet=6)+(10 AND sheet=7)+(1
AND sheet=8)+(30 AND sheet=9)+(20
AND sheet=10)+(10 AND sheet=11)+(1
AND sheet=12)
54 IF wait=1 THEN LET count=co
unt-1
55 IF count=0 AND wait=1 THEN
LET wait=0: PRINT AT a,b: PAPER
5:"" LET a=4: LET b=15
56 RETURN
57 REM
58 IF y=5+(level-5) AND x<4 THE
N GO TO 63
59 IF y=15+(5-level)*2 AND x<4
THEN GO TO 65
60 IF x=4 THEN PRINT AT x-1,y:
"OP: AT x-1,a: "; PAPER 7:"N":
PAPER 0:"N": AT x+1,y:"KL": RETU
RN
61 PRINT AT x-1,y:"HI": AT x,y-
1:"G": PAPER 7:"N": PAPER 0:"J"
: AT x+1,y:"KL"
62 RETURN
63 PRINT AT x-1,y:"OI": AT x,y-
1:"H": PAPER 7:"N": PAPER 0:"J"
: AT x+1,y:"KL"
64 RETURN
65 PRINT AT x-1,y:"HP": AT x,y-
1:"G": PAPER 7:"N": PAPER 0:"N"
: AT x+1,y:"KL"
66 REM
67 LET z=USR 60083
68 PAUSE 10: LET li=li-1
69 IF a=x AND b=y THEN PRINT AT
2,19:"THE BALL GOT YOU" FOR f
=1 TO 200: NEXT f: GO TO 73
70 IF a=x AND b=y AND sheet<4
THEN PRINT AT 1,7:"THE SNAKE GO
T YOU": FOR f=1 TO 200: NEXT f:
GO TO 73

```

```

72 IF =15+(5-(level)*2 OR y=5
level=2 OR level=0 THEN PRINT AT
19,10;"YOU FELL OFF": FOR f=1 T
0 200: NEXT f
73 IF l!=0 THEN GO TO 75
74 GO TO 9
75 CLS
76 IF sc>hi THEN LET hi=sc: PR
INT AT 4,8; FLASH 1;"NEW HIGH SC
ORE"
77 PRINT AT 10,2;"PRESS ANY KE
Y TO PLAY AGAIN"
78 PRINT AT 0,8;"YOU SCORED ",
sc
79 PAUSE 0: GO TO 6
80 REM XXXXXXXXXXXX
81 IF sheet=8 THEN LET chance=
sheet-9
82 PRINT AT 0,p; INK 9; PAPER
B; EF
83 IF (RAND*7)>chance+1 THEN RE
TURN
84 LET o1=0: LET p1=0
85 IF o<x AND p<y THEN LET o=
-2: LET p=p+2
86 IF o<x AND p>y THEN LET o=0
-2: LET p=p-2
87 IF o<x AND p=y THEN LET o=0
-2: LET p=p-2
88 IF o<x AND p<y THEN LET o=0
-2: LET p=p+2
89 IF o<o1 AND p<p1 THEN LET
z=USR 60000
90 PRINT AT 0,p; INK 9; PAPER
B; EF
91 PRINT AT 01,p1; PAPER B;"
92 IF o=x AND p=y THEN GO TO 6
93 RETURN
94 REM XXXXXXXXXXXX
95 PRINT TAB 13; PAPER 1;"Z-FR
ED"
96 PRINT "" You must guide Z-F
RED """: INK 3;"AB": INK 7;"
nto all of the cubes without fall
ing off of the pyramid and before
the ball """: INK 2;"CD": INK
7;" gets his
97 PRINT "Also you must watch
out for the deadly snake """: IN
K 5;"EF": INK 7;" which will
chase you all over the pyramid
"
98 PRINT "You gain points by
filling in all of the tops of t
he squares in the pyramid."
99 PRINT "If you complete pyr
amid 12 then you will be awarded
a big bonus."
100 PRINT "The controls are:

```



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# All the world's a stage

David Kelly talks to Graham Daubney and his accomplice, Topo

**R**obots are suddenly all the rage. You can't move these days without continually being introduced to some new wheeled wonder.

Although those in the know claim that personal robots will become the greatest thing since home computers, such a notion seems, on the face of it, puzzling. Most of the present generation of robots can do little more than a radio-controlled car costing a tenth of the price. They can both drive forwards and backwards.

But, that is to miss the point. These new home robots have the potential, within the very near future, to do a whole lot more. And prices, which may seem excessive now, should soon begin to fall quite sharply.

One of the front-runners in this new technology is Androbot, a US company set up in 1982 to design and produce a range of personal robots. Androbot was one of a number of companies funded by Atari's founder Nolan Bushnell after he sold Atari to Warner Communications.

Androbot exhibited its first robot — Topo — at the January 1983 CES show. It was controlled by an Apple computer via a 27MHz radio link, using software written in Basic. Several hundred of these Topo 1s were sold before they were superseded by Topo 2 — the version we will see in the UK. Topo 2 uses an infra-red link instead of radio, software is written in Forth — which is better suited for robotics than Basic — and the units feature a built-in speech synthesiser.

In the UK, Prism has been appointed to handle the Androbot machines. The first development versions of Topo 2 were received by the company last November and work began under the direction of Graham Daubney — Prism's development manager — to convert the operating software to run with British computers.

"The first thing I did was to start work on a high-level robotics language for the BBC micro, working as an extension of BBC Basic," says Graham.

"BBC Basic has the rather useful feature that you can add extra command words to it, altering the look-up table and the syntax checker as you go. So far, we have finished the communications software, enabling the BBC computer and Topo to understand each other, but we are still having to call some machine-code routines from Basic. The whole lot should be finished in a few weeks.

"The communications protocol of the infra-red transmission system has been the major development work for us on Topo."

The computer is connected via an RS232 interface to the infra-red tower — the base communicator. The tower contains an 8031 chip which packets up the information to

send to the robot. Topo contains two 8031s to receive and send data, so both the base communicator and the robot are intelligent.

Using one infra-red tower and computer up to 16 Topos can be independently controlled. Four 'public' channels are also included, allowing the same instruction to be broadcast to every Topo within range at the same time.

### Line of sight

The 'range' is about 200 feet. In a normal room there would be enough reflection of the infra-red signals from the walls and ceiling that the robot would not have to remain in line-of-sight of the base tower.

Information sent to the robot is of two types — either motion data or speech data. Most of the space inside Topo's casing is taken up by a cage for accepting printed circuit-board cards. Two processor boards are supplied as standard, with room for another four or five. One handles the communication with the home base, the other interprets the movement instructions. A speech synthesiser board is built into Topo's head, together with a number of Rom chips containing the robot's firmware — its on-board software.

Androbot developed Topo's software to work with the Apple II computer. Prism is working on the BBC micro version, to be followed by software for the Commodore 64. "We are trying to write transportable code and many of the Forth routines have been translated pretty much as is from the Apple." Commands are self-explanatory: 90 Forward moves Topo forward by 90cm. 90 Left turns Topo through 90°.

At the moment, Topo is capable of little else apart from driving about and talking.



But the age of the robot is only just beginning and there are many problems yet to be solved.

"How do you make a robot climb upstairs? Lateral thinking — for the moment the solution is move into a flat! But we are working on it. We have a joke at the moment. Why did the robot cross the road? Because it didn't know it was there.

"Vision is one of the biggest problems. Without recourse to very sophisticated software it is not possible for a robot to distinguish between different objects. Writing such a program is fine for development work but would be out of the question for an average computer enthusiast.

"So there may have to be some compromises with object identification — we may need to give the robot a helping hand by putting the object on a special plate." This plate might be a passive aid displaying a bar-code which could be read by the robot. Long-range bar-code readers are now available so the robot could pick up the information from some way off. Alternatively, the plate could be an active aid — an infra-red transmitter, for example.

Another idea is to use ultrasonic techniques. An ultrasonic detector works like radar — measuring distance by the time taken for an ultrasonic beam to be reflected back from some obstacle to the robot. In this way the presence of an object may be detected together with its size. "The problems start when you ask it to distinguish between two objects," says Graham. "If one is like a match box and the other the size of a TV then it should be okay but sorting out similar sized objects is much more tricky."

If the robot is preprogrammed with the dimensions of all the possible objects it may encounter, then it can make comparisons. But what happens if one object is square-on to the robot while another is at an angle? The computer attached to the robot ends up having to take the co-ordinates of the object it sees and carry out a three-dimensional rotation of the corner points, trying to match them up with something it knows. Object identification is not as easy as it would first appear.

Having identified the object, the next thing might be for the robot to pick it up. "To begin with an arm of some sort seems a good idea. Unfortunately, they cannot lift much weight and are very complex to manufacture. At the moment we are thinking more in terms of a device which operates like a fork-lift truck."

Both Androbot and Prism are working on a range of add-on units for Topo, giving it perhaps bump detectors, a bar-code reader, a lift, an ultrasonic detector, an arm, a vacuum cleaner, a lawnmower and maybe even a personality. The possibilities are endless and most of the really useful additions are still a long way off.

At £1,500 Topo isn't cheap. Personal robotics is only just beginning and there is an awful lot of work still to be done.



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“Vengo”

“Vengo”

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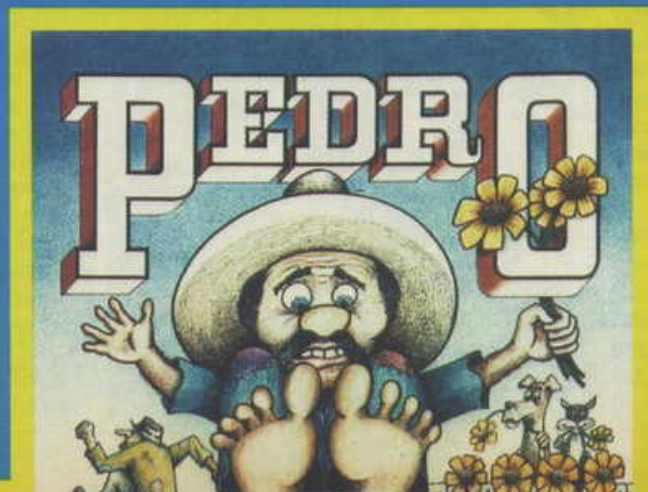
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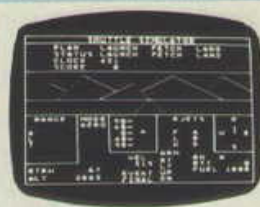
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**John Menzies**



## A snowball's chance

Barbara Conway finds herself walking some pretty mean streets in this round-up of BBC adventures

After spending the new year industriously falling into pits and chasms, drowning several times, being attacked by all manner of nasties ranging from trolls to giant insects and sinking my pacifist principles more times than I can count in order to wreak havoc of my own, I just hope you appreciate the effort I have been putting in on your behalf.

To be fair, there have been compensations, such as the extraordinary array of treasures I have collected, from rare gems to bunches of vegetables. There have also been a pleasing number of new acquaintances, several of whom have so far refrained from trying to kill me together with at least one who will take any given opportunity (some of them decidedly inconvenient) to sit down and sing. In fact taking everything, including the reincarnations, into account, it has really been quite fun.

And that, of course, has been the object of the exercise. Adventure games, if properly written, should leave the would-be hero(ine) at best triumphant and at worst frustrated but determined to try again and outwit the program. Of the half-dozen I was trying out on the BBC "B", the general standard was excellent, although one or two suffered from that bane of all adventurers, the pointless maze, and their wearisome, annoying, language problems.

Despite offers of help when I got stuck by several of the software houses involved, all these adventures were tackled on the basis that the buyer can't normally get help like that, so neither would I. After a good many years in daily journalism, I backed myself to have as devious a mind as any program writer. In at least one case, I overrated myself dismally.

The case in question was that of *Snowball*, from Level 9 Computing. My assignment was to rescue the giant colony starship *Snowball* from imminent destruction in the heart of a nearby star. There were 200,000 sleeping colonists who had entrusted me with their lives, happily oblivious to the fact that they didn't have a "snowball's" chance with me as the only agent awake and able to deal with the emergency. My most consistent score was 100 out of a possible 1,000.

### Shades of a lensman

The cassette is accompanied by a very detailed booklet putting the problem into its own historical perspective. The adventurer is Kim Kimberley (do I detect faint echoes of the E.E. Doc Smith's "Lensman" books?) awaking prematurely in his/her freezer coffin to find that the directional programming has gone awry. Urgent action is needed.

So far, so good. Few seasoned adventurers will have any difficulty escaping from the coffin, but no points are gained from this so don't feel too smug about it. The problems haven't even begun yet. Using the very sophisticated language structure of the program, you now have to work your way up through the ship, from the lowest level, making sure that you pick up, and where necessary construct, items which will aid your mission. There are no easy get-outs in *Snowball*. Yelling "help" gets you nowhere and invective doesn't help much either.

There are said to be 7,000 rooms in all, although there is a great deal of duplication



on the various levels. Nothing that you find is useless, although some items are rather difficult to locate and hang onto, and you can get useful experience in matters such as assembling a spacesuit. As a general rule, press buttons and pull levers whenever the opportunity presents itself. And bird-lovers should take note that on *Snowball* hanging around to hear a nightingale sing will always have fatal consequences!

A complex, original adventure with a hellish puzzle at the start and consistent brain exercise throughout.

Onto one of the most frequently-reviewed, and innovative, micro adventure games going, Melbourne House's *The Hobbit*. This has finally emerged on the BBC and, although the saga itself remains unchanged, there is one major difference from the Spectrum and other versions. Because of the memory limitation of the BBC, this version lacks the excellent graphics on the other machine.

I can live with this lack quite happily, not least because, as a long-time fan of the original J.R.R. Tolkien book (supplied with the game), I prefer to imagine the settings for myself. And nothing has been lost from the adventure itself which follows the plot of the book very closely. You are Bilbo the Hobbit, reluctant adventurer, setting out to beard the dragon Smaug in his lair and steal his treasure. But before you get anywhere near Smaug, you must travel across Middle Earth with (unless and until you lose them) Thorin the dwarf and Gandalf the magician as companions. This is a real-time adventure and, if you don't use the English (sic) vocabulary to act yourself, the other characters will carry on without you. Given half a chance, Thorin will burst into song about gold, while Gandalf will wander in and out and, if requested, may possibly give you a strange map which you can get another to translate for you, and maybe give you lunch as well.

But life isn't all food and song. Apart from a plentiful array of lethal nasties (beware the pale, bulbous eyes), you are pretty well bound to find yourself thrown into jail at least once and, unless you have established friendly relations with one traveller,





you won't get out. You can give complex instructions, speak to the various characters, ask them to chat to each other and, where essential, have a go at killing things. But remember that Hobbits are very definitely not in the warrior class and use your wits, and the book, wherever possible. Don't get bloodthirsty and try to kill your friends either. They will almost certainly turn the tables, and even if you succeed you will live to regret it. Or not.

The "interactive" element of *The Hobbit* does have clear limitations. Although the characters act without you, those actions are mostly confined to popping in and out, singing and maybe grabbing something, like the map. But this is carping. *The Hobbit* is a pleasure to play and, even after successfully completing the treasure-hunt, there are still challenges. It is possible to get scores of well over 100 percent through adroit adventuring. I suppose it's only wistful yearning on my part that makes me wonder if anyone could ever produce a similar effort on Tolkien's mind-blowing *Hobbit* sequel, *The Lord of the Rings*.

Although *The Hobbit* has the most detailed and readable documentation of any game to date, Salamander's case file for *Franklin's Tomb*, part of a wild detective trilogy, proves a very handy crib to keep around while wandering through the eponymous crypt. So useful, in fact, that I can even forgive the use of one of the oldest gags in the business in the intro.

## Mean streets

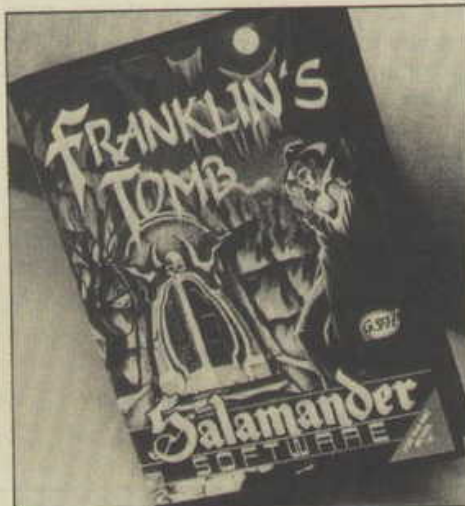
You are Dan Diamond, ex-cop, private eye very much in the Marlowe mould. Lured to a cemetery by a note delivered by a uniformed dame, the ground suddenly opens under your feet and there you are, in a strange chamber with a locked door behind you, no way back to the outside world and a distinct feeling that these streets are the meanest yet.

*Franklin's Tomb* comes into the "moderately difficult" class of adventure, but it has a pleasant sense of humour which lifts it above the norm. It is possible to get killed (beware of getting into any one-way systems without suitable precautions) and there is a desperately frustrating "maze" problem involving some over-playful giant bats. The spelling also looks a bit eccentric at times but, in at least one case, what I thought was a spelling mistake turned out to be an important clue. A very appealing package.

*Castle Frankenstein*, from Epic Software, is a more familiar scenario. After an opening cacophony (incidentally *Franklin's Tomb* has a *Pink Panther* musical intro while *Snowball* has a complex musical theme of its own) you find yourself in a village neighbouring the castle of the title. There have been mysterious murders locally and the villagers have nominated

lucky old you to find out if the dreaded Monster has returned.

This is rather more of a conventional adventure than the others in this group, and there were some language problems (if I am told I am on an east/west road I get annoyed if told I can't go west). But after a bit of trial and error it is possible to get



around fairly well, providing that you have managed to gather a few essentials of which the lamp may well be the most important.

Not my favourite, but a substantial adventure with fast reaction times and a good screen lay-out.

Last but not least, two of Acornsoft's own adventures, starting with *Sphinx Adventure*. Like the rest, these are text-only. Starting from the top of a mountain, the adventurer must find the Sphinx and live to tell the tale (and collect the treasure) amassing points, and penalties, en route.

Acornsoft adventures tend to have a sense of the ridiculous, despite accepting limited vocabularies. Those used to indis-

criminate killing beings which seem to stand in their way may not get very far. Magic can come in handy, as can a certain limited knowledge of zoology and, as always, when in doubt pick up objects and when you have too many make sure you can find what you drop. The use of most things becomes reasonably apparent quite quickly and there are plenty of objects scattered around.

In *Countdown to Doom* the start is similar to that of *Snowball*, since you are apparently trapped in a spaceship control room. But, when (if) you get out of that one, the scene changes completely. You are on the grim treasure planet of Doom and, if you know what's good for you, you'll get as much loot as you can, fix the ship and blast off before you're stranded there for eternity.

There are plenty of ways to die on Doom, and most of them can, if approached in the right spirit, be forestalled and turned to your advantage. Remember that Doom is hostile, but pretty logical. Staying for too long in the freezing cold can kill you just as effectively as the dreaded pit. But there are ways out of most problems, particularly if you find ways of manipulating the fourth dimension and you can get on with the computer (players only familiar with cassette drives for micros may have a problem in that last respect).

Both these games are absorbing and require intelligent consideration as well as humanitarian instincts (reckless killing can damage your prospects considerably). Being killed yourself may be little more than an inconvenience since reincarnation can be swift and, although it involves unpredictable changes of location, does not deprive you of your hard-won treasures. My own feeling was that *Countdown* was marginally the more devious, and therefore enjoyable, of the two but neither should disappoint.

Firm	Program	Cost
Acornsoft	<i>Sphinx Adventure</i>	£9.95
c/o Vector Marketing	<i>Countdown to Doom</i>	£9.95
Denington Estate		
Wellingborough		
Northants NN8 2RL		
Melbourne House	<i>The Hobbit</i>	£14.95
131 Trafalgar Road		
Greenwich		
London SE10		
Salamander Software	<i>Franklin's Tomb</i>	£9.95
17 Norfolk Road		
Brighton		
East Sussex BN1 3AA		
Level 9 Computing	<i>Snowball</i>	£9.90
229 Hughenden Road		
High Wycombe		
Bucks HP13 5PG		
Epic Software	<i>Castle Frankenstein</i>	£7.95
10 Gladstone Street		
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## Bilingual bytes

Ian Logan explains some of the mysteries of Basicode

On the 14th of January, 1984, the BBC's Radio 4 acknowledged the existence of the 'microcomputer revolution' by launching its weekly *Chip Shop*. (Radio 4 at 5pm on Saturdays, and 11pm on Tuesdays).

And, as a part of the programme there is a 'takeaway service' of free programs. These programs are broadcast in *Basicode*, and should be loadable into a wide range of common microcomputers. So far, the free programs have been games, but it is intended that in the broadcasts to come, there will be a wide range of programs — hopefully including ones sent in by listeners.

However, in order to take advantage of the 'free' *Basicode* programs, it is necessary to get a 'Basicode-kit' costing £3.95 from the BBC — as yet, there is no such kit available for the Spectrum. A full *Basicode*-kit program will allow for both the *Loading* of a *Basicode* program and for its conversion into the dialect of Basic that is used in the Spectrum. This conversion will not be easy and, until the proper *Basicode*-kit program for the Spectrum appears, it is a matter of guess work as to just how limited the conversion might be.

In this first article, I would like to discuss the 'tape standard' used in the transmission of the *Basicode* programs, and in next week's article give a program for the Spectrum that allows *Basicode* programs to be *Listed*. But, in order to get a *Basicode* to Run, it will be necessary to re-enter the program into the Spectrum — making the required changes as appropriate (probably not very easy!).

The *Basicode* programs are transmitted serially using a 2-tone system. Logic 1's are represented by two full waveforms at 2400 hz, and logic 0's by a single full waveform at 1200 hz. Each byte of data is sent 'least significant bit' (lsb) first, and only the lower seven bits of a byte are sent — as this is all that is necessary to convey the normal Ascii character set.

Normally, before the bytes of the program are sent, there is a seven second 'leader' made up of single full waveforms at 2400 hz. Before each byte of the program, there are three full waveforms at 2400 hz that form a byte-leader, and a byte-start-bit of a single waveform at 1200 hz.

The tape will normally be read by first 'locking onto' the 'leader' of the program and then, for each byte, identifying byte-start-bit before collecting the seven bits that together form a byte of data.

The use of byte-leaders and byte-start-bits allows for a computer to re-synchronise itself to each new byte of data; thereby allowing for differing 'clock rates' between

machines. The first byte of a *Basicode* program is normally a byte of value '2' and the last byte one of value '3'. As there is no header to the program itself, the end of a program can only be identified by the finding of the '3' byte.

The *Tape Examining* program that accompanies this article allows a 48K Spectrum to be used as an oscilloscope. With this program it is possible to produce 127 traces, spanning a half of a second's reading of the Spectrum's cassette port.

The program uses the machine code routine:

```
start  ld a,07h      ;clear port
       out (0feh),a
       ld hl,8020h   ;clear memory
       ld (hl),00h
       inc hl
       ld d,h
```

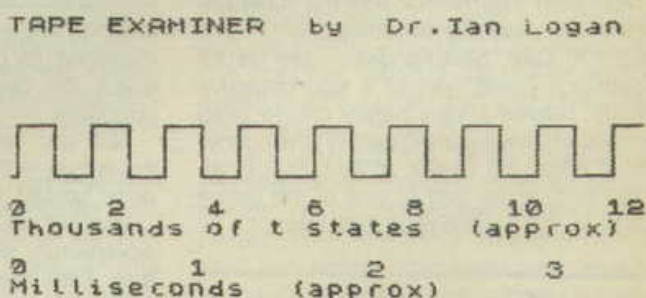
```
ld e,l
ld bc,7fdh
ldir
ld b,40h      ;mask bit 6
ld hl,8020h   ;base of memory
in a,(0feh)
and b         ;mask cassette bit
ld (hl),a     ;store result
inc hl       ;step on
ld a,h
or l
jr nz,loop
ret          ;until at 0000h
           ;all done
```

The 'loop' examines the cassette port every 1/73000 of a second and therefore gives a fairly good demonstration of the 1200 hz and 2400 hz signals found in a *Basicode* transmission.

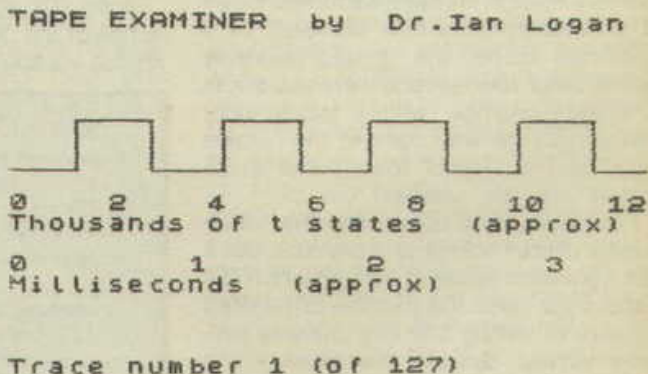
The results obtained with this program are shown in Figures 1-3.

In next week's article I will give a *Basicode* listing program, but in the meanwhile why not try to write your own. All the necessary information is contained in the above article and *The Complete Spectrum Rom Disassembly* by myself and Dr Frank O'Hara.

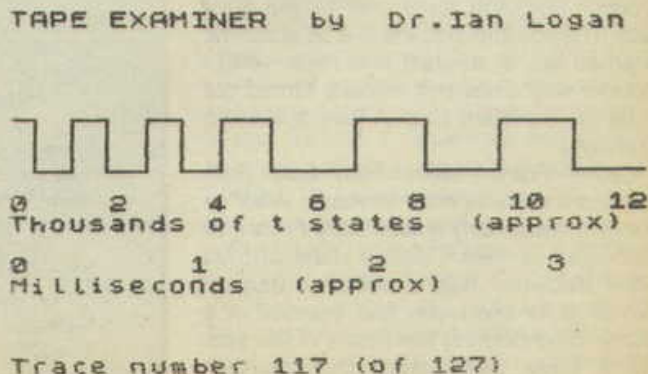
**Figure 1**  
This shows a section of the 7 second leader. There are repeated full waveforms at 2400 hz. — each half wave takes about 700 t states.



**Figure 2**  
This shows part of a byte of data. The bits of this byte are all logic 0's and each full wave takes a little over 300 t states.



**Figure 3**  
This shows a typical byte-leader followed by a byte-start-bit. The byte-leader goes from the 500 t state point to the 5000 t state point; and the start-bit from 5000 to 8000. The first two bits of the byte of data are both logic 0's in this tracing.





```

1 REM ** TAPE EXAMINER **
2 REM ** by Dr.Ian Logan **
10 CLEAR 32767
20 REM ** get machine code **
30 FOR a=0 TO 31: READ b: POKE 32768+a,b: NEXT a
40 PRINT AT 4,0: PAPER 6:"TAPE EXAMINER by Dr.Ian Logan "
50 REM ** read tape **
60 PRINT AT 13,0: PAPER 6:" Start tape and press any key "
70 PAUSE 0
80 RANDOMIZE USR 32768
90 REM ** display routine **
100 PRINT AT 13,0: PAPER 5:" Stop tape now. Press any key "
110 PAUSE 0
120 PRINT AT 13,0: PAPER 6:"0      2      4      6      8      10      12"
130 PRINT PAPER 6:"Thousands of t states (approx) "
140 PRINT AT 16,0: PAPER 6:"0          1          2          3          "
150 PRINT PAPER 6:"Milliseconds (approx) "
160 LET t=1
170 PRINT AT 21,0: PAPER 6:"Trace number ";t;" (of 127)";TAB 31;" "
180 LET p=0
190 LET a=32544+t*256
200 LET n=PEEK a: LET n1=PEEK (a+1)
210 IF n THEN PLOT p,100
220 IF NOT n THEN PLOT p,80
230 IF n<>n1 THEN PLOT p,80: DRAW 0,20
240 LET p=p+1
250 IF p<256 THEN LET a=a+1: GO TO 200
260 INPUT "Next trace number (0=RUN)? ";t
270 IF t<1 THEN RUN
280 REM ** clear trace **
290 IF t>127 THEN GO TO 260
300 REM ** clear trace **
310 PRINT AT 9,0: PRINT TAB 31:CHR$ 32:TAB 31:CHR$ 32:TAB 31:CHR$ 32
320 LET p=0
330 GO TO 170
500 REM ** machine code data **
510 DATA 62,7,211,254
520 DATA 33,32,128,54,0,35,84
530 DATA 93,1,223,127,237,176
540 DATA 6,64,33,32,128
550 DATA 219,254,160
560 DATA 119,35,124,181
570 DATA 32,247,201

```



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# Boosting the beep

*Trevor Toms looks at the beeper in his series on machine code*

One of the weakest features of the Spectrum is the beeper, which manages only barely audible squeaks of limited form in Basic (ever tried to listen to the sound effects from that new game at a ZX Microfair?). Machine code certainly widens the type of effects that can be created, although this still falls behind the more recent home computers. Gripes aside, though, this week we'll look at ways of using a couple of Rom entries that allow you access to the beeper.

Firstly, let's look at the way of simulating the *Beeper* command. The Rom routine is *XBeeper*, at address 3B5h, and it requires that the FP stack holds the pitch as the topmost item with the duration as the second. If you're unsure about the FP stack (not the Z80 stack), read last week's article. Since I have not had sufficient space to describe the format of floating point numbers, it is not possible for me to describe the best way of placing numbers on the FP stack, but with only simple arithmetic, it is quite easy to obtain almost any value that you need.

Personally, I find that it is easiest to assume that all beep durations occur in multiples of 1/100th of a second, and that all pitches take integer values only. You are not restricted to this, but it does make life simpler. Listing 1 shows you a small program that simulates:

```
10 FOR b=0 TO 69
20 BEEP 0.05,b
30 NEXT b
```

Remember that the longest duration is 10 seconds, and the highest pitch value is 69. Go outside these ranges and you'll be given a suitable error report from the *XBeeper* routine.

If you want to play a complete tune, then the best method is to hold your tune data in a series of *DEFW* instructions, terminated by a duration of -1. Listing 2 shows such a subroutine — all you need to do is add your tune at the appropriate point. The example plays a short melody.

Moving onto effects, you need a routine called *XSound*, at Rom address 3B5h. In this routine, registers DE hold the effective duration, while registers HL hold the relative pitch. The values in these registers can be worked out to provide genuine tones, but I would suggest that you might as well use the *XBeeper* routine if that's what you want to do. *XSound* is much more useful for creating effect, and Listing 3 shows how you might approach the creation of a sound effect. Don't ask me what it's supposed to sound like — just see how it has been achieved!

With the *XSound* routine, you must be aware of one or two side effects. Firstly, the

Spectrum interrupts are disabled during the routine, so lengthy noises will cost your fast action game dearly. Secondly, the duration of the routine (supplied in registers DE) alters with different frequencies such that doubling the frequency will have the duration for the same given value supplied in DE. By all accounts, the best way is to experiment with different values set within loops such as that shown in Listing 3. Keep the values of DE low so that sounds are produced rapidly, making it possible to create a type of "white noise".

Since this week's article is slightly shorter, I will spend a little time refreshing the concept of assemblers for the newcomers to the series. An assembler is a way of entering your machine code in mnemonic

form, such as that shown in the examples. All jumps, calls and data references can be made using symbol names, letting the assembler assign a value to the symbol while running. In this way, the programmer can free himself/herself from the necessity of calculating the number of bytes needed in relative jump instructions — the assembler does it automatically.

Coding becomes more structured, since it is not necessary to leave those awkward gaps needed for patching up a non-working program. In addition, the likelihood of errors due to decimal/hex translation reduces to nil! There are many assemblers available, nearly all of which are quite capable of dealing with the listings and routines given in these articles with only a few minor alterations.

By Trevor Toms, author of *The Spectrum Pocket Book*, published by Phipps Associates.

## LISTING 1 - Simulating BEEP commands

Addr	Hex	Op	Operands
D6D8		XBEEP:	
D6D8		EQU	3F8H
D6D8		XSTKBC:	
D6D8		EQU	2D2BH
D6D8		BEGIN\$HERE:	
D6D8	010000	LD	BC,0 ;STARTING PITCH
D6DB		LOOP:	
D6DB	C5	PUSH	BC ;SAVE PITCH
D6DC	010500	LD	BC,5 ;SET UP 5/100 SEC.
D6DF	CD2B2D	CALL	XSTKBC ;ONTO FP STACK
D6E2	016400	LD	BC,100
D6E5	CD2B2D	CALL	XSTKBC
D6E8	C1	POP	BC ;GET PITCH
D6E9	C5	PUSH	BC ;...BUT SAVE AGAIN
D6EA	CD2B2D	CALL	XSTKBC ;PUT ON FP STACK
D6ED	EF	RST	28H ;FP CALCULATOR
D6EE	C0	DEFB	0COH ;SAVE PITCH
D6EF	02	DEFB	02H ;DELETE IT
D6F0	05	DEFB	05H ;5/100
D6F1	E0	DEFB	0EOH ;GET PITCH
D6F2	38	DEFB	38H ;EXIT FP
D6F3	CD803	CALL	XBEEP ;MAKE THE SOUND
D6F6	C1	POP	BC ;PITCH AGAIN
D6F7	03	INC	BC ;INCREMENT PITCH
D6F8	214500	LD	HL,69 ;END LIMIT
D6FB	AF	XOR	A ;CLEAR FLAGS
D6FC	ED42	SBC	HL,BC ;CHECK FOR FINISH
D6FE	30DB	JR	NC,LOOP ;KEEP GOING!
D700	C9	RET	;BACK TO BASIC

Symbols:

XBEEP 03F8 XSTKBC 2D2B  
BEGIN\$ D6D8 LOOP D6DB

No error(s)

continued on page 23



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## LISTING 2 - Playing a tune

Addr	Hex	Op	Operands			
D6D8		XBEEP:		D707 CDF803	CALL XBEEP	:PLAY NOTE
D6D8		EQU 3F8H		D70A E1	POP HL	:RESTORE POINTER
D6D8		XSTKBC:		D70B 19CE	JR PLAY#NEXT#NOTE	
D6D8		EQU 2D2BH		D70D	TUNE#DATA:	
D6D8		XSTKDATA:		D70D 3200	DEFW 50	:DURATION
D6D8		EQU 2D34H		D70F 0000	DEFW 0	:PITCH
D6D8		PLAY#TUNE:		D711 3200	DEFW 50	
D6D8*210000		LD HL,TUNE#DATA		D713 0000	DEFW 0	
D6DB		PLAY#NEXT#NOTE:		D715 1900	DEFW 25	
D6DB 4E		LD C,(HL)	:GET DURATION	D717 FFFF	DEFW -1	
D6DC 23		INC HL		D719 1900	DEFW 25	
D6DD 46		LD B,(HL)		D71B 0000	DEFW 0	
D6DE 23		INC HL		D71D 3200	DEFW 50	
D6DF 03		INC BC	:CHECK FOR -1	D71F 0200	DEFW 2	
D6E0 78		LD A,B		D721 6400	DEFW 100	
D6E1 B1		OR C		D723 F0FF	DEFW -3	
D6E2 C8		RET Z	:END DETECTED	D725 6400	DEFW 100	
D6E3 0B		DEC BC	:RESTORE DURATION	D727 FBFF	DEFW -5	
D6E4 E5		PUSH HL	:SAVE TABLE POINTER	D729 FFFF	DEFW -1	:DURATION -1 = END
D6E5 CD2B2D		CALL XSTKBC	:STACK DURATION			
D6E8 016400		LD BC,100	:IN 1/100THS SEC.			
D6EB CD2B2D		CALL XSTKBC				
D6EE E1		POP HL	:NOW GET PITCH			
D6EF 4E		LD C,(HL)				
D6F0 23		INC HL				
D6F1 46		LD B,(HL)				
D6F2 23		INC HL				
D6F3 E5		PUSH HL	:SAVE POINTER			
D6F4 CB00		RLC B	:STACK SIGNED VALUE			
D6F6 CB08		RRC B	:...SEE LAST WEEK			
D6F8 9F		SBC A,A				
D6F9 5F		LD E,A				
D6FA 51		LD D,C				
D6FB 48		LD C,B				
D6FC AF		XOR A				
D6FD 47		LD B,A				
D6FE CD342D		CALL XSTKDATA				
D701 EF		RST 28H				
D702 C0		DEFB 0C0H	:STORE 0			
D703 02		DEFB 02H	:DELETE			
D704 05		DEFB 05H	:DURATION/100			
D705 60		DEFB 0E0H	:GET MEM 0			
D706 38		DEFB 38H	:EXIT			

Symbols:

XBEEP 03F8 XSTKBC 2D2B  
XSTKDA 2D34 PLAY#T D6D8  
PLAY#N D6DB TUNE#D D70D

No error(s)

## Listing 3

Addr	Hex	Op	Operands			
D6D8		XSOUND:		D6F0 B1	OR C	:HAS IT REACHED ZERO?
D6D8		EQU 3B5H		D6F1 20EE	JR NZ,SLOOP	:REPEAT IF NOT
D6D8		MAKE#NOISE:		D6F3 C9	RET	:ELSE BACK TO BASIC
D6DB 01EA01		LD BC,490	:LOOP COUNTER	D6F4	NOISE:	
D6DB 21F401		LD HL,500	:BASE FREQUENCY	D6F4 E5	PUSH HL	:SAVE REGISTERS
D6DE 110200		LD DE,2	:SOUND DURATION	D6F5 D5	PUSH DE	
D6E1		SLOOP:		D6F6 C5	PUSH BC	
D6E1 E5		PUSH HL	:SAVE BASE FREQ	D6F7 CDB503	CALL XSOUND	:ROM ROUTINE
D6E2 09		ADD HL,BC	:UPPER FREQUENCY	D6FA C1	POP BC	:RESTORE REGISTERS
D6E3*CD0000		CALL NOISE	:MAKE THE SOUND	D6FB D1	POP DE	
D6E6 E1		POP HL	:RESTORE BASE	D6FC E1	POP HL	
D6E7 E5		PUSH HL	:...AND SAVE AGAIN	D6FD C9	RET	
D6E8 ED42		SBC HL,BC	:LOWER FREQUENCY			
D6EA*LD0000		CALL NOISE				
D6ED E1		POP HL				
D6EE 0B		DEC BC	:CHECK COUNTER			
D6EF 78		LD A,B				

Symbols:

XSOUND 03B5 MAKE#N D6DB  
SLOOP D6E1 NOISE D6F4

No error(s)



## Keyboard table

**C McGinley** shows how to make use of the Dragon's keyboard reading routines

Locations 337-345 are known as the keyboard rollover table. With no keys pressed, they each hold the value 255. Whenever a key is pressed, the appropriate location changes to a certain value. (Fig 1 shows a few examples).

The values produced when a key is pressed stay the same all the time the key remains pressed. Reading the keyboard by *Peeking* the appropriate location, instead of using *Inkey\$* from within a program can produce a repeat key effect. An example from Fig 1 — forgetting location 337 for now — Cap A = location 339 and value 251 when pressed. This method allows more than one key to be read at a time by *Peeking* the appropriate locations. These locations and values can be found by using Program 1 and pressing the key required.

Other than *Peeking*, the only way a key can be read again is after the rollover table has been reset. This is achieved on releasing the key, therefore there is no repeat key. Writing 255 to these locations from within a program will also produce a sort of repeat key usable with *Inkey\$*. A subroutine jump will produce this, eg:

```
50 AS = INKEY$: IF AS = "" THEN 50 ELSE GOSUB
1000 FOR A = 337 TO 345 = POKE A, 255: NEXT:
RETURN
```

Machine coding is a better method to do this and also opens up ways of making repeat key a function of the machine. The following method makes use of the systems interrupts.

Every 1/50th of a second the processor stops what it is doing and runs various interrupt routines, ie: to refresh Ram, update clock, service any peripherals that require it, etc. When a regular interrupt (IRQ) happens, the processor jumps to and runs the routine at the location held in the reset vector table (&H BFF0 — &H BFFF). The IRQ location (&HBFF8) holds &H10C which in turn holds a three byte routine:

```
&H10C    7E    JMP
&H10D    9D    9D
&H10E    3D    3D
```

This instruction sends the processor to routines starting at &H9D3D.

If we alter the address held in &H10D and &H10E we can divert the interrupt to a routine of our own design before sending it on its normal path. If this is a rollover reset routine, then every interrupt the rollover table will be reset ready for re-reading. A basic machine code loader at the beginning of a program will achieve this. Assembly Listing 1 and Program 2 are examples.

To develop this further, it would be nice to have a repeat key available all the time.

This can be achieved with the interrupt method, but just resetting the rollover table is not adequate — an element of delay is required but with certain conditions, ie:

- (i) There must not be a delay every interrupt, otherwise operation of the computer will be slowed down to unacceptable levels.
- (ii) Delay is only required on the first character to allow time to release the key if only one character is required.
- (iii) Subsequent characters need no delay.

Assembly Listing 2 is a machine code routine that produces the above conditions.

I have produced a delay by using address 32766 as a counter. Counting up to 50 produces a useful delay.

Working through the routine — the first stage is to clear the address used as a counter and then load IRQ jump address with the location of my routine. The main routine first checks location 337 of the rollover table. This address always changes whichever key is pressed. If it is 255 (no key pressed) it then checks the counter to see if it is 50. If true (delay complete), it resets rollover table and exits to interrupt. If the counter is less than 50, it increments counter and exits to interrupt.

The machine code from Assembly Listing 2 can be loaded with Program 2 by altering the data in line 10 to the data in column 2 of Assembly Listing 2 (do not forget the FINI at the end). Then delete lines 100-130 in Program 2.

### Assembly Listing 1

```
7FBD CC7FC4      20    LDD #0RK,PCR    LOADS INT. VECTOR
7FC0 FD010D      30    STD #10D        WITH ADDRESS OF
7FC3 39          40    RTS            MY ROUTINE
7FC4 CFFFFF      50    @RK LDD #FFFF
7FC7 8E0151      60    LDX #337
7FCA ED01        70    @RESET STD ,X++    RESETS ROLLOVER
7FCC 8C0153      80    CMPX #345        TABLE
7FCF 26F3        90    BNE @RESET
7FD1 A784        100   STA ,X
7FD3 7E9D3D      110   JMP #9D3D        EXITS TO INT.
7FD6             120   END
```

### Assembly Listing 2

```
7FBD 7F7FFE      20    CLR 32766        RESTS DELAY COUNTER
7FC0 CC7FC7      30    LDD #0RK,PCR    DIVERTS INT.
7FC3 FD010D      40    STD #10D        TO MY ROUTINE
7FC6 39          50    RTS
7FC7 B00151      60    @RK LDA 337        CHECKS FOR KEY
7FCA 81FF        70    CMPA #255        PRESSED
7FCC 2606        80    BNE @START,PCR  IF YES CARRY ON
7FCE 7F7FFE      90    CLR 32766        IF NO RESETS COUNTER
7FD1 7E9D3D      100   JMP #9D3D        AND EXITS TO INT.
7FD4 B07FFE      110   @START LDA 32766  CHECK DELAY COUNTER
7FD7 8132        120   CMPA #50
7FD9 2F12        130   BLE @FIRST,PCR  UNDER 50 MISS RESET ROLLOVER
7FDB CFFFFF      140   @CLEAR LDD #FFFF
7FDE 8E0151      150   LDX #337
7FE1 ED01        160   @RESET STD ,X++    IF 50 RESET
7FE3 8C0153      170   CMPX #345        ROLLOVER TABLE
7FE6 26F3        180   BNE @RESET,PCR  AND EXIT TO INT.
7FE8 A784        190   STA ,X
7FEA 7E9D3D      200   JMP #9D3D
7FED 7C7FFE      210   @FIRST INC 32766  INCREMENT COUNTER
7FF0 7E9D3D      220   JMP #9D3D        AND EXIT TO INT.
7FF3             230   END
```



## Programme 1

```

5 '****ROLLOVER TABLE****
10 CLS:PRINT "location","n.p. pressed
":PRINT STRING$(32,"-");
20 FOR A= 337 TO 345:PRINTA,"255"
:NEXT A
:PRINT @396,"[  ]"
30 A$=INKEY$:IF A$="" THEN 30
40 IF ASC(A$)=10 THEN A$="DOWN]"
:GOTO 80
50 IF ASC(A$)=8 OR ASC(A$)=21
THEN A$="L
EFT]": GOTO 80
60 IF ASC(A$)=9 THEN A$="RIGHT]"
:GOTO 80
70 A$=" "+A$+" ]"
80 B=88:PRINT @397,A$ " ";
-FOR A=337 TO
345:PRINT @B,PEEK(A):B=B+32:NEXT A
90 GOTO 30

```

## Programme 2

```

10 DATA CC,7F,C4,FD,01,0D,39,CC,FF,
FF,8E
,01,51,ED,81,8C,01,59,26,F9,A7,84,
7E,9D,
3D,FINI
20 CLEAR 200,32700:A=32701
30 READ A$:IF A$="FINI" THEN 40
ELSE POK
E A,VAL("&H"+A$):A=A+1:GOTO 30
40 EXEC 32701
50 DEL-50
100 '
110 '*****MAIN PROG*****
120 CLS:PRINT "PRESS ANY KEY"
130 A$=INKEY$:IF A$="" THEN 130
ELSE PRI
NT A$;:GOTO 130

```

Fig.1

ROLLOVER TABLE PEEKS									
KEY	337	338	339	340	341	342	343	344	345
N.P.	255	255	255	255	255	255	255	255	255
SP. BAR	223	"	"	"	"	"	"	"	223
A	251	"	251	"	"	"	"	"	"
B	251	"	"	251	"	"	"	"	"
C	251	"	"	"	251	"	"	"	"
D	251	"	"	"	"	251	"	"	"
E	251	"	"	"	"	"	251	"	"
F	251	"	"	"	"	"	"	251	"
G	251	"	"	"	"	"	"	"	251
H	247	247	"	"	"	"	"	"	"
I	247	"	247	"	"	"	"	"	"
J	247	"	"	247	"	"	"	"	"
K	247	"	"	"	247	"	"	"	"
L	247	"	"	"	"	247	"	"	"
M	247	"	"	"	"	"	247	"	"
N	247	"	"	"	"	"	"	247	"
O	247	"	"	"	"	"	"	"	247
P	239	239	"	"	"	"	"	"	"
Q	239	"	239	"	"	"	"	"	"
R	239	"	"	239	"	"	"	"	"
S	239	"	"	"	239	"	"	"	"
T	239	"	"	"	"	239	"	"	"
U	239	"	"	"	"	"	239	"	"
V	239	"	"	"	"	"	"	239	"
W	239	"	"	"	"	"	"	"	239
X	223	223	"	"	"	"	"	"	"
Y	223	"	223	"	"	"	"	"	"
Z	223	"	"	223	"	"	"	"	"
←	223	"	"	"	223	"	"	"	"
↓	223	"	"	"	"	223	"	"	"
↖	223	"	"	"	"	"	223	"	"
→	223	"	"	"	"	"	"	223	"



## Character building

*S Pithers demonstrates the use of the BBC's multi-coloured characters*

This program is an improvement of one found in the BBC user guide. Although it is a fairly entertaining program in itself, its real value is as a demonstration of the use of the BBC's multi-coloured characters.

Ordinarily, you have to *Pling* each one directly. However, in this program I have

instead used the *Gcol 3,x* instruction — the important lines to note are 50-80 and 260 onwards. It should be easy to take out the relevant sections for use in your own programs.

### Program Notes

40.....MODE 2

50-80.....DEFINE CHARACTERS  
90-110.....DEFINE VARIABLES & JOIN TEXT & GRAPHICS CURSOR  
120.....REPEAT LOOP  
130.....READ A PIECE OF DATA  
140.....VARIABLE B\$=CHR\$ VALUE OF THE DATA  
150.....VARIABLE A\$=A\$+B\$  
160.....UNTIL DATA=227  
170.....REPEAT LOOP  
180-210 IF-THEN'S FOR SCREEN WALLS  
220.....GOTO PROCEDURE P: INCREASE VARIABLES  
230.....UNTIL LOOP  
260-290 PROCEDURE FOR PRINTING MULTI-COLOURED CHARACTER ON SCREEN

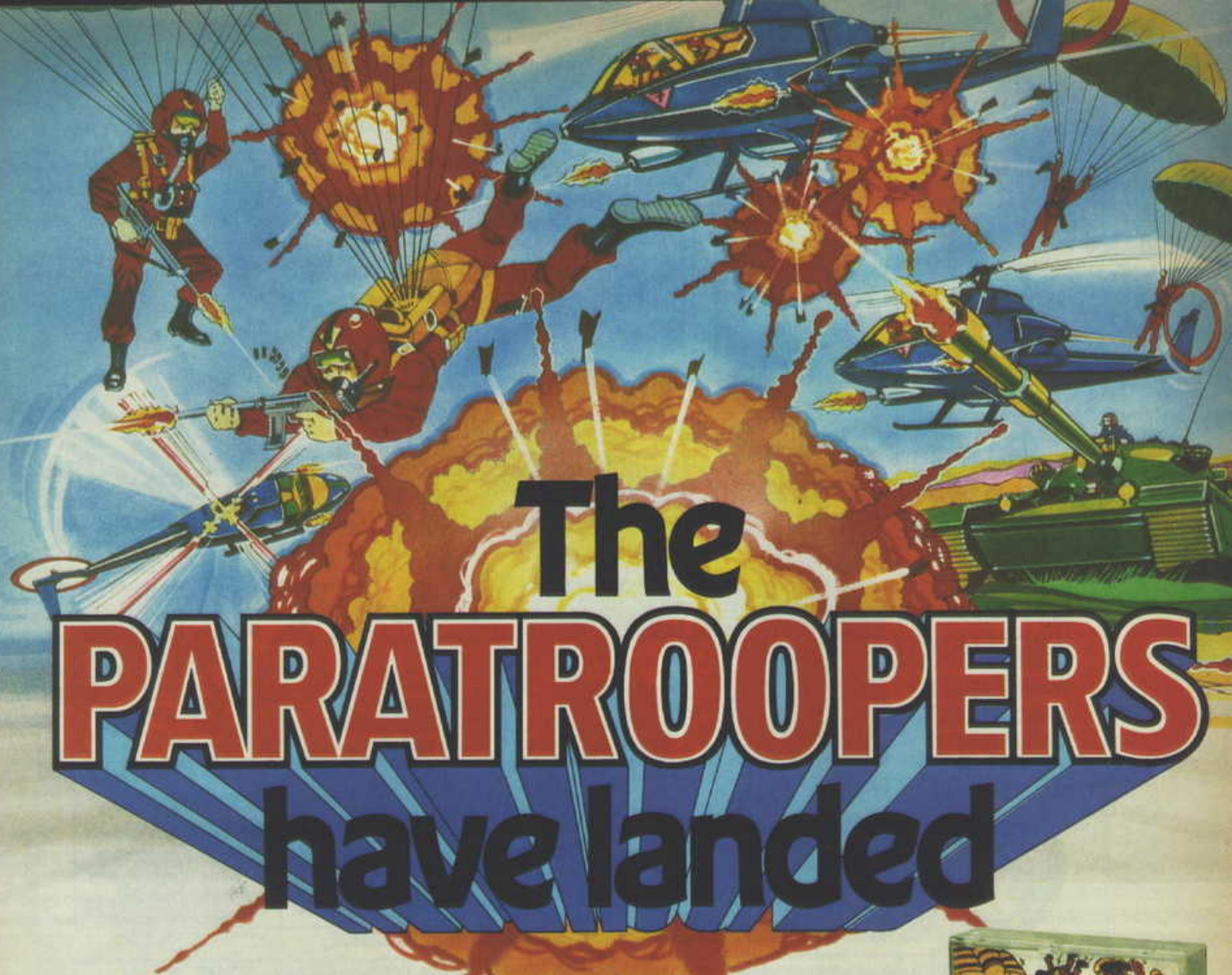
```

10 REM New Tartan
20 REM By S. C. Pithers.
30 REM
40 MODE 2
50 VDU 23,224,255,129,129,129,129,129,
129,255
60 VDU 23,225,0,126,66,66,66,66,126,0
70 VDU 23,226,0,0,60,36,36,60,0,0
80 VDU 23,227,0,0,0,24,24,0,0,0
90 T=8
100 X%=640:Y%=512
110 TX%=T:TY%=T:VDU5
120 REPEAT
130 READ B
140 B$=CHR$(B)
150 A$=A$+B$
160 UNTIL B=227
170 REPEAT
180 IF X%<20 THEN TX%=T
190 IF X%>1260 THEN TX%=-T
200 IF Y%<20 THEN TY%=T
210 IF Y%>1000 THEN TY%=-T
220 PROCP:X%=X%+TX%:Y%=Y%+TY%
230 UNTIL FALSE
240 END
250
260 DEF PROCP
270 MOVE X%,Y%
280 PRINT A$
290 ENDPROC
300
310 DATA 18,3,1,224,8
320 DATA 18,3,2,225,8
330 DATA 18,3,3,226,8
340 DATA 18,3,4,227
350
360 REM Changing the 'T' variable
370 REM to 16,32,48 or 64 for example
380 REM will change the tartan like
390 REM pattern, also try different
400 REM Multicoloured characters to
410 REM change the effect.

```

>





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you get depends on the weather, advertising and the price of the hot dogs. Extra customers may be attracted by buying expensive meat instead of the cheaper meat.

### Program notes

Program	Notes
1-100	Initialise variables
100-200	Prices
200-300	Main loop; screen output
300-500	Calculate customers
500-2000	Display; instructions

[illegible]



```

/100:M(N)=M(N)+VS(N)*PR(N)/100
570 PRINT"-----"
580 NEXT N
585 IF M(1)<=0 OR M(2)<=0 THEN 1000
590 PRINT"PRESS ANY KEY!!!!"
595 GET Z$:IF Z$="" THEN 587
598 NEXT M
600 PRINT"□"
610 PRINT"*****"
620 PRINT"*** YOU HAVE REACHED THE FINAL
    RESULTS***"
630 PRINT"*****"
640 PRINT"SCORE LAYER 1"
650 PRINT"TOTAL:\";M(1)
660 PRINT"-----"
670 PRINT"SCORE LAYER 2"
680 PRINT"TOTAL:\";M(2)
690 PRINT"-----"
700 IF M(1)<M(2) THEN PRINT"YOU DECLARE PLAYER
    2 AS THE WINNER!!!!!!"
710 IF M(2)<M(1) THEN PRINT"YOU DECLARE PLAYER
    1 AS THE WINNER!!!!!!"
720 IF M(2)=M(1) THEN PRINT"YOU DECLARE A
    DRAW!!!!!!"
800 INPUT A$
810 IF A$="N" THEN NEW
820 RUN
900 END

```

```

1000 FOR N=1 TO 10
1010 PRINT"*****"
1020 NEXT N
1030 PRINT"*** SOMEONE WENT BANKRUPT
    *****"
1040 FOR N=1 TO 10
1050 PRINT"*****"
1060 NEXT N
1200 FOR N=1 TO 1000:GOTO 600
2000 PRINT"□"
2002 PRINT"INSTRUCTIONS!!"
2004 PRINT"YOU ARE THE OWNER OF
    A 1-2-3 CHAIN"
2006 PRINT"IN 10 1-2-3"
2008 PRINT"YOU HAVE TO DECIDE ON HOW TO
    RUN YOUR
    BUSINESS.
    DECISION ABOUT THE 1-2-3
    AND AMOUNT OF "
2014 PRINT"IT- YOU BUY HAVE TO BE TAKEN."
2016 PRINT"YOU HAVE A CHOICE OF 3 SAUSAGES;"
2018 PRINT"1 ST GRADE BEING THE BEST!"
2020 PRINT"TOO HIGH PRICE WILL KEEP THE
    CUSTOMERS AWAY!!!"
2022 PRINT"1000 LUCK!!!!"
2030 GET KK$:IF KK$="" THEN 2030
2040 RETURN
READY.

```

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PCW 16/2/84



## Open Forum

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

## Mastermind

on Vic 20

This game was written on the unexpanded machine, but it should also work if you have the 3K Ram pack fitted. The instructions are exactly the same as for the popular board

game: A white dot indicates a correct colour in the right place.

Using logic you should be able to get the right combination. There are six colours and any combination may be chosen; a skill level determines how many colours you have to guess. Load listing 1 before loading listing 2 and save listing 2 as **"MASTER"**

### Listing 1

```

5 POKE56,28:POKE52,28
10 POKE36879,206:POKE36869,255:PRINT"☹":PRINT"IMPOSSIBLY 3 TO 6"
15 GETN$:IFN$=""THEN15
16 IFVAL(N$)<3ORVAL(N$)>6THEN15
17 N=VAL(N$)
20 FORX=1TON
30 A(X)=INT(RND(1)*6)+1
80 NEXTX
100 A$="+,";B$="<,";C$="& ";D$="<,";FORX=1TON-1
110 A$=A$+"<,";B$=B$+"<,";C$=C$+"& ";D$=D$+"<,"
120 NEXT: A$=A$+"*";B$=B$+"-";C$=C$+"& ";D$=D$+">"
130 PRINT"IMPOSSIBLE!";A$:FORX=1TO9:PRINT"IMPOSSIBLE!";C$
135 PRINT"IMPOSSIBLE!";B$:NEXT:PRINT"IMPOSSIBLE!";C$:PRINT"IMPOSSIBLE!";D$
140 C$(1)="☹";C$(2)="☹";C$(3)="☹";C$(4)="☹";C$(5)="☹";C$(6)="☹"
145 D$(6)="☹";D$(5)="☹";D$(4)="☹";D$(3)="☹";D$(2)="☹";D$(1)="☹"
146 E$(6)="☹";E$(5)="☹";E$(4)="☹";E$(3)="☹";E$(2)="☹";E$(1)="☹"
150 S=20:X$(1)="IMPOSSIBLE!";TB=9
155 S=S-2
156 X$="INPUT GUES S"
160 FORX=1TOLEN(X$):PRINTMID$(X$,X,1):NEXT
163 FORG=1TON
164 PRINT"☹":PRINTRIGHT$(X$(1),S):PRINTTAB(TB);:PRINT":":PRINT"||";
165 GETI$:IFI$=""THEN165
170 IFVAL(I$)<1ORVAL(I$)>6THEN165
180 B(G)=VAL(I$):TB=TB+2:PRINTC$(VAL(I$)):NEXT
190 X$="☹":FORX=1TOLEN(X$):PRINTMID$(X$,X,1):NEXT
210 GOSUB1000:GOSUB2000
220 FORX=1TON:FORY=1TON
230 IFX=YTHEN295
240 IFH(Y)=0THENGOTO295
250 IFB(X)=0THEN300
260 IFB(X)=H(Y)THENW=W+1:H(Y)=0:B(X)=0:GOTO295
295 NEXTY
300 NEXTX
301 IFB=NTHEN500
310 TB=4:PRINT"☹":PRINTRIGHT$(X$(1),S):PRINTTAB(TB);D$(B);E$(W)
320 TB=9:PRINT"☹":W=0:B=0
330 IFS<0THEN400
340 GOTO155
400 PRINT"IMPOSSIBLE!BAD LUCK"
410 PRINT"THE HIDDEN CODE WAS"
420 PRINT"☹":FORX=1TON:PRINTC$(A(X)):NEXT:PRINT
440 GOTO550
500 PRINT"IMPOSSIBLE!WELL DONE IT TOOK YOU"INT(20-S)/2;" TURNS"
550 PRINT"ANOTHER GO Y OR N"
560 GETL$:IFL$=""THEN560
570 IFL$="Y"THENRUN
580 IFL$<>"N"THEN560
590 PRINT"☹":POKE36869,240:POKE36879,27:END
1000 FORX=1TON:H(X)=A(X):NEXT:RETURN

```

### Program notes

1)	
0	Lowers memory to protect graphics
10-15	Pokes data into memory
30	Is Play depressed?
40-50	Mastermind is Loading
2)	
5	Clears memory of old program
10	Asks for difficulty 3-6
16	Checks input
20-80	Picks random sequence
100-135	Defines grid
140-148	Defines dots
150-190	Your guess
210-300	Right and wrong
310	Dots on screen
340	Loops back
400-410	Hidden code revealed
500-590	Goes taken/another go?



```
2000 FORX=1TON
2010 IFB(X)=H(X)THENH(X)=0:B(X)=0:B=B+1
2020 NEXT:RETURN
```

## Listing 2

```
0 POKE36879,8:POKE56,28:POKE52,28:PRINT"J":CLR:PRINTCHR$(8)
1 PRINT"#####"
2 PRINT"PLEASE WAIT!"
3 PRINT"#####"
10 FORX=1TO34*8:READS:POKE7167+X,S:NEXT
15 FORX=0TO207:READS:POKE7448+X,S:NEXT:CLR:POKE36869,255
20 PRINT"J"
30 IF PEEK(37151)=126THENPRINT"#####PRESS PLAY":GOTO30
40 PRINT"#####*MASTER MIND*
50 PRINT"& IS LOADING& (.....)"
60 POKE56,28:POKE52,28:LOAD"*MASTER*"
99 DATA24,60,118,231,247,118,60,24,120,68,66,66,126,66,66,66
110 DATA120,68,66,65,126,65,65,126,14,16,32,64,64,64,64,126
120 DATA120,66,65,65,65,65,65,120,6,8,16,62,64,64,64,126
130 DATA6,8,16,62,64,64,64,64,14,16,32,64,64,70,66,126,66,66,66,66,126,66,66,66
140 DATA126,8,8,8,8,8,126,126,8,8,8,8,72,40,24
150 DATA64,64,66,68,72,80,120,70,64,64,64,64,64,64,126
160 DATA120,76,74,73,73,73,73,120,76,66,65,65,65,65,65
170 DATA248,132,130,129,129,65,33,31,120,68,66,126,64,64,64,64
180 DATA248,132,130,129,137,69,35,31,120,68,66,126,96,80,72,68
190 DATA14,16,32,64,124,4,8,112,126,8,8,8,8,8,8,8
200 DATA66,66,66,66,34,18,10,6,66,66,66,66,66,38,24,24
210 DATA146,146,146,146,146,82,50,14,129,66,36,24,24,36,66,129,66,66,34,30,4,8,1
6,96
220 DATA126,2,4,8,16,32,64,126,24,36,118,231,247,102,60,24
241 DATA24,36,118,199,223,70,60,24,24,60,94,215,195,118,60,24
242 DATA24,36,110,227,251,98,60,24,24,52,110,227,235,98,60,24,0,0,0,0,0,0,0,0
243 DATA0,102,102,0,0,102,102,0
244 DATA0,102,102,0,0,96,96,0,0,102,102,0,0,0,0,0,96,96,0,0,0,0,0
245 DATA8,8,8,8,8,8,8,8,8,8,15,8,8,8,8,8,15,0,0,0,0,8,8,8,248,0,0,0,0
246 DATA0,0,0,248,8,8,8,8,0,0,0,15,8,8,8,8,0,0,0,255,0,0,0,0,8,8,8,248,8,8,8,8
247 DATA8,8,8,255,0,0,0,0,0,0,0,255,8,8,8,8
260 DATA15,19,37,73,146,164,200,240,24,56,88,24,24,24,24,126
280 DATA240,8,4,2,127,64,64,127,120,4,2,1,63,1,1,127
300 DATA2,4,8,18,34,127,2,2,127,64,64,126,2,4,8,240
320 DATA15,16,32,64,124,66,65,127,127,1,2,4,8,16,32,64
340 DATA24,36,66,129,126,129,66,60,127,65,33,31,1,2,4,120
370 DATA255,255,255,255,255,255,255,255,0,0,0,0,0,24,24,0,8,8,8,255,8,8,8,8
```

Mastermind  
by M Tooley

## Screen Copy

on Spectrum

This program was designed for the 48K machine but it is relocatable for owners of 16K by moving it down memory. The routine allows the whole screen (192 lines)

or parts of the screen to be copied onto the ZX printer. Play around with the input values to get an idea of the kinds of effects you can achieve.

```
1 REM #####
2 REM #LINE COPY#
3 REM #####
4 REM
10 CLEAR 65199
20 DATA 243,6,176,33,0,64,205,
178,14,201
30 FOR n=65200 TO 65209: READ
a: POKE n,a: NEXT n
40 CLS: INPUT "Start line 0-1
92 ";s
50 INPUT "Amount of lines to b
e printed ";c
65 LET a=(16384+s*32)/256
60 POKE 65202,c: POKE 65205,IN
T a: POKE 65204,a-INT a
70 PRINT "To activate the rout
```

```
ine use RANDOMIZE USR 65200"
80 INPUT "save y/n ";n$
90 IF n$="y" THEN PRINT "The c
ode to be saved on tape when
activated will copy from line
";s;" for ";c;" lines.": SAVE "l
copy"CODE 65200,10:
```

The routine will run at any address

Screen Copy  
by Daniel Bland



## Shadow

### on BBC

This is a routine which can be called when shadows are needed as a decorative feature on titles of programs, names of authors of programs or even copyright notices.

Use of the *Procedure* is explained in Rem

statements in the listing and will run on a BBC model B.

The foreground printing colour can be changed for personal preference by changing the *gcol* value in line 300

#### Program rules

240 Change true colour 0 (black) to logical colour 7 (white) and change true colour 7 (white) to logical colour 0 (black).

250 Change text cursor to graphics cursor.  
260 Work out to place 'p\$' in central 'X' position, and put value in 'I'.  
270-320 Print 'p\$' and shadow.  
330-340 Wait three seconds.  
350 End of procedure.

The printing is achieved by firstly printing the black shadow, and then printing the different colour slightly off position in the 'X' and 'Y' direction.

```
10 REM *****
20 REM *
30 REM * SHADOW *
40 REM * BV *
50 REM *ABDUL.K NATHEKAR*
60 REM *
70 REM *****
80
90 REM P$ CONTAINS THE WORD TO BE
100 REM PRINTED WITH ITS SHADOW
110 REM AND
120 REM B% IS THE GRAPHIC SCREEN
130 REM 'Y' CO-ORDINATE WHERE THE
140 REM WORD IS TO BE PRINTED.
150 REM 600 IS IDEAL FOR TITLES.
160 REM MAXIMUM LENGTH OF CHARACTERS
170 REM IN P$ IS 15.
180 REM MODE HAS TO BE CHANGED TO
190 REM MODE 2 BEFORE CALLING
```

```
200 REM PROC SHADOW.
210
220 DEFPROC SHADOW(P$,B%)
230 CLS
240 VDU19,0,7,0,0,0;19,7,0,0,0,0
250 VDU5
260 I=(640-(32*LEN(P$)))-10
270 MOVEI,B%
280 GCOL0,7
290 PRINTP$
300 GCOL0,5
310 MOVEI+9,B%-5
320 PRINTP$
330 T=TIME+300
340 REPEAT UNTIL TIME>T
350 ENDPROC
```

**Shadow**  
by Abdul Nathekar

## Sorting

### on BBC

This sort program can be helpful in produc-

ing in alphabetical order lists of record discs video tapes, etc.

This puts to use the BBC micro B and a printer. Names are entered as *Data* state-

ments and the end of the listing. Termination of the *Data* is executed by zzz. It is worth noting that lower case letters will be considered after capitals.

```
10 REM VIDEO LIST
20 DIM name$(200)
30 count_in = 0
40 REPEAT
50 count_in = count_in + 1
60 READ name$(count_in)
70 UNTIL name$(count_in)="zzz"
80 REM to sort the VIDEOS ETC
90 scan = 2
100 FOR count_out = 1 TO count_in - 1
110 FOR sort = scan TO count_in - 1
120 IF name$(count_out) < name$(sort) THEN 160
130 temp_store$ = name$(sort)
140 name$(sort) = name$(count_out)
150 name$(count_out) = temp_store$
160 NEXT sort
170 scan = scan + 1
180 NEXT count_out
```

```
190 REM to Print the list
200 VDU2
210 PRINTSPC(25)" VIDEO LIST"
220 PRINTSPC(25)"*****"
230 PRINT'
240 FOR P_out = 1 TO count_in - 1
250 PRINT TAB(20);P_out TAB(25);name$(P_out);
260 NEXT P_out
270 VDU3
300 DATA THE LADY KILLERS
301 DATA A CASE FOR P.C. NINE
302 DATA WENT THE DAY WELL
303 DATA VAMPIRA
304 DATA DRY ROT
400 DATA zzz
```

**Sorting**  
by A Moulden



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## Function Keys

on BBC

This program effectively gives the user 20 function keys using the 0.1 operating system, instead of the usual 11. It does this by assigning Key 0 to call a short machine code routine located at &OD00 to switch between two sets of functions.

Key in all the bytes from the hex dump as Data in the program. Then go through the same routine for your second set of definitions. To find how many bytes you are using

when programming the keys use *Print* ?&OB11. Quite probably, one set of functions will use more memory than the other, so, in line 260, the number after the CPX statement must be the larger of the two numbers obtained plus one.

Note that in both sets of definitions, Key 0 must be defined as *Call* &OD00:M. Below are the function key definitions.

```
KEY 0 CALL&OD00:M
KEY 1 RUN:M
KEY 2 :NLIST:M:O
KEY 3 CLS:M
KEY 4 NEW:M
```

```
KEY 5 LOAD""M
KEY 6 SAVE"
KEY 7 CALL&6000:M
KEY 8 MODE$6:M:NLIST:M:O
KEY 9 MODE7:M
KEY 10 OLD:M
KEY 0 CALL&OD00:M
KEY 1 +LOAD""8000:M
KEY 2 LIST07:M
KEY 3 LIST00:M
KEY 4 AUTO
KEY 5 RENUMBER
KEY 6 +LOAD:M
KEY 7 LOAD"
KEY 8 +CAT:M
KEY 9 +MOTOR
KEY 10 OLD:M
```

```
10 REM ***** FUNCTION KEYS *****
20 REM ***** ROBERT TURNER *****
30 REM ***** SEPTEMBER 1983 *****
40 DIM A$(91)
50 FOR A%=0 TO 91
60 READ A$(A%)
70 A%?&0B00= EVAL("&" + A$(A%))
80 NEXT A%
90 FOR A%=0 TO 91
100 READ A$(A%)
110 A%?&0D20= EVAL("&" + A$(A%))
120 NEXT A%
130 FOR PASS=0 TO 2 STEP 2
140 P%=&0D00
150 COPT PASS
160 LDA #0
170 TAX
180 TAY
190 .loop LDA &0B00,X
200 TAY
210 LDA &0D20,X
220 STA &0B00,X
230 TYA
240 STA &0D20,X
250 INX
260 CPX #92
270 BNE loop
```

```
280 RTS
290 J
300 NEXT
310 DATA 11,1B,1F,26,2A,2E,35,3A,44,51,57,5B,
5B,5B,5B,5B,5B,5B,43,41,4C,4C,26,30,44,30,
30,0D,52,55,4E,0D
320 DATA 0E,4C,49,53,54,0D,0F,43,4C,53,0D,4E,
45,57,0D,4C,4F,41,44,22,22,0D,53,41,56,45,
22,43,41,4C,4C,26,36,30,30,30,0D,4D,4F,44
330 DATA 45,36,0D,0E,4C,49,53,54,0D,0F,4D,4F,
44,45,37,0D,4F,4C,44,0D
340 DATA 11,1B,27,2E,35,39,41,47,4C,51,57,5B,
5B,5B,5B,5B,5B,5B,43,41,4C,4C,26,30,44,
30,30,0D,2A,4C,4F,41,44,22,22,38,30,30,
30,0D,4C,49,53,54,4F,37,0D,4C
350 DATA 49,53,54,4F,30,0D,41,55,54,4F,52,45,
4E,55,4D,42,45,52,2A,4C,4F,41,44,0D,4C,
4F,41,44,22,2A,43,41,54,0D,2A,4D,4F,54,
4F,52,4F,4C,44,0D
```

## Function Keys

by Robert Turner

## Microradio

GW6JJN



### Software library

It appears that Microradio is having some influence on the world at last. Gillian Orpin, proprietor of the National Software Library, 200 Mulgrave Road, Cheam, Surrey SM2 6JT, has written to me with some very good news for radio-computing enthusiasts.

Gill, who reads this column regularly, has decided to add some amateur radio programs to the Library's catalogue. The programs are for the Sinclair Spectrum and are published by G41NP Software. The first

program is *Awards Manager* (reviewed in PCW, Microradio, 26 January-1 February).

The second program is *Contest Duping*. What is *Contest Duping* you might ask? Well, when taking part in a contest on air, it is important to know whether a station has already been worked, because if it is entered twice, or duplicated in the log, then points will be lost. This program allows you to enter the callsign of a station and the computer will tell you whether to go ahead or not.

A month or two ago, a gentleman in Scotland wrote to Microradio asking if it were possible to find a program for the Spectrum which would plot the positions of the planets in the solar system, including the sun and moon. He was interested, as a radio amateur and astronomer, in the data and time, both real and sidereal,

of the various planets. I remember writing back to him explaining that I knew of no such program.

Good news — I have found one. It is called *Ephemeris* by Bridge Software and is available from the National Software Library. Also available from the library is *The Night Sky*, again from Bridge Software. This remarkable program will draw a star map for any time and date for any given direction.

I would like to congratulate Gillian Orpin on being the only software library in Britain to carry radio software.

I realise, of course, that in the past there has been much discussion about software libraries and whether or not they affect sales of software. I, like many other computer users, have bought software only to be disappointed.

As far as radio-computing is concerned, we are dealing with utility programs which can often cost a lot more than games. The advent of a software library, which includes such utility programs in its repertoire, means that a particular program can be hired and, if it is what you want, bought from the library at a substantial discount. For once, there are real advantages to the consumer — surely not a bad thing since without the consumer, there would be no computer industry.

Ray Berry GW6 JJN

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



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# Tony Bridge's Adventure Corner



## Hall of the mountain kings

This week I'll look at some more of your letters; the first one is from Philip Maxey of Forest Hill in London.

"I have just bought a ZX81 with 16K memory. I cannot find any good adventures for it, and would be glad if you would suggest some. Also, I would be very pleased if you could give me some hints on writing some adventure programs."

The good old ZX81 has been rather neglected of late, but of course, it is still the little machine that introduced many thousands of us to the joys of computing. There are, however, still many good adventures for the machine. Artic's programs, available for the Spectrum, were originally written for the ZX81. There are four (the latest one, unfortunately, was written for the

Spectrum only), and all are text only, extremely addictive and a good introduction to adventuring.

The original adventure program was written on a huge mainframe computer, but there are several versions around for the rather smaller ZX81 — one of which comes from Abersoft, and is called *Adventure 1* (we are still waiting for *Adventure 2*). Carnell Software will supply you with a couple of extremely good programs: *Volcanic Dungeon*, which remains one of my favourites (it is a sort of text punch up), and *Black Crystal*.

Phipps Associates have several good adventures for the ZX81, including the great *Knight's Quest* (anyone who has ploughed through more than a couple of the corners will know that this is one of my very favourites!). There should be enough there to keep anyone happy for several weeks!

"Dear Tony, I have recently bought Level 9's *Colossal Cave* for our Lynx 48K. After some hours of logic, brainstorming and lateral thinking, we keep finding ourselves stuck in the hall of the mountain kings. Help! It's driving us crazy — every time we offer the snake something or mention the word *Give*, the program prompts: "To whom?" (What, good grammar in an adventure? Well, this is Level 9, of course!)

"No matter how we word or arrange the question, the response is always the same. With the prospect of a further 270 locations to go, I am reluctant to send away for my free clue so soon," writes Alan Eastaigh of Birmingham.

Keep that free clue 'til later, Alan, believe me, you'll need it! For now, try this:  
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Andrew Dilley writes to me from Godalming in Surrey: "A few issues ago, you had a letter asking you what *PSBL* and *DID* meant when they appeared during *Pirate's Cove* for the Vic.

"When they appear they are followed by numbers. These numbers correspond to the responses that the computer can give. *PSBL* tells you the possible responses that can be given to a particular command, while *DID* tells you the number of the response you got. This can be very useful!

"For example, if you, "break mirror", and you get three different *PSBL* numbers, you know that it is worth pursuing this line of thought! After all, with three different responses available, one of them must be good! Typing "P" >return< gets you the numbers, while "X" >return< gets you back to normal.

"I have only tried this with *Pirate's Cove* and *Voodoo Castle*, but it may well work with all of the Scott Adams adventures."

And Simon Mills of London SW12 writes in a similar vein: "Re: the hieroglyphics found in *Pirate's Cove*. They are not a bug as you might have thought. They are probably a way for Scott Adams to check that the adventure is doing what he intends. The feature can be obtained by pressing *XP* or *T* — they are available on all adventures by him. There is another single-letter command that can be used, and that is *V*. This speeds up the rate at which the text is scrolled.

"Another command that I have found is *AUT* — I haven't yet found what it does, but assume it stands for Auto. I have solved four of the Scott Adams adventures for the Vic20 and I am at present stuck on *Mission Impossible*. Could you please tell me how to open the blue door? I have opened all the others!"

Finally, a couple of letters that I can't answer — if you know, let us all know!

"I cannot get any further than the grill in the stone slab, in *Arrow of Death, pt II* (from Channel 8 Software). Please can you tell me how to open it? Also, is there another exit from the beginning (for example, over the narrow gorge?) If so, how do I do it?" asks I Senator of West Moors, Dorset.

"I have recently purchased a Commodore 64 with disc drive, and among the games that came with the package is *The Quest*. Having spent the best part of 60 hours with the problem of getting out of the first set of rooms, I have finally decided to put pen to paper!

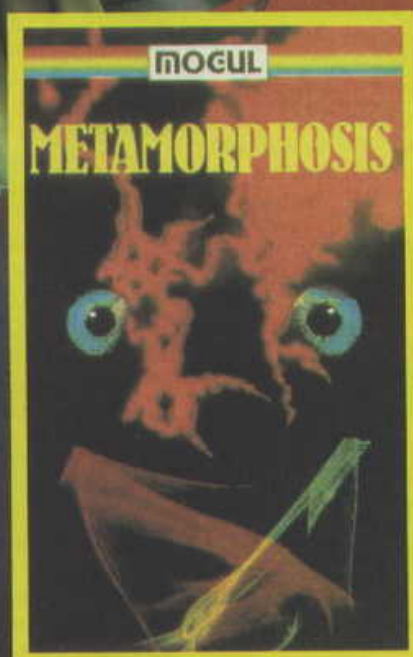
"I have got the sword out of the ground, but cannot get any further. I've investigated as thoroughly as possible. While I still have some hair left, I'd really like a pointer on how to escape from this dilemma," pleads Keith Irving of Morayshire, Scotland.

I hope someone can help with these problems. Next week, HHOF!



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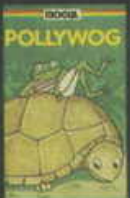
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## BOOTSTRAP ROM

*Alison Davis of Wall Walk, Carlisle, Cumbria, writes:*

**Q** Please can you tell me what a bootstrap Rom is? I have a Spectrum, and I do not think it has one, does this matter?

**A** Some computers, usually the larger business models, have only a very small Rom, called a Bootstrap Rom. This type of Rom has within it only a very few routines. Such computers have a Dos or Disc Operating System. In effect this means that Rom is stored on Disc, not on board the computer. The Bootstrap Rom's only job is to get the Disc with the Operating system, loaded into a reserved area of Ram.

Although this may seem a clumsy system, in fact it is far more flexible. Loading or 'Booting Up' the Disc only takes a few seconds, and it means that a whole variety of languages can be used depending on the individual user's specific requirements.

## ISSUE NUMBER

*A Donnahue of Leighton Buzzard, writes:*

**Q** I have a 16K Spectrum which I bought a few months ago, and I thought it was an issue 3 model. I have looked at a friend's and mine together, and have checked the expansion hole at the back, and they seem the same. Can you please tell me how to tell the two Issues apart, just so I can be sure of what I have got, because I will want to up-grade at some time.

**A** Any Issue 2 Spectrum will have its issue number somewhere on the PCB. However, if you do not want to take the top off, then there are ways of telling the issues apart from looking at the expansion port. Issue 1 models can also be identified by a small hole in about the middle left of the base of the computer. At the bottom of this hole is a small brass screw which, in fact, is a

trimming capacitor, which means that it is easier to tune in an issue 1 Spectrum if this is necessary. If you look through the expansion port you will also see several brown discs, these are ceramic capacitors, and are not visible on issues 2 & 3.

The most obvious give away otherwise is the heatsink. On the issue 2 this is hardly visible as it runs down the left hand side of the computer. Turn the computer upside down, and look through the expansion port at the underside of the top moulding, and that is exactly what you will see — a shiny black surface. On the issue 3 however, if you do this you will see a not quite so shiny aluminium surface. The heat sink of the issue 3 runs along the back of the computer, and above the expansion port. There are other ways of telling, especially if you undo the computer, but these are the easiest.

## USR FUNCTION

*Henry Thompson of Ashtree Close, Middlesbrough, writes:*

**Q** I have a Dragon 32 with which I am learning BASIC quite well. At school friends with other computers have used the *Usr* function, and I know that it is meant to be available on my Dragon, but I cannot get it to work. I always get the same thing happening whether I use *Usr 0* or *Usr 8* or whatever.

**A** There is a bug in the Rom routine that takes you to the address specified in the *Usr* statement. There is in fact a simple solution, add a nought in front of the number, thus *Usr 8* would become *Usr 08* and so on.

## COMPUTER MARKET

*John Davies of Muswell Avenue, Muswell Hill, London N10, writes:*

**Q** Please could you advise me if there are any major developments taking place in the computer market at the moment? I have got a ZX Spectrum, which I have had for

a year now, but I am wondering whether to expand my system or get a new computer — possibly a Sinclair QL.

I've heard rumours that all the present systems, costing under £1000 will soon be out of date. If so could you advise on a system that will not be obsolete a few months after I buy it?

**A** There are always major developments taking place. Manufacturers and the press play a game, where the manufacturer must let enough information about a potential new product to leak out, so that the public's interest and attention are maintained without giving too much away to their competitors. It is a situation made more complex by the fact that some manufacturers encourage independent software houses, where others do not.

The QL did take most people by surprise, because it was announced so quickly. It remains to be seen whether or not deliveries and reliability can keep pace. The track record does not offer a lot of hope, but you never know. The most important point to keep in mind is, does the computer I have now do what I want it to do? Remember when a computer has sold as many units as the Spectrum has, it just does not die. I still get letters every week from ZX81 and Vic20 owners. Both are computers that are meant to be dead.

It is a fact that already computer technology far outstrips the average user, so why buy the latest all singing, all dancing, model if you are not going to get anything extra out of it? The best analogy is with calculators, there are some exceptionally sophisticated models now available. Personally I have an old simple one. I do not use it for anything complex, so I have no intention of getting rid of it for a better model. This highlights the approximate differences between this country and America, where people are more likely to dispose of their existing machine for something new. Look at the problem the TS1000 had, once the 2000 was announced.

As regards price, I think it is just the case that a computer which would have cost £1500 a year or two ago, will be below

the thousand pound mark in a year or so's time. In this respect the new Sinclair QL is the marker against which all other cheaper computers will have to compare themselves — taking this role from the BBC. But whatever you buy it will always be superseded at some time — why wait?

## THE SAME ANSWER

*David Freeman of Great Eastern Street, Cambridge, writes:*

**Q** I have a question that I have seen answered for other computers but not my own. I hope the answer is not going to be the same. My question is this. How do I make my programs break proof; the computer I have is the Oric.

**A** I am afraid that the answer is going to be similar, in that there are no completely fool proof ways of stopping someone breaking into your programs. There is a book by Bob Maunder called *The Oric Handbook* which contains several useful tips and hints, but in the end it is the same story; any program that can be written can be broken.

## BBC PROBLEM

*J. Misket of All Hallows Road, Caversham Road, Reading, writes:*

**Q** I have a BBC micro model B. On listing a program with a first line of 300 or more, then later at the end typing *Old (R)* then *List (E)* the first line number changes. Line 300 changes to 44, and all the numbers above three hundred change. For example 650 become 138, line 1000 is 232, 2000 as 16, and 3000 as 48. A dummy line such as 100 *Rem Cold isn't it*, gets over this problem. But why should this be? What do you advise?

**A** To be honest I do not have an answer to your question. You do not say what operating system you have. I can only assume that in fact it is one of the bugs in the 0.1 OS, as there were a couple relating to the use of the *Old* command. Anyone else with a 0.1 have the same problem?



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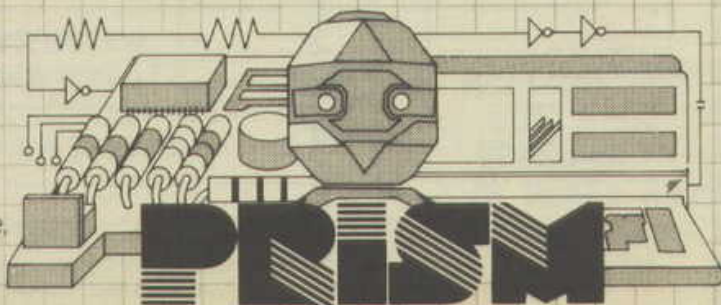
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**48K SPECTRUM**, complete as new, boxed lead, manuals, demo tape. Lots of software. £100 on. St Albans 58766.

**COMMODORE 64** Printer Interface. Intelligent system from RAM Electronics. Cost £57 for cartridge + cable for Centronics. £40 + postage. One month old. Peacehaven 81184 or 3161.

**BBC B BRAND NEW**. 12 month guarantee, cassette cable, "The BBC Micro" (book), over £72 of games for £390. Tel: Leicester 897268.

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Details from: S. Renton, "Greenlees", Braehead, Lasswade, Midlothian.

**BBC MODEL B** for sale, including soft cover, some software and mags. £299. Tel: Manchester (061) 445 0557.

**VIDEO GENIE** 48K system for sale plus monitor, dual disc drives, software and printer for £750 on. Ilkeston (0602) 302497.

**MICRODRIVE** AND interface order forms for £16. First ring Alec 01-553 5920 evenings.

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**G. W. & A. HESKETH** (Publishers) are looking for education programs and programmers for BBC B, CBM 64 and Pet, Spectrum for home and school use; interactive, multiuser expert systems and simulations especially but not exclusively wanted. Contact G. W. & A. Hesketh (Publishers), Cronos Software, PO Box 8, Ormskirk, L39 5HH. **UNBEATABLE ROYALTIES** paid for your arcade/adventure/educational/utility program for Spectrum/ZX81 (Basic or M/C). Send tape for an immediate decision to Odyssey Computing, 28 Bingham Road, Sherwood, Nottingham.

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## Commodores for sale

**VIC 20** plus 16K memory bank, C2N cassette disc drive and S/W, machine code monitor, Super Expander, Rat Race, Supermender, Pirate Cove, £300. Tel: 01-732 5438.

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**16K VIC 20** C2N unit books, games, super expander cart all for £180. 9 months old. Call/write, 47 Oldfield Park, Westbury Wilts. Ask for Bruce Whitfield.

**CBM64** with £160 of S/W, worth £390, sell for £320 on. Tel: Saffron Walden 22207, after 6pm.

**VIC 20**, £60, including £100 of S/W and £30 of books, CBM expansion, £20, super expander cartridge, £20, programmes aid K20 Arlon expansion unit, £50. Tel: St Annes-on-Sea 711658, after 4pm.

**VIC 20** with cartridges and £300 of S/W, sell for £150. Spectrum Microdrive orderform, offers. Tel: 041 639 2789.

## Ataris for sale

**ATARI VCS** plus joystick, Video Chequers and Combat cartridges for £25. Phone Basilidon (0268) 555 468.

**ATARI CONSOLE** games, Gorf, Popeye, Super Cobra, River Raid, Pitfall, £20 each, Missile Command, Kangeroo, Casino, Keystone Kapers, £15 each, all boxed. Phone Stanley 31737, or write to P.O. Hanlow, 2 Palmer Road, Dipton, Staley, Co Durham.

**ATARI** software, Zork I, Star Raiders, £15, Rescue at Rigel, £10 each. Tel: Southend-on-Sea 353336.

## Acorns for sale

**BOOKS** — The BBC micro revealed, basic programming on the BBC micro-computer and inside basic games, all in mint condition, £5 secures the lot. Tel: 0245 50432.

**BBC B 1.2 O/S**, 8 months old, £100 worth of S/W inc basic comp books, leads, boxed, £365. Tel: 01 807 8240.

**BBC MODEL B**, 1.2 rom, excellent condition, £300, includes leads and user guide. Tel: York (0904) 27411 after 6.30pm or weekends.

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# New Releases

## THE STING



*Scorpion* is a high speed arcade game for the unexpanded Vic20, which, it is interesting to note, is still outselling the Commodore 64.

The player must defend himself from a trail of scorpions. As you might expect the setting is the desert, which, aside from the blazing heat, is littered with poisonous cacti.

An additional problem is a deadly spider that turns up from time to time, and falling cacti spores that form more cacti and get in your way. As you may have gathered, this is basically a version of that old classic *Centipede* but is none the less addictive for all that.

**Program** *Scorpion*  
**Price** £7.95  
**Micro** Vic20  
**Supplier** Sumlock  
198 Deangate  
Manchester M3 3NE

## CORRECT

*Besieged* is part of a series of programs from Sulis Software designed to cover, in an entertaining way, just about every quirk of English spelling.

In *Besieged* you must help a knight enter a castle, across a ravine, by building him a bridge. To build the bridge you will have to get the correct spelling of various words.

The package contains two cassettes and a short manual. The graphics are neatly done and the words in the game are

all fairly difficult to spell correctly, or rather are easy to spell incorrectly and it is recommended for ages 15 and above.

**Program** *Besieged*  
**Price** £8.65  
**Micro** Commodore 64  
**Supplier** Sulis Software  
C/O John Wiley & Sons  
Baffins Lane  
Chichester PO19 1UD

## HIDEAWAY



Richard Shepherd Software is one of the leading Spectrum adventure game houses. Now it is converting many of its best sellers for other machines — the latest is *Super Spy* now on the Dragon 32.

The game is divided into four sections as you try to discover the location of Dr Death's secret hideaway destroy his missile and save the world.

The game is a mixture of text and graphics. The first section involves accumulating your necessary weapons and unraveling coded messages to discover the location of the evil Doctor's island.

In the next section, you have to explore the island and discover Dr Death's secret hideaway. This is followed by a 3D graphic maze, which contains the control room. Finally, you must discover the code to disarm the missile and save the world. Simple, eh — still it's something to put on your CV.

**Program** *Super Spy*  
**Price** £6.50  
**Micro** Dragon 32

**Supplier** Richard Shepherd  
Software  
Elm House  
23-25 Elmshott Lane  
Cippenham  
Slough  
Berkshire

## DECIMAL

*Cut'n'Val* is an educational program for the BBC that will test just about any mathematical expression you wish including decimal arithmetic up to six decimal places, exponential expressions, logical expressions, etc.

The questions can be run in a test format where both the result and an analysis of the difficult questions are given at the end.

It can be adapted for any level of ability from 7 to 16+. It can be run from disc, tape or network on all operating systems.

**Program** *Cut 'n'Val*  
**Price** £14.50  
**Micro** BBC B  
**Supplier** MP Software Services  
165 Spital Road  
Bromborough  
Merseyside L62 2AE

## GIANT RATS



The ZX81 is still being manufactured — a surprising and oft forgotten fact in this time of QIs and Adams. Moreover, people are still buying it — usually as a 'toe dipped in the water' measure to see how they feel about computing without risking much money.

With these facts in mind, some software houses are still producing new software for the machine and some of it is pretty impressive.

*Forty Niner* is a digging game where you must burrow through the earth searching for gold nuggets. You must watch out for giant rats and snakes as well as a gremlin who is digging his way through your pile of earth to get at you.

The really remarkable thing about the game is that it features hi-resolution graphics just like the Spectrum (although black and white of course), so the rats really do look like rats instead of square tables. Highly recommended.

**Program** *Forty Niner*  
**Price** £5.95  
**Micro** ZX81 (16K)  
**Supplier** Software Farm  
155 Whiteladies Road  
Clifton  
Bristol BS8 2RG

## A FORTUNE



Cases Computer Simulations are more or less the only company I can think of who have specialised in Simulations — those programs where you try to run a business in the midst of various, computer derived, managerial problems.

In *Stock Market* you try to make your fortune out of stocks and shares. You can buy up to six different shares and must respond to high and low prices, newsflashes and company reports in deciding when and what to sell or buy.

The program can provide graphs of your performance



and will even analyse your mistakes. There are three difficulty levels and at the hardest you will really need to think carefully about each decision.

**Program** Stock Market  
**Price** £6.00  
**Micro** Spectrum 48K  
**Supplier** Cases Computer Simulations  
14 Langton Way  
London SE3 7TL

## WAR GAMES

*Kriegspiel* is an elaborate wargame simulation for the Dragon 32. It is set in a mountain and forest landscape and involves two commanders in charge of tank divisions and infantry — the winner is the first one to enter his opponent's capital.

The different types of terrain illustrated by differing coloured hexagons on the screen display have differing properties in respect of attack, defence and movement properties.

The game involves all kinds of factors including the weather and your ability to recruit new forces. You can play either against the computer or against another player.

**Program** *Kriegspiel*  
**Price** £6.95  
**Micro** Dragon 32  
**Supplier** Beyond Software  
Competition House  
Farndon Road  
Market Harborough  
Leicestershire

## BLACK BOX

An educational program for the ZX81 might seem a fairly doubtful idea, but then again maybe not. There must be a lot of homes where the funny black box introduced parents into the world of computing and after they had gone on to higher and more expensive things, the children got the 'toy' ZX81.

*Hidden Letters* is the program and it is a mixture of a word game and an educational program teaching reading and comprehension. The tests involved can be adapted for use

by any age group from five upwards.

**Program** *Hidden Letters*  
**Price** £4.95  
**Micro** ZX81 (16K)  
**Supplier** Poppy Programs  
Richmond House  
Ingleton  
Carnforth  
Lancs LA6 3AN

## COMPOUNDS



*Which Salt?* is an educational program for the BBC that might just manage to educate. It contains information on 24 chemical compounds and tests you on them.

When the program is run, the results of a series of simple chemical tests are given — you have to deduce the compound from the information. You can either make a guess or 'run' other tests in order to get more results. The more tests you need, the lower your score.

The program comes with a sample worksheet which, it is suggested, could be used to work through the results of the tests in the classroom. An obvious subject no one else seems to have used.

**Program** *Which Salt?*  
**Price** £6.95  
**Micro** BBC B  
**Supplier** Program Power  
Northwood House  
North Street  
Leeds LS7 2AA

## ALIENS

Although you'd have thought that the memory expansion was an inevitable purchase for the Vic20 — in fact there are

very few games using the extra 16K.

*Starship Escape* is one of the few, and is called a machine code graphics adventure. Looked at more closely, it proves to be simply a very complex arcade game in which you must search an alien vessel for the various parts of your own ship which have been scattered around by some nasty aliens.

Various baddies (of course) are trying to prevent you from recovering the parts of your ship and will send you back to where you started if they catch you. You are helped by K9, the well known copyright infringement, who can attract the baddies towards him, giving you time to make your getaway.

Other features in the game include a map of the alien ship and a surrender button if the going gets too tough.

**Program** *Starship Escape*  
**Price** £9.95  
**Micro** Vic20 (16K)  
**Supplier** Sumlock  
198 Deangate  
Manchester  
M3 3NE

## LIME CAKE



Who remembers *Dig Dug*? It was the arcade game of 1982 (well, at one point) and involved moving a little man through the earth digging his way to various treats like cherries and other fruit.

Now it is available for the Spectrum and is entitled *Dinky Digger*. This version has all the features of the original, except the continuous music — which is the Spectrum's fault rather than Postern's.

To complete each screen, Dinky has to eat all the goodies and kill all the monsters; the crowning glory being a lime cake at the centre of each screen which marks the entrance to the monsters' lair.

With the likes of *Ultimate* around, no serious software house should be able to get away with anything other than excellent graphics — these though are not too good, looking like compiled Basic.

**Program** *Dinky Digger*  
**Price** £6.95  
**Micro** Spectrum 48K  
**Supplier** Postern  
PO Box 2  
Andoversford  
Cheltenham GL54 5SW

## LOGICAL

*Micro Drivin* is a graphics adventure for the 48K Spectrum. It is one of the best I've seen and is as challenging as you could possibly require.

The basic plot involves hunting for clues on a mysterious island — it works a little like the tv program *Treasure Hunt*, where each clue leads you on to the location of the next.

The graphics are superb. A major feature of the game is a sports car you use to drive from place to place — the interior of the car is as good as any of the graphics on *Chequered Flag*.

Each location is illustrated with the graphics appearing instantaneously on the screen.

In terms of the adventure, it's as difficult as any I've tried although (with the help of a crib sheet) I can see that all the clues are logical and fair. Buy it and see how long it takes you to find the car keys!

**Program** *Micro Drivin*  
**Price** £6.95  
**Micro** Spectrum 48K  
**Supplier** Softel  
5 Durward Drive  
Fife

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



## Top 10

### Spectrum\*

- 1 (1) Alic Atac (Ultimate)
- 2 (4) Lunar Jetman (Ultimate)
- 3 (-) Stonkers (Imagine)
- 4 (3) Manic Miner (Bug-Byte)
- 5 (2) Chequered Flag (Psion)
- 6 (9) Hunchback (Ocean)
- 7 (-) Pyramid (Fantasy)
- 8 (-) Mr Wimpy (Ocean)
- 9 (8) 3D Ant Attack (QuickSilva)
- 10 (6) Flight Simulation (Psion)

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

### Atari

- 1 (2) Zaxxon (Datasoft)
- 2 (4) Slinky (Cosmi)
- 3 (7) Sea Dragon (Adventure International)
- 4 (3) Astro Chase (Parker Brothers)\*
- 5 (1) Warlock (Calisto)\*
- 6 (-) Paris in Danger (Avalon Hill)\*
- 7 (-) Zork III (Infocom)\*
- 8 (-) Enchanter (Infocom)\*
- 9 (6) Caverns of Kalika (Cosmi)
- 10 (5) O' Riley's Mine (Starcade)

\* Cartridge † 32K Cassette or disc ‡ 48 K Disc.

(Figures compiled by Calisto Computers, Birmingham 021 632 6458)

### BBC\*

- 1 (-) Rocket Raid (Acornsoft)
- 2 (3) Planetoids (Acornsoft)
- 3 (2) White Knight Mk2 (BBC)
- 4 (-) Monsters (Acornsoft)
- 5 (10) Disc Doctor (Computer Concepts)
- 6 (-) Meteors (Acornsoft)
- 7 (-) Missile Control (Gemini)
- 8 (4) Chess (Acornsoft)
- 9 (5) Snapper (Acornsoft)
- 10 (-) View (Acornsoft)\*

† Rom \* All Model B.

(Figures compiled by Micromanagement, Ipswich 0473 59181)

### Books

- 1 (-) Advanced Graphics for the Spectrum, Angell and Jones (Macmillan)
- 2 (-) Mastering Machine-code on Your ZX Spectrum, Baker (Interface)
- 3 (7) Spectrum Microdrive Book, Logan (Melbourne House)
- 4 (4) BBC Micro Disk Companion, Latham (Prentice Hall)
- 5 (3) Advanced User Guide for the BBC Micro, Bray (Cambridge Micro Centre)
- 6 (-) 100 Programs for the ZX Spectrum, McLean (Prentice Hall)
- 7 (9) Programming the M68000, King (Addison-Wesley)
- 8 (8) Commodore 64 Programmer's Reference Guide, Commodore (Commodore)
- 9 (8) Complete Forth, Winfield (Sigma)
- 10 (5) 68000 Assembly Language Programming, Kane and Leventhal (Osborne)

(Figures compiled by Watford Technical Books, Watford 0923 23324 Prestel 28844)

(Last week's position in brackets).

## Top 10

### Vic 20

- 1 (8) Wacky Walters (Imagine)
- 2 (2) Wizard and the Princess (Melbourne House)
- 3 (5) Snooker (Visions)
- 4 (-) Grid Runner (Llamasoft)
- 5 (6) Flight Simulation (Ferranti)
- 6 (1) Bewitched (Imagine)
- 7 (3) Catcha-Snatcha (Imagine)
- 8 (-) Abductor (Llamasoft)
- 9 (10) Arcadia (Imagine)
- 10 (-) Tomb of Drowan (Audiogenic)

### Dragon 32

- 1 (-) The King (Microdeal)
- 2 (2) Eightball (Microdeal)
- 3 (4) Skramble (Microdeal)
- 4 (3) Leggit (Imagine)
- 5 (-) Grand Prix (Salamander)
- 6 (1) Space Shuttle (Microdeal)
- 7 (5) Dragon Chess (Oasis)
- 8 (7) Transylvanian Tower (Richard Shepherd)
- 9 (9) Intergalactic Forth (Microdeal)
- 10 (-) Danger Ranger (Microdeal)

### Commodore 64

- 1 (2) Space Shuttle (Microdeal)
- 2 (7) Falcon Patrol (Virgin)
- 3 (1) Crazy Kong (Interceptor Micros)
- 4 (-) Pirates and The Snowman (CBM)
- 5 (4) Cosmic Convoy (Tashsoft)
- 6 (-) Styx (Supersoft)
- 7 (9) Motormania (Audiogenic)
- 8 (-) Transylvanian Tower (Richard Shepherd)
- 9 (-) Ship of the Line (Richard Shepherd)
- 10 (5) Hover Bover (Llamasoft)

### ZX81

- 1 (3) Football Manager (Addictive Games)
- 2 (1) Asteroids (QuickSilva)
- 3 (-) Flight Simulation (Sinclair)
- 4 (-) Mothership (Sinclair)
- 5 (-) Space Raiders (Sinclair)
- 6 (-) Chess in 1K (Sinclair)
- 7 (5) Invaders (QuickSilva)
- 8 (4) Defender (QuickSilva)
- 9 (7) Crazy Kong (PSS)
- 10 (6) ZXAF (Bug-Byte)

(Figures compiled by Boots/Websters)

## Book Ends



### BBC DISKS

In the preface to Disk Systems for the BBC Micro it explains that since "the BBC machine is bought mainly by serious programmers... a very large proportion of BBC B users are likely to have or consider buying, disk systems."

Without wishing to go overboard on this, I should like to assert that the premise of the above argument is not really true and moreover could possibly upset those who feel it implies that other machines cannot be used for serious purposes — 32K is a bit pathetic these days and lots of BBC B's are in schools — both factors requiring fast access times; perhaps that's why so many BBC Disks are sold.

Anyway. The book is a fairly comprehensive guide to what disk drives are and what you can do with them in conjunction with your BBC Micro. It contains useful sections on files and machine code and a complete list of the DFS commands.

**Book** *Disk Systems for the BBC Micro*  
**Price** £6.95  
**Micro** BBC B

**Supplier** Granada Publishing  
8 Grafton Street  
London W1X 3LA

### MACHINE CODE

Although there are many books for Spectrum owners who are beginning to look at machine code having mastered Basic, there are few for people who have successfully grappled with registers and hexadecimal and are wondering what to do next.

David Laine's *Machine Code Applications* could be the book. It starts with the premise that you already know some machine code and discusses floating point numbers, animated graphics and passing parameters — there are various programs that illustrate the points made which are useful routines in their own right.

The book is written in a discursive arcane style — chapters begin with quotes from various unlikely sources — that you will either love or hate.

**Book** *Applications*  
**Price** £6.95  
**Micro** Spectrum  
**Supplier** Sunshine 12-13  
Little Newport Street  
London WC2R 3LD

## This Week

Program	Type	Micro	Price	Supplier
3D Battletar	Arc	Oric 1	£6.50	Topaz
Address File	Ed	Oric 1	£7.50	Severn
Alphabet	Ad	BBC B	£9.95	Opal Soft
Assignment East Berlin	Ad	Spectrum	£5.95	Link
BC Basic	Ut	Commodore 64	£57.50	Kuma
Basil Goes Ballooning	Ad	Dragon 32	£7.95	Computerhouse
Bombs Away Basil	Ad	Dragon 32	£7.95	Computerhouse
Chess	S	MZ 700	£9.95	Solo
Classic Adventure	Ad	Spectrum	£6.95	Melbourne House
Cobra	Arc	Memotech	£6.50	Xaviersire
Computer Cookbook	Ut	Spectrum	£5.95	PMCS
Cricklewood Incident	Ad	Dragon	£7.95	Salamander
Dr Franky	Ad	Spectrum	£5.95	Virgin
Dynamic Graphics	Ut	Spectrum	£14.95	Procom
Encounter	Ad	Oric 1	£7.50	Severn
Extended Basic	Ut	Oric 1	£7.50	Severn
Fun Pac2	Arc	Texas	£6.95	Virgin
Fun Pac3	Arc	Texas	£6.95	Virgin
Galaxy Adventure	Ad	Spectrum	£2.75	Alpha
Game of Truth	Ad	MZ700	£6.95	Solo
Glaxxons	Arc	Dragon	£8.00	Microdeal
Happy Letters	Ed	Electron	£8.97	Bourne
Happy Numbers	Ed	Electron	£8.97	Bourne
Happy Writing	Ed	BBC	£8.97	Bourne
Hell Gate	Arc	Vic20	£6.00	Llamasoft
Hideous Bill	Arc	Spectrum	£7.95	Virgin
Invader Cube	Arc	Dragon	£5.95	Oasis
Killer West	Arc	Commodore 64	£6.95	Alligata
Lone Raider	Arc	Oric 1	£7.50	Severn
Map Rally	Ed	Electron	£8.97	Bourne
Marooned	Ad	Vic20	£4.50	Buntasoft
Matchday	S	Spectrum	£4.75	C&D Software

Microbot	Arc	Spectrum	£5.95	Softtek
My Secret File	Ut	Commodore 64	£9.95	Mosaic
My Secret File	Ut	Spectrum	£9.95	Mosaic
Mystery of the Java Sea	Ad	Dragon 32	£7.95	Shards
North Sea Oil	S	Dragon	£5.75	Shards
Pacific War	S	Spectrum	£6.00	CCS
Pascal	Ut	Dragon 32	£14.95	Oasis
Physics 1	Ed	Dragon 32	£6.90	N.W.B.C.
Sprint	Ut	Dragon 32	£14.95	Oasis
Sprite Magic	Ut	Dragon 32	£17.25	Slik
Super Mouse	Arc	MZ 700	£3.95	Solo
Them	Arc	Oric 1	£5.95	Virgin
Timeman One	Ed	Electron	£8.97	Bourne
Timeman Two	Ed	Electron	£8.97	Bourne
Tornado	Ut	Commodore 64	£9.97	B&F CSL
Ugh!	Arc	Commodore 64	£7.95	Softtek
Ultimon	Ut	Spectrum	£13.50	Microholics Anonym
War 70	S	Spectrum	£6.00	Machine Code
Wings of War	Ad	Dragon 32	£7.95	Salamander
Word Processor	Ut	MZ 700	£19.95	Solo
Wordgame	S	BBC B	£5.45	Scientific
Wordhang	Ed	Electron	£8.87	Bourne
Zoids	Arc	Commodore 64	£7.95	Softtek

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

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





## Whiz kids

**W**hiz Kid Genius is Millionaire at eight. "We always wanted him to get a paper round like the other lads round here, but now we're glad he didn't," said whiz kid Ronny's pretty mother, Gladys (28).

Have you ever wondered where all the whiz kids went? Fleet Street used to be full of them. Features editors would spend ages dreaming up more puns on the word chip.

Hopefully, most of the kids made a couple of thousand pounds and are now doing physics or maths at University. Hopefully too they are spending some of their free time in less isolated activities than programming computers.

Even at the height of the fuss one thing was clear to me from the dozens of programs I am sent every week — with a few exceptions, the best were never from lone fifteen year old programmers. Even when a marvellous game was written by such a person, it was usually from one of the large software houses like Quicksilver where the company could provide advice and equipment to ensure a professional end result.

But even these enthusiastic amateurs are being replaced by highly paid professionals. This inevitable change is clearest seen in the Spectrum software market.

For complex reasons, mainly to do with money and market forces, Spectrum software is, by and large, cheaper and better than the software for any other machine. Before writing in to complain, take a look at some of games generally available under £6 from Ultimate or Imagine — you'll find it difficult to disagree.

What happened, and is still happening, in the Spectrum market is that as sales of the machine grew the professionals moved in — there was real money to be made. Advertising budgets expanded and many small operations that had

been previously ticking over with a small profit, started to lose money — they couldn't compete with the high profile, high quality, operations.

Atari made a lot of mistakes, but putting out poor quality software was not one of them. On the contrary, they knew a basic fact at a very early stage — really good games could not be written by one person. Too many different and, in many ways opposing, skills were required. Consequently, the Atari programmers invariably worked with graphic designers and games designers, who concentrated on the look and 'play' of the game respectively.

The same set up is true of the top Spectrum software houses — programs are written by teams rather than individuals.

This situation will undoubtedly start to be repeated on other machines which sell well — it is already largely true of the Commodore machines with their large transatlantic user base.

It is not so easy to predict the overall effects on the market in say, five years time. Should we view it with enthusiasm or foreboding?

The quality of the games in terms of use of graphics and sound will undoubtedly go up and prices will probably be standardised at a reasonable level (it could be argued that one of the things Atari did wrong was to sell its games too expensively). Getting hold of the games will be as easy as buying records — with large budgets for advertising and promotion new programs will be 'visible' — no more waiting ages for a response from a mail order company.

I see some problems through too. What will really be encouraged is standardisation — maximum appeal to maximum numbers of people for maximum profit.

The obvious analogy is with the record business — if you have top 40 tastes, you'll be well catered for.

What we must hope is that the analogy is actually very precise — in that case, just as there is an 'underground' record industry which survives (low budget labels, small scale advertising, little radio play), perhaps it is not unreasonable to imagine an 'underground' software industry where small companies grow up to fill a demand for programs outside the norm. Maybe they won't have the professional veneer of their popular rivals, but if the record industry is anything to go by, they may be far more interesting and imaginative.

Graham Taylor

## On the tiles

### Puzzle No 94

I called round to see Albert at his workshop last Saturday, to see if he could repair an antique chair that I had acquired. When I arrived he was busy working on two matching rather broken down old tables.

"I'm only interested in the tops," explained Albert. "You see they're covered with square tiles which I am hoping to remove and use to cover a larger table that I have made." Each table top was inlaid with very attractive inch square tiles, arranged with as many tiles to the row as there were rows.

Several weeks later he rang to say my chair was ready, so I went straight over. "What do you think of my new table?" he asked when I arrived. The new table top was covered with the tiles that he had salvaged — again in a perfectly square arrangement.

"Unfortunately, I broke one of the tiles," said Albert, "but luckily I still had precisely the correct number of tiles left for me to complete the job."

How many tiles did he use on the new table?

### Solution to Puzzle No 89

From the alphametic  $DAYS * 7 = WEEK$  it is clear that  $D$  must be equal to 1, otherwise there would be more than four digits in the product.

The program generates successive values for the word  $DAYS$  and multiplies this by seven to obtain the product. This result is first checked to determine if the second and third digits are the same, and then to see if the digits of the product are different from those in the word  $DAYS$ .

```
10 LET D = 1 20 FOR A = 0 TO 9 30 IF A = D THEN
GOTO 210 40 FOR Y = 0 TO 9 50 IF Y = D OR Y = A
THEN GOTO 200 60 FOR S = 0 TO 9 70 IF S = D OR S
= A OR S = Y THEN GOTO 190 80 LET DAYS = D *
1000 + A * 100 + Y * 10 + S 90 LET WEEK = DAYS * 7
100 LET WS = STR$ WEEK 110 IF WS(2) <> WS(3)
THEN GOTO 190 120 IF WS(4) = WS(3) OR WS(4) =
WS(1) OR WS(2) = WS(1) THEN GOTO 190 130 FOR
N = 1 TO 3 140 IF N = 3 THEN LET N = 4 150 LET K =
VAL WS(N) 160 IF K = D OR K = A OR K = Y OR K = S
THEN GOTO 190 170 NEXT N 180 PRINT D;A;Y;S;"" 7
=""; WS 190 NEXT S 200 NEXT Y 210 NEXT A
```

This results in two possibilities:  $1048 * 7 = 7336$  and  $1207 * 7 = 8449$ .

### Winner of Puzzle No 89

The winner is: R A Mitchell, Lingdale Avenue, South Bents, Southerland, who receives £10.





... but seriously,

# AUTOMATA

**PIMANIA** - the cult adventure that's for real.16K ZX81 £5 ☐ BBC 32K £10 ☐ Dragon 32 £10 ☐ Spectrum 48K £10 ☐**GROUCHO** - the Pimania sequel, Concord OE2-USA prizeFree rock music on the flipside. Spectrum 48K £10 ☐**PI-EYED** - the comedy cartoon arcade game, starringthe PiMan. Free protest disco record. Spectrum 48K £6 ☐**PI-BALLED** - A triumph of the arcade programmer's art.Starring the PiMan. Free offensive Reggae music. Spectrum 48K £6 ☐**MORRIS MEETS THE BIKERS** - exciting arcade fun,as seen on TV. Outrageous free doo-wop record. Any Spectrum £6 ☐**YAKZEE** - Bruddy wonderfurr game of ruck and skirr.An oriental masterpiece for Dragon 32 plus. Spectrum 48K £5 ☐**GO TO JAIL** - Play the gamefind out what all the fuss is about, cookie. Spectrum 48K £6 ☐**THE PIMAN'S GREATEST HITS** - amazing stereo L.P. cassette £3 ☐

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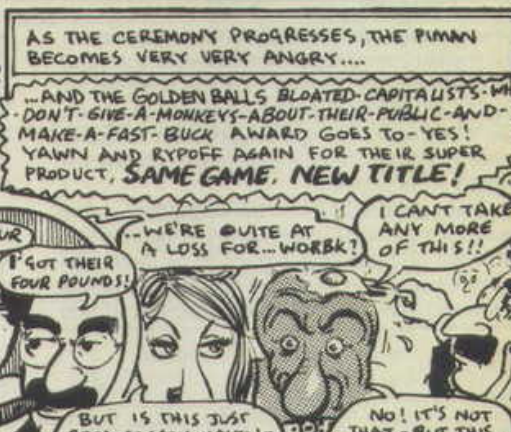
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EVENTS (the Devil made me do it!)



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