40 Rock


# POPULAR Computing WEEKLY

35p 3-9 February 1983 Vol 2 No 5


## This Week

### Vic Adventures

Mike Grace looks at the new adventure games being released for the Vic20. See page 12.

### Copyright

Gail Counsell unravels some of the copyright problems facing lending libraries and software pirates. See page 10.

### ZX machine code

Geoff Wilkins introduces two new machine code routines to add extra commands to your ZX Spectrum. See page 22.

### Dragon graphics

David Lawrence continues building up a program from his book *The Working Dragon*. See page 25.

**★STAR**
**Tank Battle on BBC Model B by John Meredith**
**See page 8**
**GAME★**

## News Desk

# TS2000 with new look silver finish

VARIATIONS on a theme. The new-look Spectrum — the TS2000, and ZX Printer — the TS2040, have been specially designed by Timex for the American market.

Apart from its silver exterior styling the TS2000 is the same as its familiar UK counterpart. It will sell in the US for £95 (16K) and £127 (48K), available in the late spring.

The TS2040 printer is larger than the British ZX Printer, and will sell for less than £65.

As Timex announced the TS2000 machine, the company also cut the price of its TS1000 machine (the ZX81 equivalent) by £10. The price drop takes the form of a rebate coupon and the offer applies only for a limited period until March 31.

## Summer plan for Binatone

THE BINATONE Personalized Computer, originally scheduled for launch in December last year, is now planned for launch in early summer.

"We are hoping for a launch date in May or June and we are still aiming for a colour computer for around the £50 mark," said Binatone Sales Manager, Stephen Oliver.

The budget home computer will feature a full-size push-button keyboard, 16 colours, high resolution graphics and 16K Ram expandable up to 64K. The on-board 12K Rom will run a version of Microsoft Basic. The screen display format will be 64 characters × 16 lines.

The computer will be fully portable with a built-in power supply, cassette drive unit and RS232 interface. The printer output will be 80 characters per line.

It will be made in the Far East. Binatone is looking for 300,000 sales through high-street stores.

## Classified Classified Classified Classified

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**VIC20,** 8-16K Ram, super expander, joystick, Vic Revealed. Nottingham 324376 after 5 pm.

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**Continued on page 28**

# NEW SPECTRUM AND ZX81 SOFTWARE

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

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your 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

Artificial Intelligence is a topic that is attracting increasing interest, both in the media and in the laboratory.

With hard and software expertise seemingly growing at an almost exponential rate, the idea of a "thinking" computer is no longer ridiculous. It is not so much a question of "If" so much as "When".

But, while a number of people are devoting themselves to the mechanics of producing Artificial Intelligence, few people seem to have given much thought to the consequences. If computers can be devised that genuinely think, as opposed to simulating thought, will they be regarded as a new life form? If so, will they have the same rights as humans and will it become murder to switch them off?

These questions might seem a little fanciful, but they will have to be answered all the same. A thinking computer could quite conceivably develop needs and desires of its own that could conflict with those of its creators. How would such conflict be equitably resolved?

If we succeed in creating Artificial Intelligence, we shall have to recognise that there is a price to pay. A computer with free will may be a dependant, it will not be a servant.

## Next Thursday

**Enter the Cavern, a new game for the 16K Spectrum, by David Leitch. Also, Tony Bridge presents a review of the latest software for the still strong ZX81 David Kelly interviews the men behind the Oric-1 computer to assess the reality of their dream to do for the rest of the world what Clive Sinclair has done for Britain.**

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# Oric switches out of mail order

ORIC Products International is to discontinue mail-order sales of its Oric 1 microcomputer almost as soon as they have begun.

This change in sales policy will mean that by March the Oric will only be available through an appointed dealership network and selected high-street stores. So far the company has received more than 2,000 orders from mail-order customers.

"Oric now believes that there is only one way to sell a home microcomputer — and that is retail," said sales director Peter Harding.

A number of deals have already been concluded which will put the computer into the high street by April.

From April onwards W H Smith will be stocking the 48K machine. Although Oric claims that W H Smith will take more than 45,000 machines in 1983, a spokesman for the store would only confirm that W H Smith will be taking the computer "in substantial quantities".

The Spectrum chain, Laskeys, Greens and Curry's Micro C have also agreed to stock the computer. Microperipherals and Tangerine (designers of the Oric 1) will act as dealers.

"As with any product it takes time to get up to high-volume production," explained Peter Harding. "But we hope to be out of mail-order by March this year."

Distribution deals have also been signed in France, Germany, Spain, Belgium, Scandinavia, Greece, Singapore and Portugal. Oric is also considering manufacture of the Oric 1 under licence in the USA, Japan, India and Latin America.

At present the company assembles and tests the printed-circuit boards in two operations running in Singapore. The cases are made and final assembly is undertaken at Kenure Plastics in Feltham.

● Oric has announced preliminary details of a range of peripherals for the machine. The Modem is planned for the end of April, priced at £79. A four-colour, plain-paper printer is planned for the same time, priced around £150. Joysticks and double-sided double-density 5¼ inch disc operating systems are scheduled for the end of May.

Bug-Byte, Artic and Salamander will be producing software for the machine — the first programs should be available in March.

# Atari signs big names

A VIDEO game based on the story and characters in the Speilberg film *Raiders of the Lost Ark* is just one of the projects in the pipeline, arising from a series of licensing agreements concluded by Atari.

Other well-known faces soon to appear on Atari products are such characters as Mickey Mouse, Snoopy, Woodstock and all the gang from the Peanuts strips.

According to Graham Daubney, Atari's UK Software Manager, the licences apply to both the Atari 400 and 800 computers and to the Atari VCS games machine system. "We will be using the characters, not just in arcade-type games, but also in a range of educational adventure games for younger children," he said.

To accompany the new software for four to seven year olds Atari has announced a controller for the VCS machine with colourful 'chunky' keys.

*Harrison Ford in Raiders of the Lost Ark.*

# Commodore gives voice

A SOPHISTICATED voice synthesizer add-on has been announced for the Commodore 64 microcomputer.

Developed by Commodore's Speech Technology Division in Dallas, Texas, the low-cost I/O unit can produce a variety of different voices — male, female, a child's or that of a cartoon character.

The Speech Cartridge plugs into the Rom slot on the Commodore 64 machine. It is addressable from the keyboard and operates using the Basic command word *Say*. A typical program construction might be *Say* "Thank you".

The most interesting application of the voice unit will be to add speech as an integral part of a program. Using the cartridge it will be possible to make the characters in an animation sequence speak — with different voices for the different characters.

Also supplied in the Rom cartridge is a learning program to help teach the alphabet.

The speech synthesizer is planned for the second quarter of 1983, and will cost £65.

# Distribution by John Wiley

JOHN WILEY and Sons is to market and distribute Acornsoft's range of software and book titles.

John Wilson, Wiley's computer publications editor, commented: "We found an increasing awareness in the book trade for software and we have agreed to handle Acornsoft's titles."

Acornsoft will continue to promote its material direct but, according to John Wilson, although "the spirit of our agreement is that Wiley will concentrate on its established outlets, Acorn dealers will be able to get software from us if they wish."

The arrangement between the two companies applies to the UK, the rest of Europe and Africa.

# More micros get government approval

MICROCOMPUTERS purchased for use by government departments are more likely to be British-made, following the announcement of new guidelines.

The Treasury's Central Computer and Telecommunications Agency which advises on such things has produced a new list of manufacturers approved by the government.

Of the 12 new companies on the list, seven are British — including ICL, Comart and Torch. Those removed from the list include Commodore and Research Machines.

David Broad, chairman of the British Microcomputer Manufacturers Group said that, although the new list was an improvement, many good British companies were still missing from it.

# Lisp for Spectrum

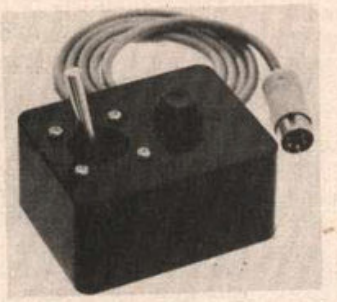
SERIOUS Software has developed a Lisp interpreter for the Spectrum.

The artificial intelligence language is contained in just over 7K of code. Features include over 50 predefined functions, iteration via *Progn* and *While*, a variable number of parameters to user-defined functions, full property list implementation and full error checking.

The cassette, together with demonstration program and programmers' manual, is available for £15 from Serious Software, 7 Woodside Road, Bickley, Bromley, Kent.

# THE DRAGON DUNGEON

## DRAGON STICKS!



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## DRAGON'S TEETH

Our monthly Club Letter will shortly emerge from the depths of the Dungeon, where insomniac games-testers crouch chained to their Dragons, endlessly reviewing the latest software for your benefit.

If you have identified any of those elusive addresses, have spotted any programming quirks of the 6809 or have any tips to assist fellow Dragon-bashers, send them along to the Dungeon.

'Dragon's Teeth' is full of news, reviews, information and products. The Annual Subscription, which includes software discount offers is £6.00 (six-month trial subscription £3.25).

Copies of David Lawrence's 'The Working Dragon 32' now in stock, £5.95 post-free.

The Dragon Dungeon is always on the lookout for innovative software which exploits the Dragon's colour and sound potential, against royalty, outright purchase or sales agency. Secrecy Agreement exchange against unprotected tapes sent for evaluation.

We should also like to get in touch with experienced programmers, who can translate detailed games concepts into working software on a contract basis.

**THE DRAGON DUNGEON**
**PO BOX 4, ASHBOURNE, DERBYSHIRE DE6 1AQ. TEL: ASHBOURNE 44626**

# DRAGON 32
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## Poking into memory

In the January 6 edition of *Popular Computing Weekly*, David Nowotnik presented a program to allow easy *Poking* to the Spectrum display memory. The routine was a mixture of Basic and machine code, with the result that it was not very fast.

The routine could have been written entirely in machine code — Figure 1 is a disassembly of just such a routine. David's expression for calculating screen addresses was also a little confusing, but Diagram 1 should make the method a bit clearer.

Program lines 10 to 90 of Figure 3 will locate the routine in the printer buffer, 23296. The desired *Y,X* co-ordinates should then be *Poked* into 23297, 23298 respectively. The routine is completely relocatable, just remember to *Poke Y,X* into the start address + 1, start address + 2. The result of the calculation is returned in *BC*, so a *Usr* call will return it directly to a variable if desired.

Figure 2 is another machine code routine for calculating screen addresses, only this time it will convert the address in *HL* to its Spectrum equivalent. The address in *HL* is the value you would expect to use if the Spectrum screen memory was arranged in a conventional manner, ie:

Line 0, Column 0 = 4000 H, 16384 D
Line 1, Column 0 = 4020 H, 16416 D
Line 2, Column 3 = 4043 H, 16451 D
and so on.

The conventional address can be calculated by: 16384 + 32 × line + column where line is in the range 0-191 and column is in the range 0-31.

While this may not seem very useful to the Basic programmer, where using *X,Y* co-ordinates is the usual method, it is very useful to someone using machine code where a single 16-bit address is often more convenient. Using this routine allows you to move blocks of the screen around using conventional addressing techniques and calling the converter to translate into 'Spectrumese'.

Like the first routine, the result is returned in *BC* but it does not allow you to *Poke* in the data from Basic. If you wish to use the routine from Basic you should add a *LD HL, nn* instruction (33, 0, 0) to the start and then *Poke* in the value as in the first program. Remember though that here it expects an address, not co-ordinates.

This routine is also relocatable — the loading program in Figure 3 lines 110 to 200 locate it at 23321. Also, bear in mind that the listings in Figures 1 and 2 is in Z80 assembler and should not be entered as part of a Basic program.

*Larry Carasco*
*43 Broadfield Close*
*Dollis Hill*
*London NW2 6NR*

```
5B00  21 00 00    LD    HL,#0000
5B03  7D          LD    A,L
5B04  E6 07       AND   #07
5B06  C6 40       ADD   A,#40
5B08  47          LD    B,A
5B09  7D          LD    A,L
5B0A  E6 C0       AND   #C0
5B0C  1F          RRA
5B0D  1F          RRA
5B0E  1F          RRA
5B0F  80          ADD   A,B
5B10  47          LD    B,A
5B11  7D          LD    A,L
5B12  E6 38       AND   #38
5B14  17          RLA
5B15  17          RLA
5B16  84          ADD   A,H
5B17  4F          LD    C,A
5B18  C9          RET
```

**Fig. 1 X,Y converter.**

```
5B19  7C          LD    A,H
5B1A  26 40       LD    H,#40
5B1C  94          SUB   H
5B1D  47          LD    B,A
5B1E  E6 18       AND   #18
5B20  84          ADD   A,H
5B21  67          LD    H,A
5B22  7D          LD    A,L
5B23  4F          LD    C,A
5B24  E6 E0       AND   #E0
5B26  17          RLA
5B27  17          RLA
5B28  17          RLA
5B29  17          RLA
5B2A  84          ADD   A,H
5B2B  67          LD    H,A
5B2C  78          LD    A,B
5B2D  1F          RRA
5B2E  1F          RRA
5B2F  1F          RRA
5B30  1F          RRA
5B31  E6 E0       AND   #E0
5B33  6F          LD    L,A
5B34  79          LD    A,C
5B35  E6 1F       AND   #1F
5B37  85          ADD   A,L
5B38  4F          LD    C,A
5B39  44          LD    B,H
5B3A  C9          RET
```

**Fig. 2 Address converter.**

```
Breakdown the Y co-ord like so:

          10   111   111 = #BF
           |    |     |
           |    |     |
           |    |     |
```

# Tank Battle

**A new game for the BBC Model B by J Meredith**

This program, for a Model B BBC Micro simulates a tank battle. The object of the game is to destroy the enemy tank before it destroys you. The computer controls the black tank while you control the yellow tank.

There are 40 white barriers which give protection to the player's tank. If either tank drives over a barrier it is destroyed. When a missile shot from either tank hits a barrier, then the barrier will explode.

There are nine levels of play. As the level is increased, the enemy tank starts to move faster. Also, the enemy tank is more likely to dodge your missiles.

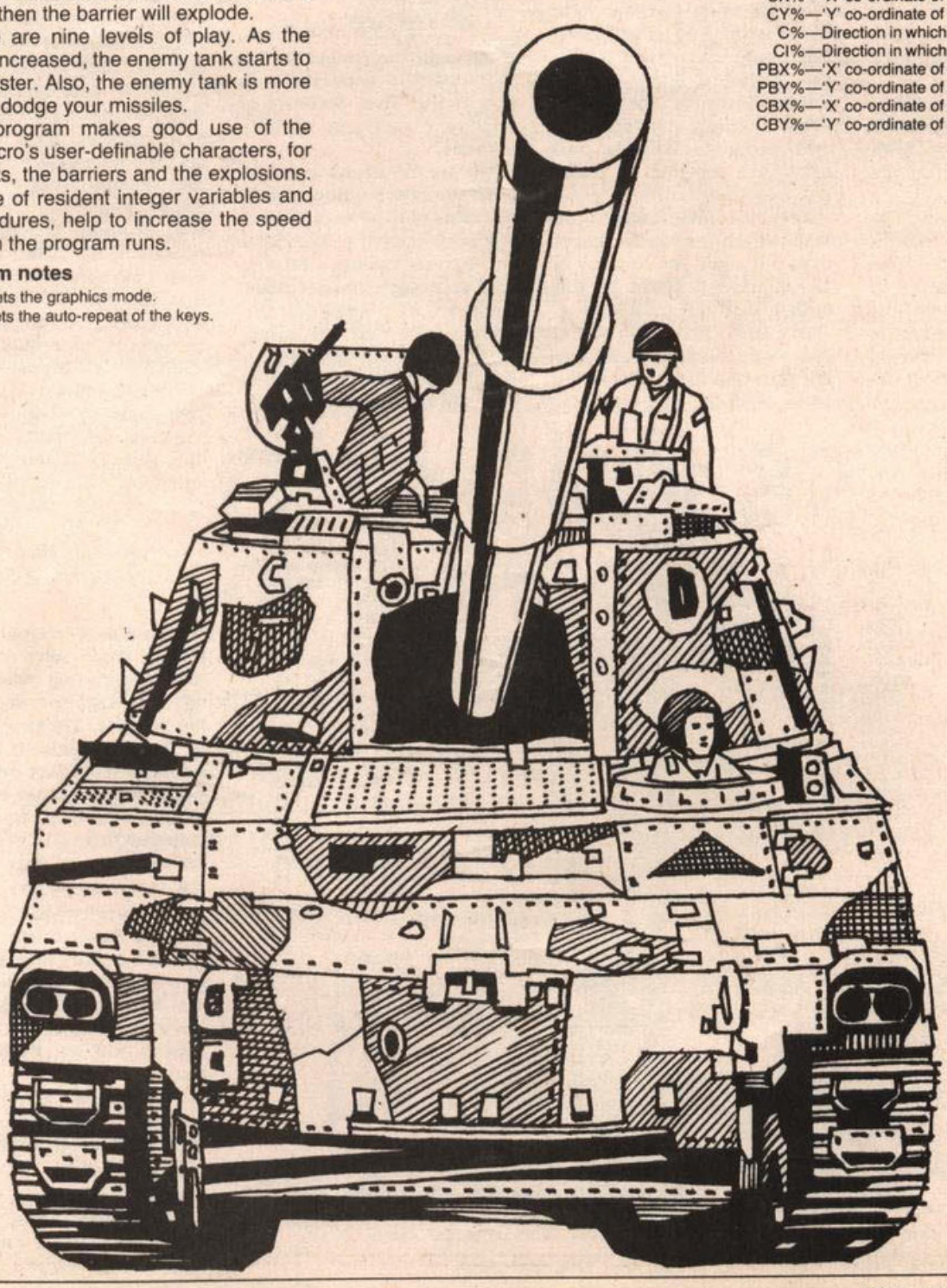
The program makes good use of the BBC Micro's user-definable characters, for the tanks, the barriers and the explosions. The use of resident integer variables and PROCedures, help to increase the speed at which the program runs.

### Program notes

Line 10 sets the graphics mode.
Line 20 sets the auto-repeat of the keys.
Lines 40 to 130 set up the instructions of the game and set the level of play.
Line 160 clears the screen.
Lines 170 to 290 set up the variables and define the characters.
Lines 300 to 380 set up the screen for battle.
Lines 390 to 1130 are the loops and procedures involved in the game.
Lines 1140 to 1160 inform the player whether he or the enemy has won.
Lines 1170 to 1200 invite the player to play again.
Line 1210 clears the screen and displays the message "BYE".
Lines 1220 to 1270 create the explosion when either tank is hit.
Line 1280 sets the auto-repeat of the keys back to normal.

### Main variables

LLL%—Level of play.
PX%—'X' co-ordinate of player's tank.
PY%—'Y' co-ordinate of player's tank.
CX%—'X' co-ordinate of enemy tank.
CY%—'Y' co-ordinate of enemy tank.
C%—Direction in which the player's tank is pointing.
CI%—Direction in which the enemy tank is pointing.
PBX%—'X' co-ordinate of player's missile.
PBY%—'Y' co-ordinate of player's missile.
CBX%—'X' co-ordinate of enemy missile.
CBY%—'Y' co-ordinate of enemy missile.



```
10 MODE 1
20*FX11,10
30ON ERROR GOTO 1280
40 PRINT"            TANK BATTLE"
50 PRINT"            -----------"
60PRINT'''"KEYS:"
70PRINT'"      E - To move tank up"
80PRINT'"      D - To move tank down"
90PRINT'"      F - To move tank left"
100PRINT'"     G - To move tank right"
110PRINT'"     H - To fire a missile"
120 INPUT''''"Type leval of play,"''"1 is easy,
9 is  very hard."''"The number should be in the
range of 1-9",LLL%
130 CLS:PRINT''''''''''" G E T
R E A D Y !":FORX=1 TO 10:SOUND 1,-15
,100,5:SOUND 1,0,100,5:NEXT
140 IF LLL%<1 OR LLL%>9 THEN RUN
150 LLL%=10-LLL%
160 CLS
180 BB%=0
190 VDU 23,224,24,24,219,219,255,255,219,219
200 VDU 23,225,63,63,12,255,255,12,63,63
210 VDU 23,226,219,219,255,255,219,219,24,24
220 VDU 23,227,252,252,48,255,255,48,252,252
230 VDU 23,228,60,126,255,255,255,255,126,60
240 VDU 23,229,0,0,0,24,24,0,0,0
250 VDU 23,230,0,0,36,0,0,36,0,0
260 VDU23,231,0,65,0,0,0,0,65,0
270 VDU23,232,129,0,0,0,0,0,0,129
280 VDU 23,233,0,0,0,0,0,0,0,0
290 PX%=20:PY%=12:CX%=37:CY%=30:C%=227:F%=0:
PBX%=-1:PBY%=-1:C1%=0:F1%=0:CEX%=0
:CEY%=0:PEX%=0:PEY%=0:PEF%=0:CEF%=0:CEC%=0:CEF%=0
300 VDU 19,0,1,0,0,0,19,1,0,0,0,0
310 COLOUR 2
320 PRINT TAB(PX%,PY%);CHR$(227)
330 COLOUR 1
340 PRINT TAB(CX%,CY%);CHR$(225)
350 COLOUR 3
360 FOR X=0 TO 40
370 PRINT TAB(RND(34)+2,RND(26)+2);CHR$(228)
380 NEXT
390 A$=INKEY$(0):*FX 15,0
400 TX%=PX%:TY%=PY%
410 IF A$="E"THEN PY%=PY%-1:C%=224:IF PY%<2
THEN PY%=30
420 IF A$="F"THEN PX%=PX%-1:C%=225:IF PX%<0
THEN PX%=38
430 IF A$="G"THEN PX%=PX%+1:C%=227:IF PX%>38
THEN PX%=0
440 IF A$="D"THEN PY%=PY%+1:C%=226:IF PY%>30
THEN PY%=2
450 IF PX%=CX% AND PY%>CY% AND F1%=0 THEN C1%=
226:PROCSHOOT
460 IF PX%=CX% AND PY%<CY% AND F1%=0 THEN C1%=
224:PROCSHOOT
470 IF PY%=CY% AND PX%<CX% AND F1%=0 THEN C1%=
225:PROCSHOOT
480 IF PY%=CY% AND PX%>CX% AND F1%=0 THEN C1%=
227:PROCSHOOT
490 IF F1%=1 THEN PROCSHOOT
500 IF CEF%=1 THEN PROCEXPL
510 IF PEF%=1 THEN PROCEXPLP
520 IF A$="H"AND F%=0 THEN 580
530 COLOUR 2
540 IF TX%=PX% AND TY%=PY% THEN 570
550 PRINT TAB(TX%,TY%);" "
560 PRINT TAB(PX%,PY%);CHR$(C%)
570 IF F%=0 THEN 740 ELSE 640
580 IF C%=224 THEN PBX%=PX%:PBY%=PY%-1:BMX%=0:
BMY%=-1
590 IF C%=225 THEN PBX%=PX%-1:PBY%=PY%:BMX%=-1
:BMY%=0
600 IF C%=226 THEN PBX%=PX%:PBY%=PY%+1:BMX%=0:
BMY%=1
610 IF C%=227 THEN PBX%=PX%+1:PBY%=PY%:BMX%=1:
BMY%=0
620 F%=1
630 SOUND 0,-15,6,10
640 PBY%=PBY%+BMY%
650 PBX%=PBX%+BMX%
660 IF PBY%<2 OR PBY%>30 OR PBX%<0 OR PBX%>38
THEN F%=0:PRINT TAB(PBX%-BMX%,PBY%-BMY%);" ":PBX%
=-1:PBY%=-1:GOTO 740
670 IF ?(HIMEM+PBY%*640+PBX%*16+4)=255
THEN F%=0:GOTO 720
680 IF PBX%=CX% AND PBY%=CY% THEN
PROCEXPLODE:GOTO 1160
690 PRINT TAB(PBX%-BMX%,PBY%-BMY%);" "
700 PRINT TAB(PBX%,PBY%);CHR$(229)
710 GOTO 740
720 PRINTTAB(PBX%-BMX%,PBY%-BMY%);" ":PEX%=PBX%:
PEY%=PBY%:PEC%=229:PEF%=1:GOTO 740
730 DEFPROCEXPLP:COLOUR3:PRINTTAB(PEX%,PEY%);
CHR$(PEC%):PEC%=PEC%+1:IF PEC%=23
4 THEN PEF%=0:ENDPROC
740 IF BB%<LLL%*2 THEN BB%=BB%+1 ELSE BB%=1
750 IF BB%<>1 THEN 390
760 OCX%=CX%:OCY%=CY%
770 IF F%=1 AND PBX%=CX% AND INT(RND(LLL%)+.999)
=1THEN CX%=CX%+1:C1%=227:GOTO 850
780 IF F%=1 ANDPBY%=CY% AND INT(RND(LLL%)+.9999)
=1 THEN CY%=CY%+1:C1%=226:GOTO 850
790 IF F%=1 AND (PBX%=CX%+1 OR PBX%=CX%-1) THEN
390
800 IF F%=1 AND (PBY%=CY%+1 OR PBY%=CY%-1) THEN
390
810 IF PX%>CX% THEN CX%=CX%+1:C1%=227:GOTO 850
820 IF PX%<CX% THEN CX%=CX%-1:C1%=225:GOTO 850
830 IF PY%>CY% THEN CY%=CY%+1:C1%=226:GOTO 850
840 IF PY%<CY% THEN CY%=CY%-1:C1%=224:GOTO 850
850 IF CX%<0 THEN CX%=38
860 IF CX%>38 THEN CX%=0
870 IF CY%<2 THEN CY%=30
880 IF CY%>30 THEN CY%=2
890 COLOUR 1
900 IF OCX%=CX% AND OCY%=CY%THEN930
910 PRINTTAB(OCX%,OCY%);" "
920 PRINTTAB(CX%,CY%);CHR$(C1%)
930 GOTO 390
940 DEFPROCSHOOT
950 IF F1%=1 THEN 1030
960 COLOUR1:PRINT TAB(CX%,CY%);CHR$(C1%)
970 IF C1%=224 THEN CBX%=CX%:CBY%=CY%-1:CMX%=0:
CMY%=-1
980 IF C1%=225 THEN CBX%=CX%-1:CBY%=CY%:CMX%=-1
:CMY%=0
990 IF C1%=226 THEN CBX%=CX%:CBY%=CY%+1:CMX%=0:
CMY%=1
1000 IF C1%=227 THEN CBX%=CX%+1:CBY%=CY%:CMX%=1
:CMY%=0
1010 F1%=1
1020 SOUND 0,-15,5,10
1030 CBY%=CBY%+CMY%
1040 CBX%=CBX%+CMX%
1050 IF CBY%<2 OR CBY%>30 OR CBX%<0 OR CBX%>38
THEN F1%=0:PRINT TAB(CBX%-CMX%,C
BY%-CMY%);" ":ENDPROC
1060 IF ?(HIMEM+CBY%*640+CBX%*16+4)=255 THEN
F1%=0:PRINT TAB(CBX%-CMX%,CBY%-CMY
%);" ":GOTO1110
1070 IF CBX%=PX% AND CBY%=PY%THEN PROCEXPLODE:
GOTO1140
1080  PRINT TAB(CBX%-CMX%,CBY%-CMY%);" "
1090 PRINT TAB(CBX%,CBY%);CHR$(229)
1100 ENDPROC
1110 F1%=0:CEX%=CBX%:CEY%=CBY%:CEC%=229:CEF%=1:
ENDPROC
1120 DEFPROCEXPL:COLOUR2:PRINT TAB(CEX%,CEY%);
CHR$(CEC%):CEC%=CEC%+1:IF CEC%=23 4 THEN CEF%=0
1130 ENDPROC
1140 VDU20:CLS:PRINT''''"  I WIN, YOU ARE DEAD"
1150 GOTO 1170
1160 VDU20:CLS:PRINT''''"YOU WIN"
1170 *FX 15,0
1180 INPUT''''"Another game ",A$
1190 IF A$="YES" OR A$="yes" THEN RUN
1200 IF A$<>"NO" THEN 1180
1210 CLS:PRINT"BYE!":GOTO 1280
1220 DEFPROCEXPLODE
1230 FOR N=1TO 20
1240 FOR W=1 TO100:NEXT
1250 VDU 19,N,0,0,0,0,19,N-1,7,0,0,0,0
1260 VDU 19,1,0,0,0,0,0,19,2,2,0,0,0,19,3,7,0,0,0
1270 NEXT:ENDPROC
1280 *FX 11,50
1290 END
```

# Tread Softly, pioneer

**Gail Counsell** tries to untangle the legal jungle created by micro technology

*Gail Counsell*

How the law affects computer programs is a thorny subject just at the moment.

Many headaches are being caused by uncertaintines in the way software fits into the existing legal structure.

Everyone agrees programs should receive some sort of protection from unfair copying, but no-one seems sure how far they want it to go. And a lot of non-programmers — book and film authors and board-game inventors, for example — are very concerned that they should be properly protected *against* computer games.

Copyright, trade marks, passing-off and contract are just some of the areas of the law which affect software. But their exact influence is very difficult to assess. Computers have developed so quickly that the law has not really caught up. Trying to guess where the lines will be drawn is what is causing all the problems.

Probably the most talked-about aspect of software protection is copyright. One reason for this interest is that copyright law offers a very wide-ranging protection. If a computer program is copyright (and, though this has not yet been conclusively decided, most people assume it will be) then it is automatically protected against a number of unauthorised acts. The most important of these is the making of copies.

Copyright protection would extend to cover both direct copies of the tape itself and copies made using all or part of the program listing. It would also prevent translations of the program — for example from Basic to Forth, adaptations taking the basis of the program and changing some of the surrounding element and even dramatisations — for instance turning a game program into a play or novel. This is because you cannot 'copy' a program even into a different form. So you probably should not make a three-dimensional board-game copy of someone else's computer game.

This also all applies in reverse. It would probably be a breach of copyright to take an existing board game and turn it into a computer game. And, while we are on the subject, it may also be a breach of trade mark law if the name of the game has been registered and you reproduce it without permission.

Unlike copyright, trade marks have to be applied for. They are not automatically granted — you have to fulfil certain criteria. The trade mark has to be in respect of certain types of goods — games are one sort — and the words used have to be *distinctive*. So they can't be everyday words like 'football' or 'chess' (on their own, at any rate).

The other danger in converting a game in this fashion is that its original author will claim it is a case of 'passing off'. This is a legal rule which says you must not mislead people — even unintentionally — into thinking that your goods are actually someone else's.

You must not 'pass off" your computer game as someone else's board game. It does not matter that one is a computer game and the other a board game.

Similar problems arise if you want to use a character from a film or play in your game program. The names of characters are not copyright (though, be careful — they may be protected by trade marks) but the visual presentation of them may well be — Mr Spock's ears for example! When such famous characters are used in a game by a reputable software house, permission is always obtained first. This is called a 'licence' and usually gives the company concerned sole rights to a particular fictional individual. Atari, for example, has recently signed a licensing agreement with Walt Disney to use all its characters. In a similar way, Melbourne House agreed with the Tolkien Estate to use the characters from The Hobbit.

A game based on a novel or film may be a breach of copyright. The plot by itself is not copyright, but once you add in characters, incidents and dialogue it soon becomes copyright and 'borrowing' from it will probably be a breach. The line drawn is a very fine one because, to some extent, it depends on the *degree* to which you use these elements.

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Another area in which copyright may be important is that of compilers and assemblers. These convert from Basic and hexadecimal addresses, respectively, to varieties of object code. Object code is very like machine-code. Compilers are particularly useful. Anyone who can write a game in Basic can compile it to object-code producing the kind of fast arcade action not possible with Basic.

Some companies which sell compilers have been demanding a royalty payment — a cut, if you like — on each cassette sold where the compiler has been used to write the program. In addition to adding to the cost of cassette software, the logic of such a royalty payment is rather doubtful. It is presumably based on the argument that the compiler is 'translating' the program.

Under copyright law the authorised translator of a copyright work gets copyright in the *translation*. For the translation to be copyright, however, it has to be "an original piece of work produced by skill or labour". Probably, a court, if asked, would say that a purely mechanical process, like that of the compiler, wouldn't count. Rather, the compiler would be like the artist's brush — a tool rather than an originator. If the product of the compiler is *not* copyright then why should a royalty be charged? The manufacturer who sells the artist the brush does not claim a royalty on every picture!

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There are two other 'hot' legal topics at the moment.

Take lending libraries. These are a recent development as far as software is concerned. They operate in much the same way as book, record and video libraries. In return for payment of a membership subscription plus a hiring fee they loan out cassettes for short periods.

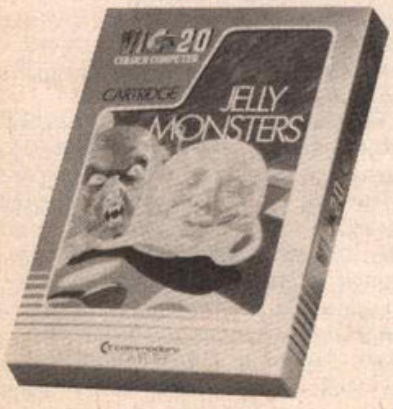
Inevitably, some of those who borrow cassettes do so to make copies of them — despite the fact there is often a rule of membership against this. Of course, this is almost certainly a breach of copyright, as

*David Paterson, a founding partner of Silversoft.*

well as of the membership rules. (The only thing which prevents this being definitely the case is the lack of a court decision conclusively stating that programs are copyright.)

To software houses these libraries represent a threat to sales and some of them — Silversoft for example — are starting to take an agressive stand. After all, it is argued that, as well as making it easier for people to make illicit copies they also discourage purchases — why buy when you can rent more cheaply. The libraries though contend that they actually encourage sales. Not only do the libraries themselves represent significant bulk buyers of cassettes but many — Sinclair Owners Software Library for example — encourage their members to buy programs they have hired. To the extent that they stimulate interest in computer games generally, it can be said they help to build up a market.

This is the approach taken by Commodore, who, unlike other software houses, do not include a prohibition against lending or hiring on the outside of their cassettes. Other companies have not yet made up their minds — Thorn/EMI and Atari for instance, both say they are urgently reviewing what position they should take towards these libraries.




*Jellymonsters — offending Atari.*

Their decision is not made any the easier by the fact there have not yet been any cases on lending and hiring software. This means the exact legal status of the libraries is uncertain.

The situation is, however, similar to that of record libraries. This parallel is underlined by the fact that some of the companies involved in record manufacture are also engaged in producing computer programs. Thorn/EMI for example. And there have been cases on the legality of record lending libraries.

Lending and hiring without permission is not specifically forbidden under copyright law. So the record companies, trying hard to stop the libraries, attempted to argue that libraries were 'authorising' breaches of copyright. They said when the libraries lent out records they knew (and did not care) that they would be taped and that this was an 'authority' in effect. 'Authorising' a breach of copyright is an offence in itself.

But the courts would have none of it. They said this was stretching the meaning of the word too far.

Then one of the record companies — Thorn/EMI in fact — tried a different argument, based not on *copyright* but on *contract.* They managed to stop a dealer from lending out their records because a clause in his dealership agreement said that he couldn't. Though they were successful, the trouble with this argument, as far as they are concerned, is that it does not help them against independent libraries — only against people who have come to special supply arrangements with them.

So it seems software libraries are not themselves committing any breaches of copyright. If they have dealership agreements though, they may be committing a breach of contract. Such agreements are not common however. There is one other way the libraries could be said to be committing a breach of contract. This involves the second 'hot topic.'

Many cassettes carry notices on them claiming they are copyright and warning against making copies. Some also say the cassettes must not be lent or hired out.

Such clauses are not strictly necessary from the copyright point of view. In this country, at any rate, if something is copyright then it is automatically protected — no word 'copyright' or '(c)' is needed. A copyright notice does however draw the buyer's attention to the fact that the program has such protection (if indeed it does). (In America a copyright notice *is* necessary before the material is protected.)

But these clauses may have another function. They can be attempts to bind contractually the person buying the cassette. Such notices are promises — the seller promises to sell you the program, but only if you promise not to copy or lend it.

While copyright law can probably not be used to restrict lending and hiring, such a contractual 'promise' may work. This is a very complicated legal area and for various reasons the attempt could fail. The clause needs to be clearly visible *before* you buy the cassette, for a start. Many of these clauses are inside the packaging and can serve as no more than warning notices.

This is also true for mail order cassettes — the clause would have to be displayed in the advertisement to stand any chance of working.

The big disadvantage of such clauses for software houses is that they do not 'bind third parties.' This means that only the person buying the cassette is stopped from hiring or lending it. Someone buying or being given it later on would not be.

*Alec Fry, founder Sinclair Owners' Software Library.*

One final interesting point concerns so-called 'breaker' programs. These are used to break into a machine-code program designed to auto-run on loading. Whether these are legal or not may depend on whether they have any purpose other than to help people break into copyright programs to copy them. If they have not then it may be that they form some sort of 'authority' to make an illicit copy. If so then those selling them might also be committing a breach of copyright.

No one is likely to get thrown into gaol merely because he commits a breach of copyright, contract or any of these other matters — breaches of what are called the 'civil' law are not punishable by a stretch in the 'pen'! But he can be made to hand over any profits he may have made out of things he has done which he should not have. He may also have to pay damages for any financial loss he may have caused — and that can be a very expensive business.

With so many grey areas in the law at the moment as far as software is concerned it may be just as well to err on the side of caution.

● On the letters page of this issue, 7, *Popular Computing Weekly* replies to complaints against lending libraries from Bug Byte Software and Silversoft. PSC is offering to help bring software companies together to take some joint action.

# Adventure trails

***Mike Grace** ruminates on a selection of Vic Adventure games.*

*Mike Grace, our cheerful reviewer.*

Computer games fall into several distinct categories: Invaders type, Educational, Traditional (such as chess), and Adventure. Of course there are subdivisions within those categories, and there are some which do not fit into any of the above, but to my mind most software can be classified within one of these major divisions.

Adventure games form a particular genre and have a mystique all their own, (see my review of the Commodore range in *Popular Computing Weekly* Volume 1:25). It is this type of game that I am reviewing in this article. However not all Adventure-type software is of the traditional type — sometimes to its advantage.

The first batch of Adventure games I tried was from *Leisure Soft* in Blackpool. These games were in cassette form, with very attractive cardboard sleeves inside cases depicting assorted wizards, demons, swords and the other characters typically found in fantasy stories.

Closer scrutiny reveals the artwork to be a trifle amateurish. It always seems a shame that a little more effort and time spent in considering packaging would go a long way towards selling the final product. In software the customer still seems to have to put up with a low standard from so many sources.

Having experienced the Scott Adams series, produced by Commodore, I was a little surprised by these three offerings. The format was essentially the same, (instructions on the screen answered by appropriate text), but the general standard was much lower. Silly spelling errors crept in occasionally and many of the messages seemed less helpful to my essentially novice status.

More seriously, some of the directions were incorrect so that if I went north to one location I found that by typing south again I would not return to the correct place but to somewhere else. To be fair this only happened in one adventure, but in another I never succeeded in leaving the first location as whatever I typed resulted in my being left in the same place. Although this may be due to some incredible stupidity on my part, after about 15 minutes of frustrated attempts I gave up, assuming it to be a bug in the program.

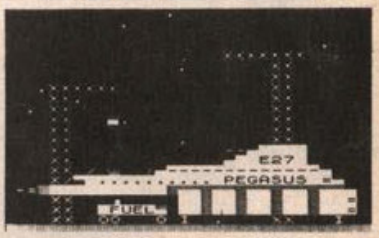
There were three different adventures to discover. *Time Machine* was one, where I was promised (in the sketchy synopsis written on the accompanying instruction leaflet) that I would have to search for all three glass prisms and insert them into the *Time Machine*. This would have unpredictable results.

To start with I was stranded on a foggy moor looking for the eccentric Dr Potter's old house late at night. Basic good stuff of which adventures are made — but alas this was the program I could not solve at all as whichever direction I typed resulted in the same message "you are on a foggy moor" flashing back onto the screen. If this *is* a bug perhaps I can explore *Time* more satisfactorily later.

The other two adventures are part of a triology which starts with the *Golden Baton* adventure and follows with the *Arrow of Death* Parts I and II. It concerns Tolkienesque characters in the ancient Kingdom of Elves. *Golden Baton* was the better of the two as I managed to get quite a long way into the adventure and the continuity was good. *Arrow of Death* (Part I) annoyed me by failing to adhere to a proper map. I gave up at an early stage.

The cassettes cost £9.95 plus 50p postage, so are much cheaper than Commodore's range, but the amateurish style (both in presentation of the packaging and of screen layouts in the messages themselves) detracts greatly and I would prefer to pay more for a better game. However, if you want to struggle with an adventure for a lot less money then try *The Golden Baton* first, and hopefully Leisure Soft will tidy up the other two to make them easier.

TRADER

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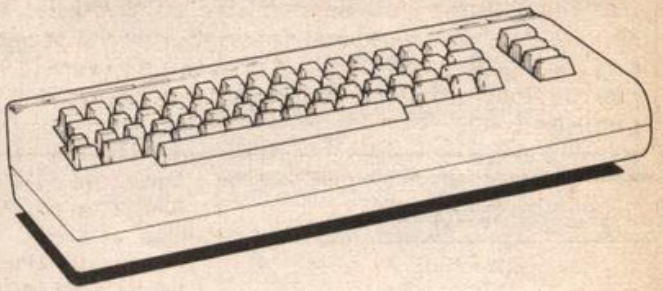

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10 DEF FNA(A)=ABS(PEEK(135)*((PEEK(65280) OR 128)<>255))
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and may be used by A=FNA(0) where A will equal the Ascii code of any key being pressed. A will equal zero if no key is being pressed.

It can be annoying when writing programs which require Yes/No answers to have to check for both upper and lower case letters. Memory location 329 is the lower case on/off switch. *Poke* 329,0 turns lower case on; *Poke* 329,255 turns it off.

Anybody writing machine code programs should find the following notes especially useful:

| | |
|---|---|
| 105 & 106 | Line number of program line currently being executed |
| 136 & 137 | PRINT@ position in memory, ie if PRINT position were at 23, PEEK(137)+256 *PEEK(136) would give 1047. |
| 337 to 345 | Keyboard check. |
| 426 to 433 | Name of file being searched for. |
| 434 to 441 | Name of file being loaded. |
| 274 & 275 | Value of TIMER function. |
| For the 'PLAY' command: | |
| 226 | TEMPO |
| 225 | NOTE DURATION |
| 222 | CONTROLS OCTAVE |

Locations 346 to 349 contain the values of *Joystick*(0) to *Joystick*(3) respectively. These may be updated by calling the Rom routine which starts at location 48466. In Basic this would be *Exec*(48466).

Locations 65494 and 65495 are used to alter the CPU speed. *Poke* 65495,255 will double the speed to 1.8 MHz, *Poke* 65494,255 returns it to its normal speed. The Dragon is not designed to run at 1.8 MHz and so I don't really recommend its frequent use in programs. Other useful Rom routines that may be called are:

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Finally, I give below two machine code routines that may be of general use, the first scrolls the Hi-Res screen down by one pixel in *Pmodes* 3 and 4, the second can be used to either invert the whole text screen to white on black or clear the text screen to an Ascii character. The routines can be located anywhere in Ram as they contain no absolute jumps etc.

```
10 CLEAR 200,31999
20 DATA 142,23,223,16,142,23,255,166,137,
   6,0,167,169,6,0,49,63,48,31,140,255,255,46,
   239,57
30 FOR I=1 TO 25
40 READ A : POKE 31999+I,A
50 NEXT I
```

call by EXEC(32000)

Screen invert/clear;

```
10 CLEAR 200,31999
20 DATA 142,0,0,166,137,
   4,0,132,191,167,137,4,0,48,1,140,2,0,37,239,57
30 B=32050 : FOR I=0 TO 20 : READ A
40 POKE B+I,A
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```

call by EXEC(B)

To change to screen clear, *Poke* B+7,134 and *Poke* B+8, Ascii of required character. These two routines can be used separately or together.

**Editor**
*by Brian Cadge*

## Colour Strips

### on Spectrum

This program draws, in the right-hand bottom corner of the screen, the Spectrum colour stripes. It is numbered in such a way as to be easily *Merged* with other programs to provide an extra splash of colour to a title page.

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```
9800 REM © Steve Mercer 1982
9805 LET p=0
9810 BORDER 7: PAPER p: CLS : IN
K 2
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R 6;x,y
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9875 FOR n=217 TO 255
9880 PLOT n,0 : DRAW x,y
9885 LET x=x-1: LET y=y-1
9890 NEXT n
9895 INVERSE 1. LET x=26: LET y=
26
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```
string array      a$(2,4,6,)
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variable array    a(5,3,)
variable          sum=17
variable          xlimit=10
variable          pi=3.1415927
variable          zzz=25271
variable          zz=186
for-next count    h=  3
string            z$=  ""
END OF DUMP
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LET zzz=zzz+6: PRINT "variable",
CHR$ zz;"=  ";VAL (CHR$ zz): GO
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9985 IF zz>=160 AND zz<=191 THEN
 PRINT "variable",: LET z$=CHR$
 (zz-64): GO TO 9990
9986 IF zz>=128 AND zz<=159 THEN
 PRINT "variable array",CHR$ (zz
-32);"(";: FOR h=1 TO PEEK (zzz+
3): PRINT PEEK (zzz+2+2*h)+256*P
EEK (zzz+2*h+3);",";: NEXT h: PR
INT ")"; LET zzz=zzz+3+PEEK (zzz
+1)+256*PEEK (zzz+2): GO TO 9982
9987 IF zz>=224 AND zz<=255 THEN
 LET zzz=zzz+10: PRINT "for-next
 count",CHR$ (zz-128);"=  ";VAL
 (CHR$ (zz-128)): GO TO 9982
9988 IF zz>=64 AND zz<=95 THEN L
ET zzz=zzz+3+PEEK (zzz+1)+256*PE
EK (zzz+2): PRINT "string",CHR$
 (zz+32);"$","=  ";VAL$ (CHR$ (
zz+32)+"$"): GO TO 9982
9989 IF zz>=192 AND zz<=223 THEN
 PRINT "string array",CHR$ (zz-9
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zz): GO TO 9990
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## Alien Shoot

### on Vic-20

The object of this game is to shoot the alien who flys across the screen before he lands and takes your base. You use the space bar to fire and your score is shown when the game is over. The variables are R: Missile and Q: Alien.

**Program notes**

7 to 11 Set up screen and put in the base and ground.
15 to 100 Get the alien to move and test for firing.
105 to 140 Get the missile to move and make missile sound.
150 Checks a hit or not.
180 to 204 Make the alien explode and make sounds.
205 to 400 End the game and give you your score.

```
 0 POKE36879,27:PRINT"□"
 1 PRINT"■■■■■ALIEN SHOOT■"
 2 PRINT"■■■SPACE BAR■=FIRE"
 3 REM **BY MAX ADDIE**"
 4 FORI=1TO3000:NEXT
 5 PRINT"□"
 6 REM SET SCREEN
 7 POKE7690,160
 8 POKE8130,65
 9 FORW=8142TO8163:POKEW,160:NEXT
 10 POKE8125,102:POKE8135,102
 11 POKE36879,109
 12 REM SET ALIEN
 13 REM *** *****
 15 Q=7790
 20 POKEQ,88
 30 FORI=1TO10:NEXT
 40 POKEQ,32
 50 Q=Q+1
 52 IFPEEK(Q)=160THEN300
 55 GETA$:IFA$=" "THEN100
 60 GOTO20
 100 POKEQ,88
 103 REM SET LASER
 105 R=8098+10
 106 POKE36878,15
 107 POKE36876,229
 108 FORI=1TO200:NEXT
 109 POKE36876,0
 110 POKER,33
 120 FORJ=1TO10:NEXTJ
 130 POKER,32
 140 R=R-22
 150 IFPEEK(R)<>32THEN180
 160 GOTO110
 180 IFPEEK(R)=160THEN400
 200 POKER,86
 201 POKE36878,15
 202 POKE36877,147
 203 FORI=1TO300:NEXT
 204 POKE36877,0
 205 PRINT"■■■■HIT"
 208 FORI=1TO500:NEXT
 210 SC=SC+5
 220 GOTO5
 300 PRINT"■■■■■YOU HAVE BEEN"
 310 PRINT"■■■■TAKEN OVER!"
 315 PRINT"■SCORE="SC
 320 FORI=1TO2000:NEXT
 330 PRINT"■■■NEW GAME?(Y,N)"
 340 INPUTA$:IFA$="Y"THENGOTO5
 350 END
 400 GOTO20

READY.
READY.
```

**Alien Shoot**
*by Max Addie*

## Line Drawing

### on BBC Micro

This program is written for a BBC micro Model A and makes use of most aspects of line drawing on the BBC e.g. *Plot, Draw, Move,* and uses Mode 4 for a higher resolution.

The pattern includes a solid circle made out of tiny triangles joined together. The other two parts of the program also make use of the Cos,Sin,Tan functions.

**Program notes**

10 Selects the mode.
20 Starts the loop for the circular motion.
30,40 Draws the pattern.
50 Returns the loop.
60 See 20.
70,80,90 Fills in the circle with tiny triangles.
120 Draws first circle.
130,140 Draws second circle.
160 This line is not essential, I just put it in to stop the arrow coming up and spoiling the corner pattern.

```
1 REM**SIN,COS,TAN DISPLAY
2 REM**IAN'S PROGRAM (C)1982
10 MODE 4
20 FOR L=0 TO 2*PI STEP 0.07
30 MOVE 635-200/COS(L)*TAN(L),400+300*SIN(L)*COS
   (L)*TAN(L)
40 DRAW 635,0
50 NEXT L
60 FOR L=0 TO 2*PI STEP 0.04
70 PLOT 4,635,800
80 PLOT 4,635+200*SIN(L),800+200*COS(L)
90 PLOT 85,635+200*SIN(L+0.04),800+200*COS(L+0.04)
100 NEXT L
110 FOR L=0 TO 2*PI STEP 0.06
120 MOVE 0+300*SIN(L),1000+300*COS(L):DRAW 0,1000
130 MOVE 1270+300*SIN(L),1000+300*COS(L)
140 DRAW 1270,1000
150 NEXT L
160 GOTO 160
```

**Line Drawing**
*by Ian Entwistle*

## Conversion

### on ZX81

This program starts off by asking you which subject you want:
*Equivalents*
*To Convert*
*Equivalents (British)*

*Equivalents* tells you metric equivalents eg 1 mm = 0.0394 in.

*To Convert* converts metric to yards feet and inches. You enter the number you want to convert then it works it out and prints it out on the screen.

*Equivalents (British)* tells you British equivalents. On both equivalents there is an option to copy on a printer.

If you have not got a printer then take out lines 170, 199, 767, 770. Lines 100—199 prints out equivalents. Lines 200—239 prints out choices for conversions, and lines 300—700 works out the conversion and prints the answer on the screen.

```
  1 LLIST
  6 CLS
 10 PRINT AT 0,7;"MEASURE"
 11 PRINT AT 1,7;"■■■■■■■"
 12 PRINT
 13 PRINT
 20 PRINT "1 EQUIVALENTS  (METR
IC)"
 22 PRINT
 24 PRINT "2 TO CONVERT"
 25 PRINT
 26 PRINT "3 EQUIVALENTS  (BRIT
ISH)"
 30 PRINT AT 18,17;"ENTER 1,2 O
R 3"
 32 INPUT A$
 34 IF A$="1" THEN GOTO 100
 36 IF A$="2" THEN GOTO 200
 38 IF A$="3" THEN GOTO 700
```

```
100 CLS
110 PRINT "METRIC EQUIVALENTS"
111 PRINT "■■■■■■■■■■■■■■■"
114 PRINT AT 2,0;"LENGTH"
115 PRINT
120 PRINT
130 PRINT "1 MM
=0.0394 IN"
140 PRINT "1 CM          = 10 MM
=0.3937 IN"
150 PRINT "1 M           =100 CM
=1.0936 YDS"
160 PRINT "1 KM          =1000 M
=0.6214 MILE"
170 PRINT AT 12,1;"TO COPY PRES
S C"
180 PRINT AT 13,1;"PRESS M TO G
ET BACK TO MENU"
```

```
190 INPUT A$
192 IF A$="M" THEN GOTO 8
199 IF A$="C" THEN COPY
200 CLS
210 PRINT "TO CONVERT"
220 PRINT "■■■■■■■■■"
221 PRINT
222 PRINT "ENTER:"
223 PRINT
224 PRINT "1 MILLIMETRES TO INC
HES"
226 PRINT "2 METRES TO FEET"
228 PRINT "3 METRES TO YARDS"
230 PRINT "4 KILOMETRES TO MILE
S"
232 PRINT "5 INCHES TO MILLIMET
RES"
234 PRINT "6 FEET TO METRES"
235 PRINT "7 YARDS TO METRES"
236 PRINT "8 MILES TO KILOMETRE
S"
237 PRINT
238 PRINT "-NUMBER"
```

Continued on page 18

Continued from page 17

```
239 INPUT A$
240 IF A$="1" THEN GOTO 300
245 IF A$="2" THEN GOTO 320
250 IF A$="3" THEN GOTO 340
255 IF A$="4" THEN GOTO 360
260 IF A$="5" THEN GOTO 380
265 IF A$="6" THEN GOTO 400
270 IF A$="7" THEN GOTO 420
275 IF A$="8" THEN GOTO 440
300 CLS
302 PRINT "MILLIMETRES TO INCHE
S"
304 PRINT
306 PRINT "ENTER MILLIMETRES?"
308 INPUT B
310 PRINT AT 4,0;B
312 PRINT AT 4,8;B*0.0394
315 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
316 PRINT AT 17,1;"ENTER M FOR
MENU"
317 INPUT A$
318 IF A$="0" THEN GOTO 200
319 IF A$="M" THEN GOTO 8
320 CLS
321 PRINT "METRES TO FEET"
322 PRINT
323 PRINT "ENTER METRES?"
324 INPUT B
325 PRINT AT 4,0;B
326 PRINT AT 4,8;B*3.2808
327 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
328 PRINT AT 17,1;"ENTER M FOR
MENU"
329 INPUT A$
330 IF A$="0" THEN GOTO 200
331 IF A$="M" THEN GOTO 8
340 CLS
341 PRINT "METRES TO YARDS"
342 PRINT
343 PRINT "ENTER METRES"
344 INPUT B
345 PRINT AT 4,0;B
346 PRINT AT 4,8;B*1.0936
347 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
348 PRINT AT 17,1;"ENTER M FOR
MENU"
349 INPUT A$
350 IF A$="0" THEN GOTO 200
351 IF A$="M" THEN GOTO 8
360 CLS
361 PRINT "KILOMETRES TO MILES"
362 PRINT
363 PRINT "ENTER KILOMETRES"
364 INPUT B
365 PRINT AT 4,0;B
366 PRINT AT 4,8;B*0.6214
367 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
368 PRINT AT 17,1;"ENTER M FOR
MENU"
369 INPUT A$
370 IF A$="0" THEN GOTO 200
371 IF A$="M" THEN GOTO 8
380 CLS
381 PRINT "INCHES TO MILLIMETRE
S"
382 PRINT
383 PRINT "ENTER INCHES?"
384 INPUT B
385 PRINT AT 4,0;B
386 PRINT AT 4,8;B*25.4
387 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
388 PRINT AT 17,1;"ENTER M FOR
MENU"
389 INPUT A$
390 IF A$="0" THEN GOTO 200
391 IF A$="M" THEN GOTO 8
400 CLS
401 PRINT "FEET TO METRES"
402 PRINT
403 PRINT "ENTER FEET?"
404 INPUT B
405 PRINT AT 4,0;B
406 PRINT AT 4,8;B*0.3048
407 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
408 PRINT AT 17,1;"ENTER M FOR
MENU"
409 INPUT A$
410 IF A$="0" THEN GOTO 200
411 IF A$="M" THEN GOTO 8
420 CLS
421 PRINT "YARDS TO METRES"
422 PRINT
423 PRINT "ENTER YARDS?"
424 INPUT B
425 PRINT AT 4,0;B
426 PRINT AT 4,8;B*0.9144
427 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
428 PRINT AT 17,1;"ENTER M FOR
MENU"
429 INPUT A$
430 IF A$="0" THEN GOTO 200
431 IF A$="M" THEN GOTO 8
440 CLS
441 PRINT "MILES TO KILOMETRES"
442 PRINT
443 PRINT "ENTER MILES?"
444 INPUT B
445 PRINT AT 4,0;B
446 PRINT AT 4,8;B*1.6093
447 PRINT AT 16,1;"ENTER 0 TO D
O MORE"
448 PRINT AT 17,1;"ENTER M FOR
MENU"
449 INPUT A$
450 IF A$="0" THEN GOTO 200
451 IF A$="M" THEN GOTO 8
700 CLS
701 PRINT "BRITISH EQUIVALENTS"
710 PRINT
720 PRINT "1 INCH"
721 PRINT
723 PRINT "1 IN
= 2.54 CM"
725 PRINT "1 FT      =12 IN
= 0.3048 M"
730 PRINT "1 YD      =3 FT
= 0.9144 M"
735 PRINT "1 ROD     =5.5 YDS
= 5.0292 M"
740 PRINT "1 CHAIN   =22 YDS
= 20.117 M"
745 PRINT "1 FURLONG=220 YDS
= 201.17 M"
750 PRINT "1 MILE    =1760 YDS
= 1.6093 KM"
760 PRINT "1 NAUTICAL MILE
=6080 FT"
765 PRINT "   = 1.8532 KM"
766 PRINT
767 PRINT "ENTER C TO COPY"
768 PRINT "ENTER M FOR MENU"
769 INPUT A$
770 IF A$="C" THEN COPY
790 IF A$="M" THEN GOTO 8
```

**Conversion**
*by L Maudsley*

## Break Key Disable

### on ZX81

When using *Inkey$* to input data in a program, if *Break* is pressed (eg by a computer-ignorant user), the program will break, which may cause chaos if the user continues to press keys. This Machine Code program prevents the *Break* functioning, while allowing the user to enter a space.

It also has other useful effects: The program replaces:

```
10 PAUSE 40000
20 LET A= CODE INKEY$
```

with:

```
10 LET A = USR 16514 (or whatever address it is
   stored at)
```

The advantages are that pressing *Break* returns "0", so it is mug-proof. It only uses one line of Basic to call it. It is flicker-free in use (unlike *Pause*) and it returns with the code of the key pressed, therefore:

```
10 PRINT CHR$ (USR 16514 + 128)
```

will print the inverse of the key pressed.

The disadvantages are that it is slower(!) than Basic and it only works in *Slow* if you wish to retain the display (unlike *Pause*).

When used in a long program, it is an advantage to:

```
10 LET K = 16514
50 PRINT USR K (or whatever)
```

Other uses are:

```
MENU . . . .
20 GOTO (USR K– 28) * 1000
```

or:

```
20 DIM A (10)
30 LET A(1) = 1210 (ie line no. of option "1")
40 LET A(2) = 2340 (option "2")
MENU . . . .
50 GOTO A(USR K)
```

It uses 30 Bytes, and can be stored anywhere in Ram. If it is stored in a *Rem* statement at Line 1, then it is called by *Usr* 16514 (or K = 16514). Any suitable Machine Code loader may be used.

**Break Key Disable**
*by A S Thornton*

**Machine Code Listing:**

| *Decimal* | *Hex* | *Comment* |
|---|---|---|
| 205 | CD | |
| 187 | BB | |
| 2 | 02 | Wait for key to be released |
| 44 | 2C | |
| 32 | 20 | |
| 250 | FA | |
| 205 | CD | |
| 187 | BB | Wait for key to be pressed. |
| 2 | 02 | |
| 68 | 44 | Load BC with corresponding number. |
| 77 | 4D | |
| 81 | 51 | |
| 20 | 14 | Find character corresponding to the number now in BC, and load its character code into HL. |
| 40 | 28 | |
| 247 | F7 | |
| 205 | CD | |
| 189 | BD | |
| 7 | 07 | |
| 78 | 4E | |
| 6 | 06 | Load this number into BC, and push it onto the stack. |
| 0 | 00 | |
| 197 | C5 | |
| 205 | CD | |
| 187 | BB | |
| 2 | 02 | Wait again for key to be released |
| 44 | 2C | |
| 32 | 20 | |
| 250 | FA | |
| 193 | C1 | Pop BC, and return to Basic. |
| 201 | C9 | |

## Patterns

### on Dragon

This is a program for drawing patterns of a regular nature on a Dragon 32. In its present listing it draws patterns in three colours on a buff background. However, it can easily be adapted to draw in a higher resolution, black lines on a buff background.

**Program notes**

10 doubles the normal speed of the computer
20-50 set up the screen and allocate values to the several variables in use.
70 plots the point on the screen
80 changes the value of x and y by either 1 or −1
90-100 check that the next point to be set lies within the parameters of the screen
110 provides the opportunity to have another pattern without having to break out of the program. Pressing any key will automatically cause the program to start again.
60 and 120 allow 10 points to be set without the colour altering, allowing the separate colours to be seen clearly.
130 starts the cycle again, this time in a different colour.

The resolution and colours of the screen can be altered easily, for example to draw black on buff in high resolution, delete lines 50, 60 and 140 and change line 10 to pmode 4, line 70 — replace c with 5 and line 150 *Goto* 70.

```
10 Poke 65495,0
20 Pmode3:Screen1,1:Pcls
30 A=1:B=1
40 X=Rnd(256):Y=Rnd(192)
50 C=Rnd(3)+5
60 For Z=1to5
70 Pset(X,Y,C)
80 X=X+A:Y=Y+B
90 If X>255 or X<1 Then A=−A
100 If Y>192 or Y<1 Then B=−B
110 If Inkeys ""Then Run
120 Next Z
130 Goto50
```

**Patterns**
*by Philip Magurn*

# Number Puzzle

## on Spectrum

The object of this game is to rearrange the numbers in the grid back into their correct numerical sequence, reading either across or down. A score is kept of how many moves you make.

### Program notes

Lines

| | |
|---|---|
| 5 | Sets up colours (personal choice). |
| 4000 to 4050 | Instructions. |
| 5000 to 6100 | Draw Grid and set up start position. Because of the possibility of producing a random start position that could not be solved, I have created three start positions, stored in Q$ at lines 6000, 6050 and 6100. These positions were found by mixing up a completed grid, using legal moves. Then, reading left to right going down the grid, the numbers were recorded then stored in Q$. Q$ may be changed, but only by a sequence found using the method described. |
| 300 to 360 | Generate the user definable characters (A,B,C,D). This is used every time a number is moved, as each number is regenerated before every move. |
| 1000 to 1024 | Restore *Data* to relevant position. Position depends on number to be moved. |
| 1040 to 1070 | Detect empty square. |
| 1205 to 1380 | Produce move. Blank out old position and reprint new position. |
| 9000 to 9074 | *Data*. To generate the 15 enlarged numbers. |
| 8000 to 8020 | End routine. |

There are no mug traps in the move section of the program, so always move towards the blank square. Movement is via the curser keys.

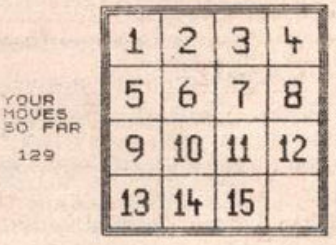
The following DATA statements are not too clear on the printout:

```
016 DATA 24,24,24,24,24,24,24,24
026 DATA 1,3,6,12,24,24,27,31
027 DATA 128,0,0,0,0,0,224,240
028 DATA 24,24,24,24,24,24,15,7
029 DATA 24,24,24,24,24,24,240,224
031 DATA 31,31,0,0,0,0,1,1
032 DATA 248,248,24,48,96,192,128,126
034 DATA 128,128,128,128,128,128,128,128
061 DATA 48,48,112,112,240,240,48,48
062 DATA 124,254,131,131,3,3,7,62
```

```
PRESS:P-PRINT SCREEN; C-CONTINUE
```

```
  5 INK 7: BORDER 1: PAPER 1: C
LS
  7 GO TO 4000
 100 FOR P=4 TO 16 STEP 4
 120 FOR O=9 TO 21 STEP 4
 130 IF P=16 AND O=21 THEN GO TO
 200
 140 PRINT PAPER 1; INK 7;AT P,O
;"AB";AT P+1,O;"CD"
 160 GO SUB 7030
 180 NEXT O
 190 NEXT P
 200 PRINT PAPER 1;AT P,O;"  ";A
T P+1,O;"  "
 220 GO TO 1000
 250 NEXT F
 260 GO TO 7010
 300 FOR F=144 TO 147
 310 FOR N=0 TO 7
 320 READ Z
 330 POKE USR CHR$ F+N,Z
 340 NEXT N
 350 NEXT F
 360 RETURN
1000 INPUT "THE NUMBER YOU WISH
TO MOVE.    WHEN COMPLETE ENTER
""0"";X
1005 IF X=0 THEN GO TO 6000
1010 IF X=1 THEN RESTORE 9000
1011 IF X=2 THEN RESTORE 9005
1012 IF X=3 THEN RESTORE 9010
1013 IF X=4 THEN RESTORE 9015
1014 IF X=5 THEN RESTORE 9020
1015 IF X=6 THEN RESTORE 9025
1016 IF X=7 THEN RESTORE 9030
1017 IF X=8 THEN RESTORE 9035
1018 IF X=9 THEN RESTORE 9040
1019 IF X=10 THEN RESTORE 9045
1020 IF X=11 THEN RESTORE 9050
1021 IF X=12 THEN RESTORE 9055
1022 IF X=13 THEN RESTORE 9060
1023 IF X=14 THEN RESTORE 9065
1024 IF X=15 THEN RESTORE 9070
1030 GO SUB 300
1035 IF C<2 THEN GO TO 100

1036 IF C>29 THEN GO TO 1040
1038 GO TO 160
1040 FOR P=4 TO 16 STEP 4
1045 FOR O=9 TO 21 STEP 4
1050 IF SCREEN$ (P,O)=" " THEN G
O TO 1200
1060 NEXT O
1070 NEXT P
1200 PRINT INK 7;AT 20,0;"INDICA-
TE MOVE BY USING      THE CU
RSER KEYS.....'"
1210 IF INKEY$="" THEN GO TO 121
0
1300 IF INKEY$="5" THEN PRINT AT
 P,O+4;"  ";AT P+1,O+4;"  ";AT P
,O;"AB";AT P+1,O;"CD"
1320 IF INKEY$="6" THEN PRINT AT
 P-4,O;"  ";AT P-3,O;"  ";AT P,O
;"AB";AT P+1,O;"CD"
1340 IF INKEY$="7" THEN PRINT AT
 P+4,O;"  ";AT P+5,O;"  ";AT P,O
;"AB";AT P+1,O;"CD"
1360 IF INKEY$="8" THEN PRINT AT
 P,O-4;"  ";AT P+1,O-4;"  ";AT P
,O;"AB";AT P+1,O;"CD"
1380 PRINT AT 20,0;"                "
1390 LET S=S+1: PRINT FLASH 1;AT
 13,1;S
1400 GO TO 1000
4000 PRINT AT 3,0;"THE OBJECT OF
 THIS EXERCISE IS  TO RETURN THE
 GRID BACK TO ITS  ORIGINAL NUME
RICAL NEATNESS      ''''''A    SCOR
E IS KEPT OF YOUR MOVES"
4010 PAUSE 250
4020 PRINT AT 10,0;"YOU MAY COMP
LETE THE GRID       ACROSS OR DO
WN"
4030 PAUSE 200
4040 PRINT AT 13,0;"YOU WILL HAV
E TO INDICATE WHICH NUMBER YOU W
ISH TO MOVE BEFORE  YOU INDICATE
 THE DIRECTION YOU  WANT TO MOVE
 IN "
4050 PAUSE 300
5000 PRINT AT 10,0;"THERE ARE ""
3"" DIFFERENT START    POSITIONS
ENTER YOUR CHOICE          (1.2.3.)
"
5010 INPUT "MY CHOICE IS :.....
";Z
5020 IF Z<0 OR Z>3 THEN GO TO 50
10
5050 CLS : PRINT AT 9,0;"YOUR";A
T 10,0;"MOVES";AT 11,0;"SO FAR":
 LET S=0: PRINT AT 13,1;S: PLOT
64,24: DRAW 128,0: DRAW 0,128: D
RAW -128,0: DRAW 0,-128
5060 FOR F=95 TO 312 STEP 32
5070 PLOT F,24: DRAW 0,128
5080 PLOT 64,F-40: DRAW 128,0
5090 NEXT F
5100 PLOT 60,20: DRAW 136,0: DRA
W 0,136: DRAW -136,0: DRAW 0,-13
6
5200 PLOT 62,22: DRAW 132,0: DRA
W 0,132: DRAW -132,0: DRAW 0,-13
2
5400 IF Z=1 THEN GO TO 6000
5450 IF Z=2 THEN GO TO 6050
5500 IF Z=3 THEN GO TO 6100
6000 LET Q$="05010407100611030200
40508091312"
6010 GO TO 7000
6050 LET Q$="05151104100108071400
03120209131"
6060 GO TO 7000
6100 LET Q$="15110407050106121010
40903020613"
6110 GO TO 7000
7000 FOR C=1 TO 29 STEP 2
7010 LET X=VAL Q$(C TO C+1)
7020 GO SUB 1010
7030 NEXT C
7500 GO TO 1000
8000 INPUT "WOULD YOU LIKE TO TR
Y AGAIN      (Y)ES OR (N)O :-";W$
8010 IF W$<> "Y" OR W$="N" THEN CL
S : PRINT AT 10,7;"UNTIL NEXT TI
ME": FLASH 1;AT 12,10;"GOODBYE":
 PAUSE 0: STOP
8020 CLS : GO TO 5000
9000 REM number 1
9001 DATA 1,1,3,3,7,7,1,1
9002 DATA 128,128,128,128,128,12
8,128,128
9003 DATA 1,1,1,1,1,1,31,31
9004 DATA 128,128,128,128,128,12
8,248,248
9005 REM number 2
9006 DATA 7,15,24,16,0,0,0,0
9007 DATA 224,240,56,24,24,24,48
,96
9008 DATA 0,1,3,6,12,24,31,31
9009 DATA 192,128,0,0,0,0,248,24
8
9010 REM number 3
9011 DATA 15,31,16,16,0,0,0,3
9012 DATA 240,248,24,24,24,24,56
,240
9013 DATA 3,0,0,0,16,16,31,15
9014 DATA 240,56,24,24,24,24,248
,240
9015 REM number 4
9016 DATA 24,24,24,24,24,24,24,2
4
9017 DATA 0,0,0,0,0,0,255,255
9018 DATA 31,31,0,0,0,0,0,0
9019 DATA 248,248,192,192,192,19
2,192,192
9020 REM number 5
9021 DATA 31,31,24,24,24,27,31,2
4
9022 DATA 248,248,0,0,0,224,240,
24
9023 DATA 16,0,0,0,16,24,15,7
9024 DATA 24,24,24,24,24,24,240,
224
9025 REM number 6
9026 DATA 1,3,6,12,24,24,27,31
9027 DATA 128,0,0,0,0,0,224,240
9028 DATA 24,24,24,24,24,24,15,7
9029 DATA 24,24,24,24,24,24,240,
224
9030 REM number 7
9031 DATA 31,31,0,0,0,0,1,1
9032 DATA 248,248,24,24,24,24,192,1
28,128
9033 DATA 1,1,1,1,1,1,1,1
9034 DATA 128,128,128,128,128,12
8,128,128
9035 REM number 8
9036 DATA 15,31,24,24,24,24,28,1
8
9037 DATA 240,248,24,24,24,24,56
,240
9038 DATA 16,28,24,24,24,24,31,1
5
9039 DATA 240,56,24,24,24,24,248
,240
9040 REM number 9
9041 DATA 7,15,24,24,24,24,24,24
9042 DATA 224,240,24,24,24,24,24
,24
9043 DATA 15,7,0,0,0,0,0,1
9044 DATA 248,216,24,24,48,96,19
2,128
9045 REM number 10
9046 DATA 48,48,112,112,240,240,
48,48
9047 DATA 60,126,195,195,195,195
,195,195
9048 DATA 48,48,48,48,48,48,252,
252
9049 DATA 195,195,195,195,195,19
5,126,60
9050 REM number 11
9051 DATA 48,48,112,112,240,240,
48,48
9052 DATA 48,48,112,112,240,240,
48,48
9053 DATA 48,48,48,48,48,48,252,
252
9054 DATA 48,48,48,48,48,48,252,
252
9055 REM number 12
9056 DATA 48,48,112,112,240,240,
48,48
9057 DATA 56,124,198,131,3,3,3,6
9058 DATA 48,48,48,48,48,48,252,
252
9059 DATA 12,24,48,96,192,192,25
5,255
9060 REM number 13
9061 DATA 48,48,112,112,240,240,
48,48
9062 DATA 124,254,131,131,3,3,7,
62
9063 DATA 48,48,48,48,48,48,252,
252
9064 DATA 62,7,3,3,131,131,254,1
24
9065 REM number 14
9066 DATA 48,48,112,112,240,240,
48,48
9067 DATA 192,192,192,192,192,19
2,204,204
9068 DATA 48,48,48,48,48,48,252,
252
9069 DATA 255,255,12,12,12,12,12
,12
9070 REM number 15
9071 DATA 48,48,112,112,240,240,
48,48
9072 DATA 255,255,192,192,192,19
2,252,254
9073 DATA 48,48,48,48,48,48,252,
252
9074 DATA 195,131,3,3,131,195,12
6,60
```




**Number Puzzle**
*by John Crawford*

## Generator

### on Vic

This program generates another program, which, when run, adds a new word to Basic. The new word is 'OLD' and its function is to recover a program which has been 'NEWED'. To achieve this just type OLD. (This program must be loaded first.)

The program listed is the Basic loader. When run, it checks the data and gives error reports providing that the line numbers and number of data elements per line are not changed (*Rem*s may be left out). The program then automatically loads the machine code into memory. The machine code is then tagged on to the end of another program one third of the length of the loader.

Note that the loader is lost at this stage, and so must be saved first. Finally, save the program now in memory. This is the working copy. When run, this final program relocates the machine code to the top of available memory and lowers the pointers so no Basic program can touch it. It then breaks chargot to set up the new keyword. The programs both adjust to run on any configuration of Vic20.

```
0 REM*****************
2 REM* D. MCINTYRE. *
4 REM*13 KING STREET*
6 REM* KIRKCALDY. *
8 REM*****************
10 FOR LP = 0 TO 284 STEP 15
20 FOR CT = 0 TO 14
30 READ A : POKE(6400+LP+CT),A : CHK = CHK + A
40 NEXT CT
50 READ SUM
60 IF SUM <> CHK THEN PRINT"□DATA ERROR IN LINE"(LP/1.5)+90 : END
70 CHK = 0 : NEXT LP
80 PRINT"□'OLD' PROGRAM NOW IN MEMORY":SYS6400
90 DATA 169,46,162,25,133,251,134,252,160,2,177,251,145,43,200,2150
100 DATA 208,249,165,44,133,46,165,43,105,233,144,2,230,46,133,1946
110 DATA 45,169,96,141,209,25,32,162,25,169,196,72,169,115,72,1697
120 DATA 76,96,198,10,0,158,40,194,40,52,52,41,172,50,53,1232
130 DATA 54,170,194,40,52,51,41,170,51,48,41,58,162,0,0,1132
140 DATA 0,165,55,56,233,148,176,2,198,56,133,55,165,44,133,1619
150 DATA 252,165,43,24,105,84,144,2,230,252,133,251,160,148,136,2129
160 DATA 8,177,251,145,55,40,208,247,169,32,133,117,165,55,133,1935
170 DATA 118,165,56,133,119,169,234,133,120,96,208,2,230,123,165,2071
180 DATA 58,201,255,240,1,96,173,0,2,201,79,208,248,173,1,1936
190 DATA 2,201,76,208,241,173,2,2,201,68,208,234,134,253,132,2135
200 DATA 254,165,43,133,251,165,44,133,252,160,3,200,177,251,240,2471
210 DATA 7,192,91,208,247,164,254,96,152,56,101,251,144,2,230,2195
220 DATA 252,133,251,160,0,165,251,145,43,165,252,200,145,43,160,2365
230 DATA 0,177,251,170,200,177,251,224,0,240,6,134,251,133,252,2466
240 DATA 208,238,201,0,208,246,165,251,24,105,2,144,2,230,252,2276
250 DATA 133,251,133,45,133,47,133,49,165,252,133,46,133,48,133,1834
260 DATA 50,165,55,133,51,165,56,133,52,166,253,164,254,169,2,1868
270 DATA 133,122,169,58,141,2,2,96,0,0,0,0,0,0,0,723
READY.
```

**Generator**
*by David McIntyre*

## Mutant Wars

### on BBC Micro

Mutant Wars is an arcade-type game which is fast, flicker-free and very addictive. The screen shows the players score and the number of waves encountered. The idea of the game is to stop the Mutants from reaching Earth by shooting them as they jump down through the atmospheric layers.

The controls are:

Z . . . Left
X . . . Right
SHIFT . . . Fire

The program runs so fast because of the speed of BBC Basic, the use of multi-statement lines and the use of the VDU commands instead of *Colour* for example. The program takes up 5.5K in Mode 6 and will run on both models. I chose mode 6 because it allows user definable graphics with the minimum of memory loss.

The program works by scrolling 38 individual text windows, each containing a mutant. This is why it is so flicker-free.

A special feature of the BBC micro allows the player to fire whilst still moving. This is done in line 490, where −1 is the special number of the shift key.

### Program notes

| Line | |
|---|---|
| 90 | Sets up the error trap. |
| 110 | Moves the TV picture down one line. |
| 120 to 130 | Change the repeat and delay on all keys for smooth movement. |
| 140 | Stops editing cursor from spoiling display if cursor keys are depressed. |
| 150 | Change display to mode 6. |
| 170 | Define envelope for mutants moving. |
| 180 | Initialise most of variables. |
| 190 | Remove cursor and define characters. |
| 210 | Clears screen, prints title, changes foreground and background colours. |
| 220 to 250 | Calls procedures to play game. |

### List of procedures

| | |
|---|---|
| PROCT(T) | Used as time delay. |
| PROCGAME | Contains main loop and is used to call most of the other PROCS. |
| PROCBASE | Controls the movement of the laser base. |
| PROCSPACE | Rubs out laser base. |
| PROCFIRE | Displays bullet and checks for hit. |
| PROCEND | Called when player is invaded. This procedure also calls the invasion tune. |
| PROCSTART | Sets up new screen and increases the difficulty level. |
| PROCTUNE | Plays "Song Song blue" when invaded. |
| PROCHIT | Called when an alien is hit. Adds to the score and displays new score. |

PROGRAM OF THE WEEK

```
10 REM ****************
20 REM *               *
30 REM * MUTANT WARS *
40 REM *               *
50 REM * by A.HYNES   *
60 REM *               *
70 REM ****************
80 REM
90 ON ERROR GOTO 580
100 REM
110 *TV 255,0
120 *FX 12,1
130 *FX 11,1
140 *FX 4,1
150 MODE 6
160 REM
170 ENVELOPE 1,1,-26,-36,-45,255,255,255,127,0,0,0,126,0
180 DIM SX(39):DIF=6:BX=20:BY=24:BX1=20:SCORE=0:B=0:WAVE=0:S$=STRING$(40," ")
190 VDU 23;8202;0;0;0;23,255,195,36,126,219,126,195,126,165,23,225,90,60,231,36,
126,90,66,231
200 REM
210 PRINT TAB(8,11);"HERE COME THE MUTANTS":PROCT(300):VDU 12,19,1,4,0,0,0,19,0,
7,0,0,0
```

```
220 SOUND 1,1,1,1
230 PROCSTART
240 PROCGAME
250 GOTO 230
260 END
270 REM
280 DEFPROCT(T):TIME=0:REPEAT UNTIL TIME>T:ENDPROC
290 REM
300 DEFPROCGAME:KILL=0
310 FOR X=1 TO 38
320 IF SX(X+1)=0 AND (X/3=INT(X/3)):PROCBASE:GOTO 390
330 IF SX(X+1)=0 GOTO 400
340 PROCBASE
350 IF B=1 THEN PROCFIRE
360 IF RND(1)>.85 THEN 390
370 PROCT(10-DIF)
380 VDU 28,X,23,X,1,30,11,26:SX(X+1)=SX(X+1)+1:IF SX(X+1)=23 THEN PROCEND
390 IF BX1<>BX:PROCSPACE
400 IF B=1 THEN PROCFIRE
410 NEXT
420 IF KILL>=38 THEN 440
430 X=38:GOTO 310
440 ENDPROC
450 REM
460 DEFPROCBASE:*FX 15,1
470 PRINT TAB(BX,BY);CHR$(225);
480 RESP$=INKEY$(5)
490 IF INKEY(-1)=-1 AND B=0:BLX=BX:BLY=BY:B=1:SOUND 3,-15,200,3
500 IF RESP$="Z" THEN BX=BX-1:IF BX<1 THEN BX=1
510 IF RESP$="X" THEN BX=BX+1:IF BX>38 THEN BX=38
520 ENDPROC
530 REM
540 DEFPROCSPACE
550 PRINT TAB(BX1,BY);" ";
560 BX1=BX:ENDPROC
570 REM
580 MODE 7:IF ERR<>17:REPORT:PRINT" at line ";ERL
590 *FX 12,0
600 *FX 4,0
610 SOUND 1,0,0,1:END
620 REM
630 DEFPROCEND:PRINT TAB(0,10);S$;TAB(0,11);S$;TAB(0,12);S$;TAB(15,11);"GAME OVE
R"
640 SOUND 0,-15,60,10:SOUND 1,0,0,1:PROCT(40):PROCTUNE
650 PROCT(250):VDU28,0,24,39,1,12,20:PRINT TAB(8,10);"Press SPACE bar to play":*
FX 15,0
660 REPEAT UNTIL GET$=" "
670 RUN
680 REM
690 DEFPROCFIRE:VDU 28,BLX,23,BLX,BLY-1,12,26:BLY=BLY-1:PRINT TAB(BLX,BLY);"!";
700 IF SX(BLX+1)>=BLY:PROCHIT:GOTO 720
710 IF BLY<3:VDU 28,BLX,23,BLX,2,12,26:SX(BLX+1)=0:B=0
720 ENDPROC
730 REM
740 DEFPROCSTART
750 WAVE=WAVE+1:DIF=DIF+2:IF DIF>16 THEN DIF=16
760 FOR X=1 TO 38:Y=RND(DIF)+2:SX(X+1)=Y:PRINT TAB(X,Y);CHR$(255):NEXT
770 VDU 17,129,17,0:PRINT TAB(0,0);S$;TAB(2,0);"SCORE ";SCORE;TAB(29,0);"WAVE ";
WAVE:VDU 17,1,17,128
780 ENDPROC
790 REM
800 DATA 69,24,53,24,81,24,73,6,69,2,61,6,53,2,61,8,81,24
810 REM
820 DEFPROCTUNE
830 FOR S=1 TO 9:READ F,E
840 SOUND 2,-15,F,E:SOUND 2,0,0,2:NEXT
850 ENDPROC
860 REM
870 DEFPROCHIT
880 SCORE=SCORE+10:VDU 28,BLX,23,BLX,2,12,26,17,0,17,129:PRINT TAB(8,0);SCORE
890 SX(BLX+1)=0:VDU 17,1,17,128:B=0:SOUND 0,-15,60,2:KILL=KILL+1
900 ENDPROC
```

**Mutant Wars**
*by Alan Hynes*

## Battlestar

*Preliminary Results*

The first phase of **Battlestar,** *Popular Computing Weekly*'s unique, computer moderated, play-by-mail, space adventure game, has now closed. The names of the 245 players winning through are now being sorted. They will all shortly receive a voucher giving them £10 off a ZX Printer.

Most of you had little difficulty in answering the questions correctly. For the few who got some of them wrong, here are the answers:

1) **Harrison Ford** played Han Solo in *Star Wars* and Deckard in *Blade Runner.*
2) **The Empire Strikes Back** was the sequel to *Star Wars.*
3) In the film *Tron* the letters MCP stood for **Master Control Program.**
4) The two robots in *Star Wars* were called **R2D2** and **C3PO.**
5) *ET* was trying to 'phone **home.**

More news on **Battlestar** next week, as the first round in space begins.

### The Cruising Competition

£10 is the prize each month for the highest score on Cruising, the new machine code game from *Solarsoft* for the ZX Spectrum.

The entries for each month should arrive at the *Popular Computing Weekly* offices at least five working days before the end of the month. Entries for March, therefore, should arrive here by 22 February.

Each entry should be accompanied by a print-out of the high score, using the special printer routine and code number generated by each game. No High Score can win more than once.

To give you something to aim for, here are our best scores so far:

1) *Duncan Scot* **2264**
2) *Brendon Gore* **1800**
3) *David Kelly* **246**

# Two aspects of coding

***Geoff Wilkins** shows two machine-code routines for the Spectrum*

Here are two short machine-code routines for the Spectrum that do nothing useful at all except to demonstrate some essential aspects of coding the machine. These are: *reading the keyboard, printing on the screen, controlling the colours* (by two different methods), coding the *user-defined characters*, and *moving the print-position* — with particular regard to differences between the Spectrum and the ZX80/81.

The first routine can easily be loaded to addresses 32256 to 32310 with the following Basic loader-program:

```
10 CLEAR 32255
20 FOR A=32256 TO 32310
30 READ N: POKE A,N
40 NEXT A
50 DATA 205,36,126,135,135,135
50,143,92,6,32,62,215,16,251,
205,36,126,79,58,143,92,129,50,
143,92,6,8,62,217,215,16,251,24,
220
60 DATA 151,50,8,92,58,8,92,254,
0,40,249,214,48,167,254,8,48,238,
201
```

If you've already got your own hex-loader for the Spectrum, the hex-code is:

```
7E00  CD247E
7E03  87
7E04  87
7E05  87
7E06  328F5C
7E09  0620
7E0B  3E20
7E0D  D7
7E0E  10FB
7E10  CD247E
7E13  4F
7E14  3A8F5C
7E17  81
7E18  328F5C
7E1B  0608
7E1D  3ED9
7E1F  D7
7E20  10FB
7E22  18DC
7E24  97
7E25  32085C
7E28  3A085C
7E2B  FE00
7E2D  28F9
7E2F  D630
7E31  A7
7E32  FE08
7E34  30EE
7E36  C9
```

Once you've loaded the code, enter the command NEW, and then the line

```
PRINT USR 32256
```

Run this, and you should confront a blank screen. Nothing will happen unless you press one of the numeral-keys 0-7. The first such key you press will produce a line of spaces in the appropriate *Paper* colour on the screen; the next will produce a line with the same *Paper* colour, but with the word *Ink* printed eight times in the new key's *Ink* colour. The next key will produce a line in a new *Paper* colour; and so on.

This is a disassembled listing of the program:

```
Address  Instruction
32256    CALL 32292
32259    ADD A,A
32260    ADD A,A
32261    ADD A,A
32262    LD (23695),A
32265    LD B,32
32267    LD A,32
32269    RST16
32270    DJNZ —5
32272    CALL 32292
32275    LD C,A
32276    LD (23695)
32279    ADD A,C
32280    LD (23695),A
32283    LD B,8
32285    LD A,217
32287    RST16
32288    DJNZ —5
32290    JR —36
32292    SUB A,A
32293    LD (23560),A
32296    LD A,(23560)
32299    CP 0
32301    JR Z —7
32303    SUB A,48
32305    AND A
32306    CP 8
32308    JR NC —18
32310    RET
```

The program starts by calling a sub-routine at address 32292. This is a *Keyboard Read* routine. It uses the system variable *Last K*, at address 23560, which stores the code of the last-pressed key. The sub-routine Pokes zero into this address — the Spectrum has no character for code zero — and then goes into a loop which only breaks when *Last K* gets a value other than zero.

When such a value has been found, addresses 32303 to 32309 subtract 48 from *Last K* — 48 being the difference between 0—7 and *Code*"0"—*Code*"7". If the result is more than 7 — ie if any key had been pressed other than the numeral-keys 0—7 — the sub-routine jumps back to its start; otherwise, it returns to the main routine, with a value 0—7 in the A-register.

The principle of this use of the system variable *Last K* can be used in any routine that needs to read the keyboard and transfer information from keys pressed into a register — this, of course, is the machine-code equivalent of *Inkey$* in Basic. (The *Inkey$* function is in fact easier to reproduce in machine code than the *Input* function.)

The next addresses, 32259 to 32264, multiply the A-register value by 8, and load the result into address 23695. This is the system variable *Attr T*, storing values for "temporary current colours".

Both this system variable and the system variable *Attr P* for "permanent current colours", at address 23693, store values for colours in the same way: bit 7 stores 0 or 1 for *Flash;* bit 6 stores 0 or 1 for *Bright;* bits 5 to 3 store 0—7 for *Paper;* and bits 2 to 0 store 0—7 for *Ink*.

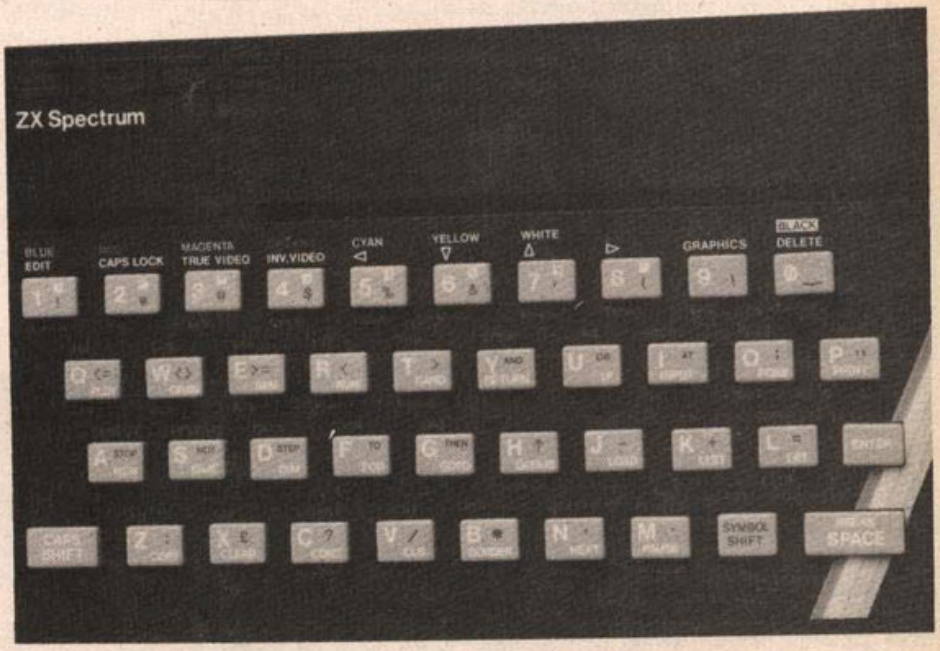
Thus by multiplying the A-register value by 8 and then poking it into *Attr T* we are altering the temporary *Paper* colour according to the value 0—7 in the A-register.

Addresses 32265 to 32271 print a space (code 32) of *Paper* colour 32 times. As the manual tells us, because of the Spectrum's more complex display-file, one cannot poke directly on to the screen as easily as with the ZX80/81. Fortunately, the machine-code instruction *"Rst16"* works just as well on the Spectrum, printing the character whose code is in the A-register at the next print-position.

Addresses 32272 to 32282 call the *Keyboard Read* sub-routine again, and then add the returned A-register value 0—7 unmodified to the value in the *Attr T* system variable. This has the effect of changing the temporary *Ink* colour while leaving the *Paper* colour unchanged.

Addresses 32283 to 32289 print the character with code 217 — *Ink* — eight times across the screen in the new *Ink* colour on the unchanged *Paper* colour.

Finally, addresses 32290 to 32291 jump



back to the start of the routine. The program will continue, with no chance of breaking out, until you fill the screen and elicit the "scroll?" query. In the present program, pressing the "N"-key at this point is a handy way of getting back to Basic. But often, in both Basic and machine-code programs, the "scroll?" is just a nuisance. You can get rid of it in machine-code, as in Basic, by poking the system variable at address 23692. In the present program, simply replace.

```
32310    201   RET
```

by

```
32310    245   PUSH AF
32311     62   LD A,255
            255
32313     50   LD (23692),A
            140
             92
32316    241   POP AF
32317    201   RET
```

(Hex-code is:

```
7E36   F5
7E37   3EFF
7E39   328C5C
7E3C   F1
7E3D   C9.)
```

This will get rid of "scroll?"; but now, the only way of stopping the program is by pulling out the plug. Of course, using the *Keyboard Read* sub-routine, it would be easy to include a means of breaking out within the routine — e.g. by pressing the space-key.

What happens if we change our Basic line

```
10 PRINT USR 32256
```

to

```
10 RANDOMIZE USR 32256
```

On the ZX80/81 that would make no difference to the program like this. It does not of itself return to Basic; but with the Spectrum you'll find that the colour-lines print upwards from the bottom two lines of the screen, and soon produce an "Out of screen" error-report.

*Print Usr* works perfectly well with the present program; but sometimes you won't want to use it because, on return to Basic, it will print the value of the BC-register to the screen. You can get round this problem by using

```
PRINT;: RANDOMIZE USR (address)
PRINT;: LET A=USR (address)
```

and so on.

The second routine might be the start of a machine-code "Space Invaders" program. You can use the same loader-program as before, changing line 20 to

```
20 FOR A=32256 TO 32326
```

and changing the DATA-lines to

```
  50 DATA 195,36,60,90,126,24,24,102,
0,0,8,8,28,62,127,127
  60 DATA 1,16,0,33,0,126,17,88,127,
237,176
  70 DATA 62,16,215,62,2,215,62,22,
215,62,10,215,62,0,215
  80 DATA 6,16,62,144,215,62,32,215,
16,248,62,16,215,62,1,215,62,22,215,
62,21,215,62,9,215,62,145,215,201
```

Here's the hex-code listing:

```
7E00   C3243C
7E03   5A
7E04   7E
7E05   1818
7E07   66
7E08   00
7E09   00
7E0A   08
7E0B   08
7E0C   1C
7E0D   3E7F
7E0F   7F
7E10   011000
7E13   21007E
7E16   11587F
7E19   EDB0
7E1B   3E10
7E1D   D7
7E1E   3E02
7E20   D7
7E21   3E16
7E23   D7
7E24   3E0A
7E26   D7
7E27   3E00
7E29   D7
7E2A   0610
7E2C   3E90
7E2E   D7
7E2F   3E20
7E31   D7
7E32   10F8
7E34   3E10
7E36   D7
7E37   3E01
7E39   D7
7E3A   3E16
7E3C   D7
7E3D   3E15
7E3F   D7
7E40   3E09
7E42   D7
7E43   3E91
7E45   D7
7E46   C9
```

Here's the routine disassembled from address 32272; this is because the first 16 addresses, 32256—32271, hold data for the user-defined graphics, and would be meaningless disassembled:

```
32272    LD BC,16
32275    LD HL,32256
32278    LD    ,32600
32281    LDIR
32283    LD A,16
32285    RST 16
32286    LD A,2
32288    RST 16
32289    LD A,22
32291    RST 16
32292    LD A,10
32294    RST 16
32295    LD A,0
32297    RST 16
32298    LD B,16
32300    LD A,144
32302    RST 16
32303    LD A,32
32305    RST 16
32306    DJNZ —8
32308    LD A,16
32310    RST 16
32311    LD A,1
32313    RST 16
32314    LD A,22
32316    RST 16
32317    LD A,21
32319    RST 16
32320    LD A,9
32322    RST 16
```

```
32323    LD A,145
32325    RST 16
32326    RET
```

You can run this with the command

```
CLS : PRINT;: RANDOMIZE USR 32272
```

This should produce a row of red space-invaders about halfway down the screen, and a blue defender at the bottom.

Addresses 32272—32281 *Poke* the data from the routine's first 16 addresses into the first 16 addresses of the Spectrum's user-defined graphics, 32600—32615. (Note: these latter addresses apply only to the 16K Specrrum; on the 48K model the user-defined graphics start at address 65368 — so you need to change address 32280 in the routine to 255 instead of 127 (hex address 7E18 to FF instead of 7F).) This data is, of course, for the space-invader and the defender.

The rest of the routine is almost entirely taken up with instructions to load the A-register with different values and then print by the instruction "RST 16". However, these instructions don't just print characters on the screen — they also serve to alter the colours and the print-position. If you look in chapters 15 and 16 of the Spectrum manual, you'll see that characters 6 to 23 of the character set can be printed in various combinations and with numeral-characters to alter the print-position, colour, brightness, flash etc. The good news is that you can do the same in machine-code — which is quite a substantil compensation for the difficulties in poking directly into the Spectrum's display-file.

I'll leave it to you to work out, by referring to the manual's chapters, how the different machine-code instructions in the routine alter colour and print-position, and to experiment with the many other possibilities. (My routine could have been much more neatly written by putting the characters to be printed into a data-list; I'll leave you to try that as well.) If you go further and use the *Keyboard Read* sub-routine from the first routine, you can think about moving characters both on their own and via the keyboard — and then you're well on your way to a genuine "Space Invaders' program!

Finally, as a pendant to my piece on redefining the Spectrum keyboard in *PCW* no. 24 (30 September 1980), here's a little novelty that produces an *"Australian Keyboard":*

```
10 CLEAR 31743
20 FOR A=15616 TO 16383 STEP 8
30 FOR N=0 TO 7
40 POKE A+16128+N, PEEK (A+8-N)
50 NEXT N: NEXT A: POKE 23607,123
```

■

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# Specifying corners

***David Lawrence** continues his commentary on lines 2060-2180 of Module 5 of his Characters program.*

On calling up this section by the use of the 'M' key in the previous module, the user is asked to specify a corner. If corner four is specified, then a rectangle is defined with two opposite corners consisting of grid corner 1 (the corner opposite four) and the current position of the cursor. This rectangle is then moved so that the corner defined by the cursor is relocated in grid corner 4. This may sound complex but a little experimentation will show that it is in fact a neat and simple means of moving the contents of the grid around. It is important to remember that if the design is to be moved down two lines, the bottom two lines of the design will be lost and similarly for moves in other directions.

2070 This line draws a large "M" next to the grid to show that the move function has been called — it seemed like a good idea at the time. The empty loop in this line serves the important function of seperating the input named T$ in the previous module and one called T1$ which is about to be called for. Without this delaying loop there is a danger that if the user's finger lingers on the 'M' key when calling up this function, the *Inkeys* function at line 2090 will define T1$ as 'M' too. This delay is neccesary whenever using a succession of *Inkeys* inputs.

2080 MX and MY are the variables which will be used to record the distance the defined rectangle must be moved. X1, Y1, X2 and Y2 will record the opposite corners of the defined rectangle.

2100-2130 These variables are set according to the corner specified as the destination of the move and the current position of the cursor. Again for no particular reason, the number of the corner chosen as a destination is drawn next to the grid.

2140 If an erroneous input is made when the program is expecting a corner to be specified, the "M" is erased and control is returned to Module 4.

2150-2170 Having established the size of the rectangle to be moved and the amount of movement necessary, these values are divided by four so that they can be applied to the array A and the transformation accomplished in transferring the contents to the array B.

*Testing*

The three functions specified in the commentary should now be available.

Module 6: *Lines 3000-3300*

Having established the functions necessary to define and manipulate a character on the grid, we come to the heart of the program, the module which takes the design which the user has created and transforms it into a string which, when DRAWn, will reproduce the desired character or design.

*Commentary*

3030 Since elements in the design will be erased from the array as they are incorporated into the string, the process is actually carried out on a copy of the main array.

3040 The letters contained in DI$ are the eight directions which can be handled by the *Draw* command. E$ will contain the string defining the design or character.

3050 X and Y are used to register coordinates on the grid. D1 and D2 are used to record the vertical and horizontal elements of the direction in which a line is currently being *Drawn*.

3060 and 3250 The loop defined by these two lines scans through the grid, ignoring empty squares.

3070-3120 For reasons that will be seen later, the fact that program execution has arrived at this point shows that the square currently defined by I and J is inked in but that it does not follow on in a continuous line from any part of the design previously recorded in E$. The location of the square is therefore recorded in the form of a B(lank) M(ove) within the string. The first square to be recorded in this fashion will always be the top left-hand square in the design and its position will be defined in relation to the top left-hand corner. Other squares to be recorded in the BM format will be defined in relation to wherever *Drawing* last left off. The drawing position is updated to the current square and the square is erased so that it cannot figure twice in the design.

3130 If the element at Y+D1,X+D2 is not zero, then since D1 and D2 contain the direction in which a line is currently being drawn, the loop examining surrounding squares is jumped around.

3140-3170 If a current direction cannot be continued, this loop examines surrounding squares to see if there is any direction in which *Drawing* may continue. If no such continuation is found then to E$ is added the direction and length of the line which has been traced in the design.

3190-3200 If it is possible to draw from the current square, the direction is checked to see if it is the direction of a line currently being drawn, if so the variable NN is incremented. If it is a new direction, the direction and length of the previously traced line are added to E$. The value attached to any particular direction is calculated by the formula at line 3190 and this value corresponds to the position of the relevant letter in DI$ (defined at line 3040). It may be worth noting in passing that this formula can come in useful in a variety of circumstances where a direction on a rectangular grid requires to be recorded. The values which the line will produce for the eight possible directions are as follows:

```
1 2 3
4 * 5
6 7 8
```

Compare this with the letters specified in DI$ and you will see why they are arranged as they are. The variables D1 and D2 are vertical and horizontal elements of the direction and range between −1 and +1.

3260 This line simply ensures that any *Drawing* left unfinished at the end of the loop is completed.

***The Working Dragon 32**, by David Lawrence, costs £5.95 and is available from **Sunshine Books Ltd.**, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.*

**Module 6**

```
3000 REM**************************
3010 REM EXTRACT STRING
3020 REM**************************
3030 FOR I=0 TO 31:FOR J=0 TO 31:LET B(I,J)=A(I,J):NEXT J,I
3040 LET DI$="HUELRGDF":LET E$=""
3050 LET X=0:LET Y=0:LET D1=0:LET D2=0:LET DIR=0
3060 FOR I=0 TO 31:FOR J=0 TO 31:IF B(I,J)=0 THEN GOTO 3250
3070 LET E$=E$+"BM":IF J-X>0 THEN LET E$=E$+"+" ELSE LET
E$=E$+"-"
3080 LET E$=E$+MID$(STR$(ABS(J-X)),2)+","
3090 IF I-Y>0 THEN LET E$=E$+"+" ELSE LET E$=E$+"-"
3100 LET E$=E$+MID$(STR$(ABS(I-Y)),2)+";R0;"
3110 LET X=J:LET Y=I
3120 LET B(Y,X)=0
3130 IF Y+D1>=0 AND Y+D1<=31 AND X+D2>=0 AND X+D2<=31 THEN
IF B(Y+D1,X+D2)<>0 THEN GOTO 3190
3140 FOR K=-1 TO 1:FOR L=-1 TO 1
3150 IF X+L>31 OR X+L<0 OR Y+K>31 OR Y+K<0 THEN GOTO 3170
3160 IF B(Y+K,X+L)<>0 THEN LET D1=K:LET D2=L:GOTO 3190
3170 NEXT L,K:IF DIR<>0 THEN LET E$=E$+MID$(DI$,DIR,1)+MID$
(STR$(NN+1),2)+";"
3180 LET DIR=0:LET D1=0:LET D2=0:LET NN=0:GOTO 3250
3190 LET T1=3*(D1+1)+D2+2:IF T1>4 THEN LET T1=T1-1
3200 IF T1=DIR THEN LET NN=NN+1
3210 IF T1<>DIR AND DIR<>0 THEN LET E$=E$+MID$(DI$,DIR,1)+
MID$(STR$(NN+1),2)+";":LET NN=0
3220 LET DIR=T1
3230 LET X=X+D2:LET Y=Y+D1
3240 GOTO 3120
3250 NEXT J,I
3260 IF NN<>0 AND DIR<>0 THEN LET E$=E$+MID$(DI$,DIR,1)+MID
$(STR$(NN+1),2)
3270 DRAW "S8;C3;BM150,60;"+E$
3280 IF INKEY$="" THEN GOTO 3280
3290 FOR I=0 TO 63:DRAW "C2;BM150,"+STR$(60+I)+";R64":NEXT I
3300 LET X=0:LET Y=0:DRAW "S4":RETURN
```

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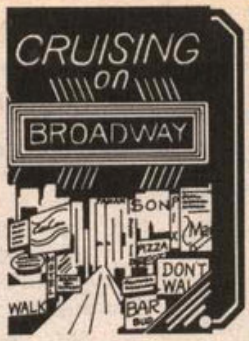


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*Mr J Martin of Clarence Road, Walthamstow, London E17, writes:*

**Q I have a Spectrum and have used the command SCREEN$ to save a picture, and LOAD it back, but I cannot find any way of using it. As soon as I press ENTER it disappears and I cannot find anyway of retrieving it.**

A *Screen$* is a command that stores every pixel on the screen. When you enter a command such as *Enter* then you are asking the computer to print on the screen a listing of the program. This it does and, of course, it overprints the current screen display in the process.

The way round this is to auto run the program, which will return the control to you. If you use a *Print At* statement at 21, 0 the print position will be on the bottom line, which will give you some work space. You would lose whatever was displayed on this line.

## COMING IN THE MONTHS AHEAD

*Andrew Jones of Old Road East, Gravesend, Kent, writes:*

**Q I am thinking of buying a Jupiter Ace microcomputer. Do you know if there is much software available for the unexpanded version? I would also like to know the difference between Basic and Microsoft Basic.**

A The Jupiter Ace is based around Forth 79, though there are some differences. Programs in this should generally work without major changes, though some words in the Ace's dictionary are not to be found in Forth 79 and vice versa.

Remsoft (18 George Street, Brighton, Sussex) has produced two cassettes for the Ace — *Peeker*, which costs £3.50 and enables you to unravel both Rom and Ram, and *Tape 2*, which costs £4.50 and includes *Night Rider*, *Sketch* and *Editor*. More software should become available in the coming months.

Basic has several dialects. Microsoft Basic is probably the most common form. Like most Basics found on home computers, Microsoft differs from its fellows in relatively minor ways.

The form of Basic used on the Sinclair computers is probably the most common after the Microsoft version, by virtue of the large number of Sinclair computers in circulation. It is interesting to note that the Sinclair Basic is very similar to the new Ansii standard for Basic. Perhaps this form will gain more ground.

## COMMAND WAS CORRECT

*Paul Gurney of Hereford Road, Hereford, writes:*

**Q I have a 16K Spectrum. On page 169 of the manual it says that if you enter *Clear* 23800 as a direct command, it will give you an idea of what happens when the memory becomes full. All I get when I do this is *M-Ramtop* no good. This even happens when I try it as soon as I switch on. I do not really understand what is wrong. Is there anything wrong with my Spectrum?**

A There is nothing wrong with your Spectrum. This is the result that you were meant to obtain. *Clear* and *Clear n* are commands that in effect *New* certain of the routines in the computer.

One of the effects of *Clear* 23800 is to lower Ramtop to that address. *Clear n* will always lower Ramtop to the specified address, but in this case you have lowered it so much that there is no room for the Basic program or instructions.

If you look at page 165 of your manual there is a memory map. Look at how much has to be fitted in between 23734 and Ramtop. This command gives you just 66 bytes (23800 — 23734) for this entire area. No wonder there is no room, and an error code comes up. If you look at *Clear* and *Clear n* in the appendix, you will see just what sort of effect they will have on a program.

## THE MANUAL IS COMING SOON

*Gary Foreman of Hazelton Road, Colchester, Essex, writes:*

**Q Now that the Commodore 64 is here, and I have access to one, I would like to know if the memory map locations are listed anywhere. There is nothing about them in the manual. This would enable me to start writing some machine code programs, and make use of the User Defined Graphics. Also is there any news of a Commodore 64 Programmers Reference Guide, similar to that for the Vic-20?**

A These two questions have effectively the same answer. Although I have not seen it, I gather that the 64 Programmers Manual will have a much more complete breakdown of the 64's memory addressing. It is due for release soon, though at the time of writing I do not know how much it will cost. I presume it will be available from all the usual Commodore dealers.

## NO NEED TO GO BACK TO BASIC

*P A Roberts of St Johns Avenue, Pearl Street, Carlinghow, Batley West, writes:*

**Q I have recently been writing an assembler program for my BBC model B micro, and I would like to know whether it is possible to access VDU 19 from within the assembler (ie without having to revert to Basic).**

**The User Guide does not seem to give many clues to a solution to the problem, but since almost all the other Basic commands have a simple machine-code equivalent for the assembler programmer I'm sure there must be a machine code form of VDU 19.**

**If this is so can other functions such as *Mode* and *GCOL* be accessed in a similar way?**

A The equivalent of VDU in assembler is:

```
LDA #n
NEWLINE
JSR & FFEE
```

where **n** is the number you want to use, in your case nineteen. You can repeat this as you need. There is a full table of VDU codes in the manual.

## MODEL B IS A BETTER CHOICE

*D Nugent of Parkway, Coxhesth, Kent, writes:*

**Q I am considering buying a BBC computer, but I am unsure of a few points which I hope you would clear up for me. Would the model A have the same graphics capabilities as the B if the A was upgraded to 23K. Also would the programs for the model B *Load* and run in the same way on a 32K model A? Finally what other differences are there between the model A and the model B?**

A As far as graphics and programs go then a 32K model A will be able to run model B programs. The essential difference lies in the additional facilities that the model B has for peripherals. The model B has both parallel and serial printer interfaces, and the 'Tube', which allows you to add a second processor to your model B. The second processor does not have to be the same as the on board 6509. At the moment, Acorn is developing a Z80A microprocessor that will be compatible via the tube. This will also make CP/M possible. If you are looking for a computer that can become the centre of an extended system, then the model B will be a much better choice.

**Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW,* Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.**

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## Ziggurat

# Simulating reality

A computer simulation is a copy, in numerical form, of some abstraction from reality.

Take population growth: as Malthus noted, if there are no checks then the growth of population is exponential in form. This can be copied if we abstract from reality by forgetting births and deaths and only concentrating on the increase in size at a constant rate.

If *R* is the rate and *P* is the original population size (already set), we can compute the size of successive years' populations by one line:

```
FOR I = 1 TO 20: P = P * R: PRINT I, P: NEXT I
```

The same line can be split into four separate lines for machines such as the ZX81. If you try different values for *R*, you will be able to see how quickly such a population would grow — if nothing else happened.

A different approach to simulating (sometimes called modelling) population growth is used by the program normally called *Life*. Many versions have been written but the basic program is listed in *Basic Computer Games* by David Ahl (1978), based on an idea by Martin Gardner in *Scientific American* of October 1970.

The original version of *Life* used a number of counters — itself a simulation — which were added to or subtracted from, according to three rules. Any counter with two or three neighbours survives; every counter with four or more neighbours is removed (or 'dies'); and every empty cell, with *exactly* three counters adjoining, has a counter placed upon it (is 'born'). From different starting configurations of counters, different sets will have different life histories; some populations even die out.

The *Life* program is a helpful reminder that, just because something has always happened before, nothing *has* to happen in the future.

Consider the growth in the number of computers. Over the last three years they have grown at a rate of about, say, 49 percent (the figure is a guess), so that in 20 years the number of computers will be about 2,000 times the number at the beginning of the three years. If 1 percent of the population had a computer at the start of the three years, that means in 17 years there will be 20 computers per head. Not likely.

Of course, things might be different. If the total population is *T* (say 100 units) and the number of people with a computer is *P*, then the number of people who might buy a computer is $T - P$. The likelihood of a computer being purchased depends upon how many are without computers (ie $T - P$).

Suppose, therefore, that the number of new purchasers depends on the present number of owners and non-owners and some constant. So, if *I* is the number of new purchasers $I = K * P * (T - P)$. Assuming we have values for *K*, *T*, and an initial value for *P*, we can program:

```
1000 FOR J = 1 TO 20: I = K * P * (T - P)
1010 PRINT J, I + P, (I + P)/P: P = R + I: NEXT J
```

which will list the time period, new population, and the ratio between the new population and the previous population of computers. (Note how the purchasers have become a *population* of computers?)

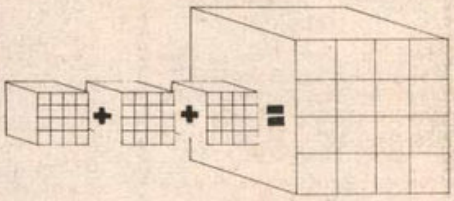
If you set $K = 0.005$, $P = 1$, and $T = 100$ then the growth rate (the final column) starts at 1.495, then 1.493, then 1.488, and after six years it is still 1.475. By year 10 the population is 30.463. Even by year 20 the population is only 99.407: not 2000.

Really, this new model is too simple — but it is better than the first attempt. What we really want is an even better one . . .

**Boris Allan**

## Puzzle

# Cubed beginning



**Puzzle No 41**

The number 153 has the following unusual property. If each of the digits is cubed and these cubes are added together we arrive back at the original numbers:

$$1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153$$

Can you find any other numbers with this property?

**Solution to Puzzle No 36**

Starting with zero and one, each term in the Fibonacci series is formed by adding together the preceding two terms, eg:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, . . .

The following program generates the first 20 terms of the Fibonacci series, and displays the result of dividing each term by the preceding one. The value so obtained converges on the 'golden' number.

```
10 LET X = 0
20 LET Y = 1
30 FOR N = 1 TO 10
40 PRINT X, X/Y
50 LET X = X + Y
60 PRINT Y , Y/X
70 LET Y = X + Y
80 NEXT N
```

The value of the 'golden' number is: 0.61803399 . . . Stability in the 8th decimal place is shown by the convergence of the 9th decimal place.

**Winner of Puzzle No 36**

The winner is: D Pain, Yew Tree Lane, Rotherfield, East Sussex, who receives £10.

## Top 10

**Atari**

| | | |
|---|---|---|
| 1(2) | Astro Chase | (First Star Software)‡ |
| 2(7) | Preppie | (Adventure International) |
| 3(1) | Air Strike | (English Software) |
| 4(–) | Galaxians | (Atari)* |
| 5(–) | Canyon Climber | (Data Soft) |
| 6(4) | Shamus | (Synapse) |
| 7(–) | Pac-Man | (Atari)* |
| 8(5) | Jumbo Jet Pilot | (Thorn EMI)* |
| 9(–) | Hellcat Ace | (Microprose)§ |
| 10(3) | The Scott Adams Adventures | (Adventure International)† |

*Cartridge. †24K cassette. ‡32K cassette. §48K disc.

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

**Spectrum**

| | | |
|---|---|---|
| 1(1) | The Hobbit | (Melbourne House)* |
| 2(2) | Penetrator | (Melbourne House)* |
| 3(–) | 3D Tunnel | (New Generation) |
| 4(–) | Arcadia | (Imagine) |
| 5(–) | Flight Simulation | (Psion) |
| 6(–) | Spectrum Chess | (Artic) |
| 7(7) | Spectral Invaders | (Bug-Byte) |
| 8(9) | Hungry Horace | (Psion) |
| 9(6) | Escape | (New Generation) |
| 10(4) | Orbiter | (Silversoft) |

*Requires 48K.

(Figures compiled by Buffer Micro Shop, London 01-769 2887)

**ZX81***

| | | |
|---|---|---|
| 1(2) | Frogger | (DJL Software) |
| 2(5) | 3D Defender | (JK Greye) |
| 3(3) | Gauntlet | (Colourmatic) |
| 4(4) | Flight Simulation | (Psion) |
| 5(6) | Gulp II | (Campbell Systems) |
| 6(1) | Black Crystal | (Carnell Software) |
| 7(–) | Sea War | (Panda) |
| 8(–) | Adventure 1 | (Abbersoft) |
| 9(–) | Mazogs | (Bug-Byte) |
| 10(–) | ZXAS | (Bug-Byte) |

All 16K.

(Figures compiled by Buffer Micro Shop, London 01-769 2887)

**Vic20**

| | | |
|---|---|---|
| 1(3) | Grid Runner | (Llamasoft) |
| 2(–) | Abductor | (Llamasoft) |
| 3(9) | Blitz | (Commodore) |
| 4(2) | Jellymonsters | (Commodore)* |
| 5(–) | Gorf | (Commodore)* |
| 6(4) | Andes Attack | (Llamasoft)† |
| 7(1) | Traxx | (Llamasoft)† |
| 8(6) | Hopper | (Rabbit) |
| 9(8) | Myriad | (Rabbit) |
| 10(–) | Shark Attack | (Romik) |

*Cartridge. †Requires 8K or 16K.

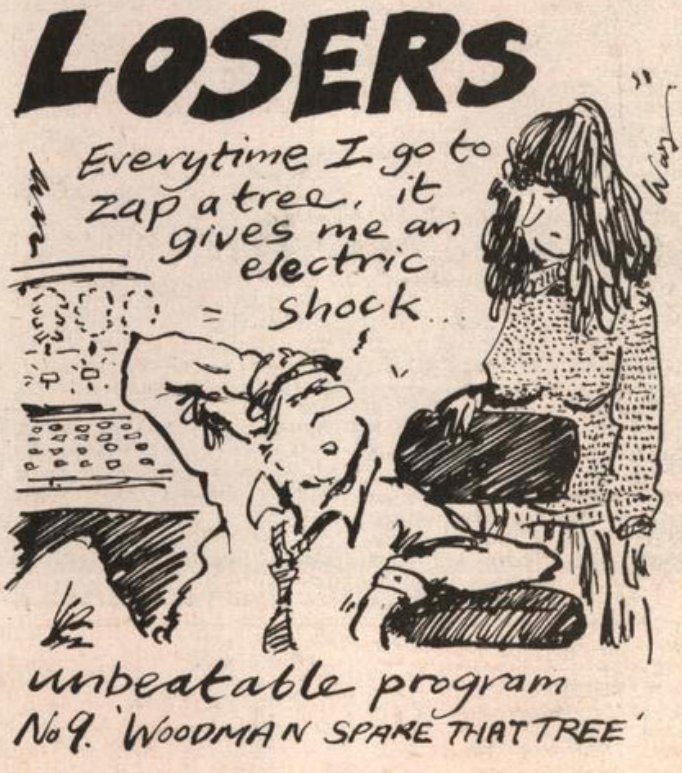
(Figures compiled by the Vic Centre, London 01-992 9904)

**Books**

| | | |
|---|---|---|
| 1(–) | Creative Graphics on the BBC Microcomputer, *Cownie* | (Acornsoft) |
| 2(2) | Assembly Language Programming for the BBC Micro, *Birnbaum* | (Macmillan) |
| 3(5) | Discover Forth, *Hogan* | (Osbourne) |
| 4(6) | Programming the 6502, *Zaks* | (Sybex) |
| 5(9) | Z80 Assembly Language Programming, *Levanthal* | (Osbourne) |
| 6(–) | Over the Spectrum, various authors | (Melbourne House) |
| 7(7) | Basic Programming for the BBC Micro, *Cryer* | (Prentice Hall) |
| 8(–) | Graphs and Charts on the BBC Microcomputer, *Harding* | (Acornsoft) |
| 9(8) | Spectrum Book of Games, *James* et al. | (Granada) |
| 10(–) | Illustrating Basic, *Alcock* | (Cambridge CUP) |

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

(Last week's figures in brackets)



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