

40 Rock POPULAR Computing WEEKLY

40p

3-9 May 1984 Vol 3 No 18

Education special — page 20

BRITAIN'S BEST-SELLING MICRO WEEKLY

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★ STAR

Solitaire on Dragon
See page 10

GAME ★

News Desk

Philips set the standards

PHILIPS is negotiating with the French computer manufacturer Thomson to develop a joint standard for European home and business micro-computers.

If agreement can be reached between the two companies then the new Thomson machine — the MO5, announced last week, will become the home computer (eight-bit) standard for the two companies. It is hoped that Philips will then begin manufacture of the MO5, under licence from Thomson.

The two firms hope for a long-term relationship in

which a business (16-bit) joint standard could also be established.

Thomson also announced a second home machine last week — the TO7-70. Both the MO5 and the TO7-70 are developments of Thomson's existing home micro, the TO7, which will now be discontinued. All of the machines are based on the 6809E microprocessor chip.

The MO5 is priced at 2390F (around £200). It has 48K Ram, a moving-key keyboard and a single keyword entry Basic included in Rom. It will

continued on page 5 ▶



The Thomson TO7 (shown above) is the forerunner of both the new MO5 and the TO7-70 machines

Commodore presents the C16

HAVING abandoned plans to sell its 116 machine in Europe, Commodore has announced a new low-cost machine — to be called the C16.

The C16 is intended as a competitor for the Sinclair Spectrum. In appearance it resembles the Commodore 64, using the same case and keyboard. Inside, however, it is more reminiscent of the now dropped 116. It uses the upgraded 6502 processor chip — the 7501, and has 16K Ram and 32K Rom. Included in the Rom is Commodore Basic 3.5.

Screen display is 40 x 25 characters. Up to 121 colours can be selected with a graphics (not colour) resolution of 320 x 200 pixels. The C16 has twin sound generators — either two music or one music and one white-noise channel.

The new machine will be shown at this year's Commodore Computer Show held from June 7 to 9 at Novotel (formerly the Cunard Hotel) in London.

Commodore's other new machine, the 264 — now renamed the Commodore Plus 4 — will also be at the show.

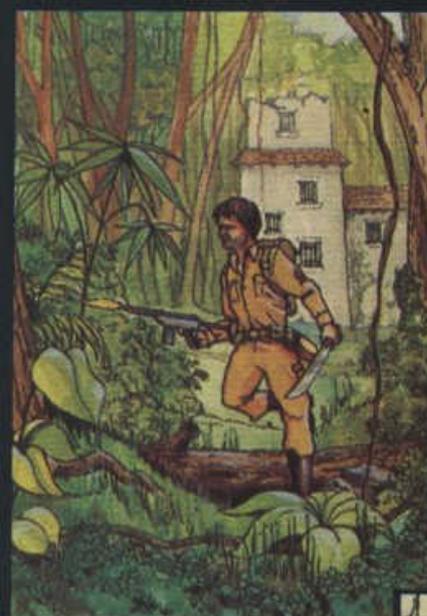
This Week

- **Street Life** David Kelly meets Chris Hall, whose company, Locomotive Software, wrote the Rom for the Amstrad. See page 13.
- **Education Special** A new series beginning with a look at educational programs for Spectrum and Dragon on page 20.
- **Commodore 64** Paul Irvin presents a musical synthesiser program on page 36.
- **Arcade Avenue** Tony Kendal kicks off a new feature for arcade addicts. Page 43.
- **New Releases**

Included in this week's reviews are 3D Tankzone from Dynabyte and The Greedy Dwarf from Goldstar.

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How to submit articles

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

Accuracy

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

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Editorial

Silicon Valley enjoys an enviable reputation, both in the US and in the rest of the world. It is a haven for bright young entrepreneurs, budding venture capitalists and engineers of all description.

The 25 mile strip, which runs just south of San Francisco from Palo Alto to San Jose, is littered with famous names. Atari, Apple, IBM, Hewlett-Packard, Intel and National Semiconductor are just a few of the companies which rub shoulders in the high-tech 'Valley'.

Unfortunately, there is no exact UK equivalent. Cambridge is perhaps the closest to a 'Silicon City', with companies such as Acorn, Sinclair and Computers. But, manufacturing and assembly plants tend to be located further afield, eg, Timex in Dundee.

Software companies are distributed throughout the country — Psion in London, Quicksilver in Southampton, Bug-Byte, Imagine and Software Projects in Liverpool.

Even Sir Clive Sinclair's much vaunted Metalab will not cover quite the same range of high technology industries as exist in Silicon Valley.

Acorn, however, has made the best of both worlds by opening its own research facility in Silicon Valley (PCW 1-7 March). Unfortunately, Acorn is unwilling to talk about its latest US venture. Perhaps Acorn is afraid of Silicon Moles?

● PCW goes up in price from 35p to 40p today. This is the first increase in two years.

Next Thursday

Next week's star game is *Othello* — for 16/48K Spectrum by Paul Reynolds.

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Optical discs from Acorn and BSR

ACORN Computers and audio products company BSR International have set up a partnership to develop optical discs for computers.

The joint venture company called Optical Information Systems will produce the disc drives which read the stored information in a similar way to present video disc players by means of a laser.

"This is an up and coming technology," said Acorn director Andy Hopper. "At the moment it is a speculative venture but if it works well, we'll certainly start taking it

seriously."

The advantage of an optical disc system over a more conventional magnetic disc is its considerably enhanced storage capacity. Development of magnetic media has now almost reached its limit and manufacturers are looking to other types of storage for the next generation of disc units.

Production of the optical drive is expected to start at the beginning of 1985 in Hong Kong, but the optical discs themselves will probably not be available for a couple of years.

Philips

4 continued from page 1

run both cassette and Rom cartridge software.

The TO7-70 is more expensive at 3500F (£300). It has 64K Ram — expandable to 128K, a professional quality keyboard and a built-in quality keyboard and a built-in cassette player. Unlike the MO5, Basic must be loaded from cassette. Also unlike the MO5, the machine is software compatible with its predecessor, the TO7.

The MO5 is to play a similar role in France as the BBC machine did over here. It will be used as the basis for a tv series to be broadcast nationally in October. By then it is hoped some 40,000 machines will have been manufactured.

Philips is very keen to make an entry into the home computer market. In recent months its name has been linked with two other companies in connection with possible joint ventures — Atari and Microsoft (for an MSX machine).

A portable Apple

APPLE has introduced a portable version of the long-standing IIe computer.

The new version will be called the IIc, and is aimed at 'serious home users'. Apple is keen to distinguish these from those who primarily play video

A strategic Empire

EMPIRES is a strategy game with a difference, for the 48K Spectrum.

The game is for four Spectrum players, and comes complete with four cassettes. Three users actually play the game, the fourth acting as an umpire.

The three are each leaders of a galactic race whose aim is to wipe out the other races to gain supreme control. Each plays separately and, after each move, players return their saved data to the umpire. The moves are then analysed by the umpire's program and the data for the new positions is then saved and returned to the players for the next move.

Empires costs £19.95. Details from Imperial Software, 153 Churchill Road, Parkstone, Poole, Dorset.

games.

The IIc's software will be compatible with that of the IIe in that it will be able to use about 90 per cent of its software.

The IIc will cost \$1,295 (about £900) — this includes a floppy disc drive in addition to the micro itself. It has 128K of memory, twice that of the IIe.

As well as the machine itself, Apple has also launched a set of peripherals for the machine — a colour printer priced at \$299 (£212), a high-resolution black-and-white monitor for 80 column display, a mouse cursor device, external disc drive and a carrying case.

Monopoly money for Leisure

LEISURE Genius, the computer board-game specialist, has signed an agreement with Waddington to produce a micro version of *Monopoly*.



Peter Deutsch

"Our initial plans are to produce the game for Commodore 64 and Spectrum," said Peter Deutsch, managing director of Leisure Genius. "But the Amstrad seems to be making a big impact, and Adv-

Who's for tennis?

PSION'S next release will be *Tennis* for the 48K Spectrum, scheduled for late-May, well in time for Wimbledon.

You play against the computer and view the game from your end of the court facing the net and your computer generated opponent.

Commented Psion's managing director David Potter, "I predict that nobody will be watching Wimbledon this year — they'll all be playing Psion *Tennis*!"

Modulator design for ABM

THE Acorn Business Machine — Acorn's entry into the business micro market — will feature a modular design, much like the BBC machine.

"The ABM will almost certainly have a number of dual processor options" explained an Acorn spokesman.

A 6502 second processor option is planned. "The ABM will be able to be configured in such a way that it will run BBC Basic. That may not be its normal mode of operation, but the potential for compatibility with BBC micro software will be there for those who want it.

The ABM is expected to be announced later this year.

ance machine sounds excellent too.

"We would expect to see a *Monopoly* program out in July, although it's very early days yet. At the moment we're concentrating on getting our *Scrabble*, *Cluedo* and *Mastermind* games for Commodore 64 in the shops for May."

The onus for protecting *Monopoly* from unlicensed versions of the game still falls ultimately to Waddington, which has in the past taken action against a number of companies.

Queen's award for Acorn

A Queen's Award for Technological Achievement has been won by Acorn Computers, for its BBC microcomputer system.

The Award praises the "advanced design" and "innovative features" of the BBC micro.

Chris Curry, managing director of Acorn Computers, said, "It is a special honour for Acorn."

QL reaches the outside world

FIRST deliveries of the QL should by now have reached some customers.

The initial batch of machines — around 1000 — should be going out all this week and it is hoped that all customers who received letters from Sinclair indicating an April delivery should get their QLs before the weekend.

The number of machines being sent out will steadily increase and Sinclair hopes to clear its current backlog of more than 13,000 orders by mid-July.

Two working QL machines made an appearance at the 11th ZX Microfair held last weekend at Alexandra Palace, attracting big crowds.

● PCW's QL order: Week 15. Still no sign.

Correction

● *Pengwyn* for the Amstrad micro is being developed by Postern. The game was incorrectly attributed to Ocean in PCW, April 19.

METAGALACTIC LLAMAS BATTLE AT THE EDGE OF TIME

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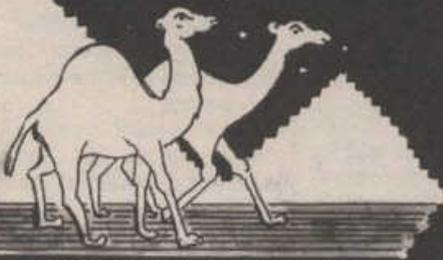


MATRIX

Jeff Minter has taken Gridrunner — the game that topped bestseller charts in USA and UK — and created an awesome sequel. Graphically superb, it features multiple screens, new aliens and attack waves, mystery bonuses, renegade humanoids, deflexor fields, diagonal tracking, countdown/panic phase and much, much more.

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HOVER BOYVER

A totally original arcade game for C64 featuring outstanding graphics and a sound track created by a professional Piano Wizard. Gordon Bennet has borrowed his neighbour's Air-Mo lawnmower. Mow your way through as many of the 16 lawns as you can before the pursuing neighbour retrieves his mower. Set your dog onto the neighbour to help you out of tight spots, and don't annoy the gardener. Try not to plough through the neat flower beds or overhurl your mower!

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Available for Commodore 64 £7.50.

ABDUCTOR

A classic new space game! ZAP the swirling alien hordes before they ram you — and abduct your humanoids! Survive the assault for long enough and you'll get an extra stage on your spaceship with double firepower! Awesome unexpanded VIC Action. £5.00



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Letters

Satisfied customer

My son takes your magazine *Popular Computing Weekly* and has done so since it was first published.

In January of this year, he experienced some difficulty with his ZX81 Printer, using it with an adaptor link up to his BBC Computer. After approaching various electronic engineers, with no satisfaction from any, my son asked me to get in touch with a company advertised in your magazine, Advanced Digital Systems Ltd, of Portsmouth, which supplied the adaptor.

This company deserves to get on; the after sales service (re the adaptor) plus advice and repairs done on a ZX Power Pack, ZX Printer and 16K Ram Pack (Sinclair did not even reply to letters) were attended to without hesitation. Advanced Digital Systems Ltd acted above and beyond the call of duty — Well Done!

I would appreciate it if you would print this on your letters page: maybe somebody else might be glad to know of a company who, without doubt, goes to any length to satisfy the customer.

Marcus Ley
43 Somers Road
North Reddish
Stockport SK5 6SL

Word package

I am writing in answer to S Guerqueb's letter in Peek and Poke in issue no 15 Vol 3 of *Popular Computing Weekly*, regarding the use of a Brother personal printer/typewriter with a Spectrum. It is in fact possible to put together a word processing package using the Brother EP22 printer/typewriter, a Tasman RS232 interface and Tasword Two for around two hundred pounds.

The Brother EP22 uses two ways of printing, on plain paper using ink cassettes, or on thermal paper. At the moment I do not know the cost of replacement cassettes or thermal paper. To save thermal A4 paper supplied, I have used the

thermal paper from an Alpha-com 32 printer and this works fine. The EP22 has many excellent features besides the fact that it can double as a printer and is extremely portable, working off batteries or mains.

To connect it to a Spectrum all that is required is a Tasman RS232 interface, which plugs straight into the computer and has a lead which connects to the Brother EP22. Software is supplied to configure to various printers and the interface works well with Tasword Two Word processor.

The RS232 Interface and Tasword Two are available from Tasman Software and the Brother EP22 is available from Micro Research, Livingstone.

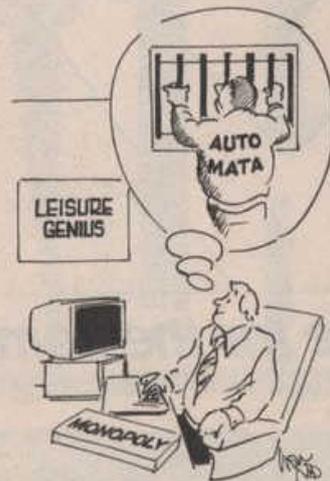
Iain Ferguson
18 Gorsebank
Ladywell
Livingston
West Lothian

Screen clearance

I own a Vic 20, and I have two programming tips for your readers. 1) To prevent people from breaking into your programs, *Poke 788,194* followed by *Poke 808,100*.

2) When saving programs, if you type *Save program name*, on loading, the screen will be cleared when the program is found, thus giving a professional effect (the symbol before 'program name' is obtained by *Shift/Clr*).

Carl Pickin
Lenvens
Tunstal Road
Knypersley
Stoke-on-Trent



A strange anomaly

I am writing to report a strange anomaly concerning the loading of tapes on my ZX Spectrum (or, it seems, any micro with an external power supply).

A friend informed me of problems he had loading games into his Commodore 64, and he found that by placing the power supply away from the tv set and not next to it as he had done, the tapes would load with no problem. As I had much the same set up, I tried the same procedure and found that *Valhalla*, which I had no end of trouble getting to load, went in first time.

The only explanation I can think of may be that some sort of feedback or interference is affecting the power supply and forming a loop back to the computer.

I hope that this information is of some use to anyone having loading problems.

D McRiner
Dhahran
Saudi Arabia

Compatible programs

I would like to take this opportunity to inform your readers that there are two types of ZX Spectrum software.

- That which is compatible with the ZX Microdrive.
- That which is *not*, ie, that which requires complex manipulation of code to overcome the incompatibility obstacle.

Please advise your software reviewers to bear the above in mind when reviewing new programs within the columns of your excellent weekly.

There must be thousands of ZX Spectrum users who no longer run incompatible programs in favour of programs that are compatible, ie, those which may be *Saved* and *Loaded* onto Microdrive cartridges.

Likewise, there must be vast quantities of unsold material due to lack of information in compatibility and the attendant risk of a purchase being incompatible.

In the naive hope that this letter will stimulate reaction, I hope that you will prompt and advise your advertisers to comment on compatibility.

David Lowe
31 Hill View Road
Rotherham

Biological theme

Please could you send me any information on whether there is any software firm that offers a biology game. I ask because my biology project for the term is 'Design a biological game' for which I thought a computer game would be suitable.

My computer is a Sinclair Spectrum (48K). However, my school also has Apple IIs and BBC micros.

I look forward to hearing from you.

Timothy Andrews
Inver Cottage
Maple Walk
Cooden
Sussex

The most obvious game would be *Life*, which simulates the growth of cells over a number of generations. Numerous listings have been published in various computer magazines over the past two years.

Missing hex loader

I have a question about an article in your magazine dated 12-18 April. On pages 26-27 you have a hex code listing to make your spectrum simulate an organ — something I have been looking for for a long time.

However the notes tell us to type in the hex loader — where is it? As I am new to machine code I do not know how to *poke* it in. Can you help?

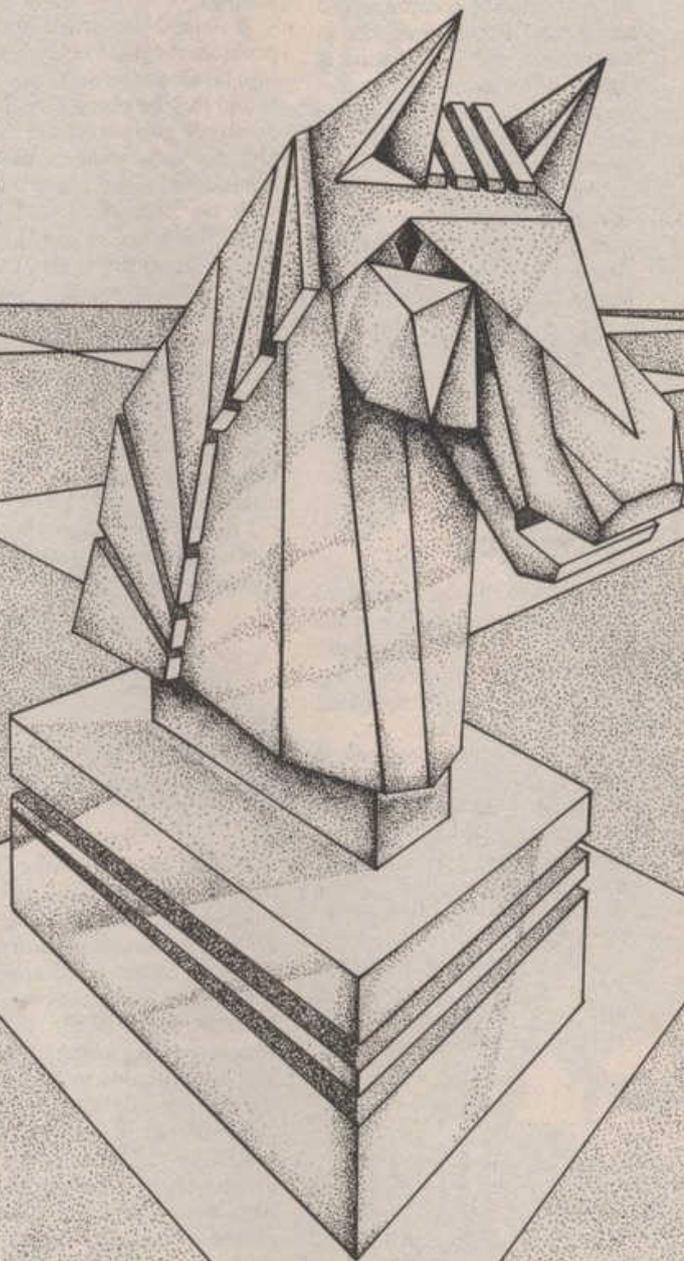
Gary Joyce
48 Princess Drive
Sandbach
Cheshire
CW11 9BP

The missing hex loader seems to have baffled quite a few people. In fact Mark Lawrence's series, of which the *Organ* was only part, utilises the same hex loader for every section — the one printed in the first part, issue dated 5-11 April.

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**GAME
OF THE YEAR
BMA'84**



VALHALLA

SOON FOR COMMODORE 64

Solitaire

A new game for Dragon 32 by J D Bateman

This game is played in the same way as the standard Solitaire with pegs or marbles. Each piece can be jumped over an adjacent one in an empty hole immediately beyond. The piece that is jumped over is then removed from the board. The object of the game is to finish with just one

piece remaining in the centre space.

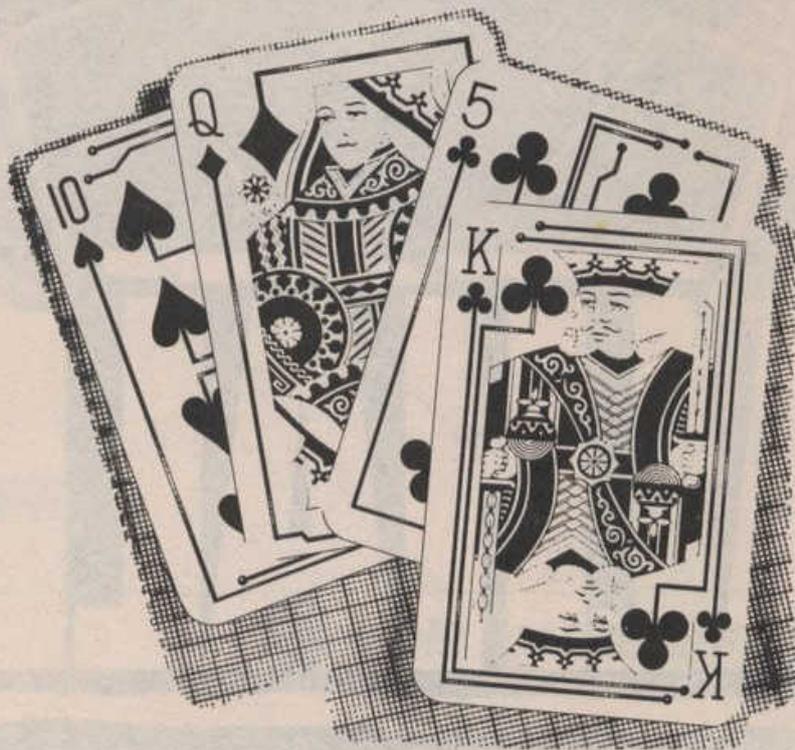
Program Notes

All lower case letters are inverse characters. The colours used are not suitable for a B/W TV, but can be easily changed for ones with a better contrast. All peg positions, vacant holes, etc., are stored in the various Data lines.
Lines 120-280 Set up the board.

Lines 310-640 Input of (moving) peg positions.
Line 650 Checks for valid peg location.
Lines 660-710 Input direction.
Lines 810-1010 Show a solution.
Lines 1040-1130 Instructions.
Lines 1160-1320 Check for and print valid moves.
Line 1330 Checks if final move leaves peg in centre hole.

```

10 '          * *
20 '          * SOLITAIRE *
30 '          FOR
40 '          * DRAGON 32 *
50 '          J.D.BATEMAN
60 '          * 15/1/84 *
70 '          * *
80 CLS:PRINT@232,"INSTRUCTIONS Y/N"
90 A$=INKEY$:IF A$="" THEN#0
100 IF A$="Y" THEN 1040
110 CLS@
120 PRINT@10,"(SOLITAIRE)";
130 FOR X=69 TO 89:PRINT@X,CHR$(255):NEXT
140 FOR Y=101 TO 389 STEP 32:PRINT@Y,CHR
$(255):NEXT
150 FOR Z=121 TO 409 STEP 32:PRINT@Z,CHR
$(255):NEXT
160 FOR W=421 TO 441:PRINT@W,CHR$(255):
NEXT
170 PRINT@166,"a":PRINT@198,"b":PRINT@
230,"c":PRINT@262,"d":PRINT@294,"e":P
RINT@326,"f":PRINT@358,"g"
180 POKE1129,49:POKE1131,50:POKE1133,51
POKE1135,52:POKE1137,53:POKE1139,54:POKE
1141,55
190 U=32
200 PRINT@155,"pegs":PRINT@187,"lell";
210 PRINT@271,CHR$(158);
220 DIMA(32)
230 FOR J=1 TO 32
240 READA(J)
250 PRINT@A(J),CHR$(284);
260 NEXTJ
270 PRINT@219,U;IF U=1 THEN 1930
280 PRINT@448,"PEG";
290 INPUT P$
300 SP=0
310 IF P$="D" THEN 240
320 IF P$="A3" OR P$="3A" THEN SP=123
330 IF P$="A4" OR P$="4A" THEN SP=125
340 IF P$="A5" OR P$="5A" THEN SP=127
350 IF P$="B3" OR P$="3B" THEN SP=205
360 IF P$="B4" OR P$="4B" THEN SP=207
370 IF P$="B5" OR P$="5B" THEN SP=209
    
```



Star Game

```

380 IF P#="C1" OR P#="1C" THEN SP=233
390 IF P#="C2" OR P#="2C" THEN SP=235
400 IF P#="C3" OR P#="3C" THEN SP=237
410 IF P#="C4" OR P#="4C" THEN SP=239
420 IF P#="C5" OR P#="5C" THEN SP=241
430 IF P#="C6" OR P#="6C" THEN SP=243
440 IF P#="C7" OR P#="7C" THEN SP=245
450 IF P#="D1" OR P#="1D" THEN SP=265
460 IF P#="D2" OR P#="2D" THEN SP=267
470 IF P#="D3" OR P#="3D" THEN SP=269
480 IF P#="D4" OR P#="4D" THEN SP=271
490 IF P#="D5" OR P#="5D" THEN SP=273
500 IF P#="D6" OR P#="6D" THEN SP=275
510 IF P#="D7" OR P#="7D" THEN SP=277
520 IF P#="E1" OR P#="1E" THEN SP=297
530 IF P#="E2" OR P#="2E" THEN SP=299
540 IF P#="E3" OR P#="3E" THEN SP=301
550 IF P#="E4" OR P#="4E" THEN SP=303
560 IF P#="E5" OR P#="5E" THEN SP=305
570 IF P#="E6" OR P#="6E" THEN SP=307
580 IF P#="E7" OR P#="7E" THEN SP=309
590 IF P#="F3" OR P#="3F" THEN SP=333
600 IF P#="F4" OR P#="4F" THEN SP=335
610 IF P#="F5" OR P#="5F" THEN SP=337
620 IF P#="G3" OR P#="3G" THEN SP=365
630 IF P#="G4" OR P#="4G" THEN SP=367
640 IF P#="G5" OR P#="5G" THEN SP=369
650 IF SP=0 THEN 1320
660 PRINT@467,"PRESS ARROW";
670 A$=INKEY$:IF A$="" THEN 870
680 IF A$=CHR$(8) THEN GOSUB 1100
690 IF A$=CHR$(10) THEN GOSUB 1200
700 IF A$=CHR$(94) THEN GOSUB 1240
710 IF A$=CHR$(13) THEN GOSUB 1280
720 FOR X=448 TO 479:PRINT@X,CHR$(224);
NEXT
730 GOTO 270
740 FOR B=448 TO 479:PRINT@B,CHR$(224);
NEXT
750 PRINT@458,"SOLUTION Y/N";
760 A$=INKEY$:IF A$="" THEN 760
770 IF A$="Y" THEN 810
780 FORB=458 TO 469:PRINT@B,CHR$(224);NEXT
790 GOTO 1080
800 DATA 173,175,177,205,207,209,233,235,
237,239,241,243,245,265,267,269,273,275,
277,297,299,301,303,305,307,309,333,335,
337,365,367,369
810 PRINT@458,"SOLUTION ";
820 B$=CHR$(224)+CHR$(224)+CHR$(224)+CHR
$(224);
830 PRINT@155,B$;PRINT@187,B$;PRINT@21
9,B$;
840 RESTORE
850 PRINT@271,CHR$(156);
860 DIMB(32)
870 FOR I=1 TO 32
880 READ B(I)
890 PRINT@B(I),CHR$(204);
900 NEXT I
910 FOR D=0 TO 100:NEXT D
920 DIMX(31):DIMY(31):DIMZ(31)
930 FOR I=1 TO 31
940 READX(I),Y(I),Z(I)
950 PRINT@X(I),CHR$(188);FOR D=0 TO 80:
NEXT:PRINT@Y(I),CHR$(188);FOR D=0 TO 80
:NEXT:PRINT@Z(I),CHR$(188);FOR F=0 TO 2
80:NEXT
960 PRINT@X(I),CHR$(156);PRINT@Y(I),CHR
$(204);PRINT@Z(I),CHR$(156);
970 FORD=1 TO 155:NEXTD
980 NEXTI
990 FOR D=0 TO 1000:NEXT
1000 '(C) J.D.B. 15/1/84 <C>
1010 GOTO 1360
1020 DATA 207,271,239,243,239,241,177,241
,209,273,209,241,173,177,175,177,241,205
,337,273,305,309,305,307,303,307,305,245
,309,277,309,305,307,299,303,301,365,301
,333,269,333,301,369,365,367
1030 DATA 365,301,333,285,269,237,233,297
,235,239,235,237,297,233,265,233,237,235
,303,239,271,239,235,237,235,289,267,289
,303,301,303,307,305,275,271,273,269,273
,271,241,305,273,307,303,305,335,271,303
1040 CLS:PRINT:PRINT" EACH PIECE IS JUMP
ED OVER AN ADJACENT ONE INTO AN EMPTY
HOLE IMMEDIATELY BEYOND THE PIECE BEI
NG JUMPED. THE PIECE THAT HAS BEEN JUMPED
OVER IS REMOVED FROM THE BOARD."
1050 PRINT:PRINT" PERMITTED MOVES ARE UP,
DOWN, LEFT OR RIGHT. THE OBJECT OF THIS GAM
E IS TO END UP WITH THE LAST PIECE IN THE
CENTRAL POSITION."
1060 PRINT:PRINT" press any key to con
tinue"
1070 A$=INKEY$:IF A$="" THEN 1070
1080 CLS:PRINT" To move any valid piec
e":PRINT" ENTER THE LOCATION OF THAT PIEC
E AND THEN PRESS THE APPROPRIATE ARROW K
EY."
1090 PRINT:PRINT" for example":PRINT" YOU MAY
WISH TO JUMP THE PIECE FROM A3 OVER THE P
IECE IN A4 TO AN EMPTY SPACE AT A5."
1100 PRINT" TYPE IN A8 OR A4 PRESS <ENTE
R>, THEN PRESS THE RIGHT ARROW KEY."
1110 PRINT" IF AT ANY TIME YOU CAN MOVE N
O FURTHER PRESS Q TO QUIT.":PRINT:PRINT
" press any key to continue"
1120 A$=INKEY$:IF A$="" THEN 1120
1130 CLS:PRINT@193,"A CHANCE TO VIEW A S
OLUTION IS OFFERED AFTER PLAY IS FINISHE
D.":PRINT:PRINT:PRINT:PRINT" press any
key to continue"
1140 A$=INKEY$:IF A$="" THEN 1140
1150 GOTO 110
1160 L=PEEK(1024+SP):M=PEEK(1022+SP):N=P
EEK(1020+SP)
1170 IF L=204 AND M=204 AND N=156 THEN
1190
1180 GOTO 1320
1190 PRINT@SP,CHR$(156);PRINT@SP-2,CHR$
(156);PRINT@SP-4,CHR$(204);:U=U-1:RETUR
N
1200 L=PEEK(1024+SP):M=PEEK(1056+SP):N=P
EEK(1088+SP)
1210 IF L=204 AND M=204 AND N=156 THEN 12
30
1220 GOTO 1320
1230 PRINT@SP,CHR$(156);PRINT@SP+32,CHR
$(156);PRINT@SP+64,CHR$(204);:U=U-1:RET
URN
1240 L=PEEK(1024+SP):M=PEEK(992+SP):N=P
EEK(960+SP)
1250 IF L=204 AND M=204 AND N=156 THEN 12
70
1260 GOTO 1320
1270 PRINT@SP,CHR$(156);PRINT@SP-32,CHR
$(156);PRINT@SP-64,CHR$(204);:U=U-1:RET
URN
1280 L=PEEK(1024+SP):M=PEEK(1026+SP):N=P
EEK(1028+SP)
1290 IF L=204 AND M=204 AND N=156 THEN 1
310
1300 GOTO 1320
1310 PRINT@SP,CHR$(156);PRINT@SP+2,CHR$
(156);PRINT@SP+4,CHR$(204);:U=U-1:RETUR
N
1320 SOUND 1,5:GOTO 720
1330 T=PEEK(1295):IF T=204 THEN 1350
1340 PRINT@449,"YOU HAVE GONE WRONG SOME
WHERE";FOR D=0 TO 1000:NEXT:GOTO 1360
1350 PRINT@448,"CONGRATULATIONS YOU GOT
IT RIGHT";FOR D=0 TO 5000:NEXT
1360 CLS:PRINT@201,"TRY AGAIN Y/N?"
1370 A$=INKEY$:IF A$="" THEN 1370
1380 IF A$="Y" THEN 1400
1390 END
1400 CLS:PRINT@202,"PRESS BREAK"
1410 PRINT@224,"TYPE RUN AND <ENTER> TO
PLAY,"

```

Code-name Arnold

David Kelly talks to Chris Hall from Locomotive Software

The Amstrad CPC464 is the first home computer Chris Hall has had a hand in designing.

Amstrad began work on their machine almost two years ago. Unfortunately, by August last year it became apparent that there were difficulties with both original system software and the hardware.

So, Amstrad had a keyboard and a case together with a partly finished hardware design based around the 6502 processor. And not much else.

MEJ Electronics was brought in by Amstrad to sort out the hardware design. They, in turn, get in touch with Chris Hall's software house Locomotive (both companies are composed of former Data Recall employees) and both decided to start again from scratch.

The original design was ditched entirely and a new one was created, based around the Z80 processor. This was code named 'Arnold' and became the Amstrad CPC64.

The Z80 suited Amstrad because it gave the machine the possibility of running business software using the CP/M disc system. And it helped Locomotive, which already had experience of the Z80 chip.

Locomotive is a new company set up to develop system software. "We don't do applications or games and we are very interested in speed — our Basic is fast!

"We literally first heard of the Arnold last August and the three of us — Richard Clayton, Bruce Godden and myself — had a hectic few months." Locomotive actually started writing in September last year and had to work blind for six weeks.

Locomotive and MEJ worked closely on the design. "We had an idea of what price the machine was going to be sold for — which set the parameters for the hardware. We couldn't knock out something 'noddy'. On the other hand, we didn't have time to produce a QL from scratch.

"Before we started we looked at the BBC machine, because at that time we saw it as a market leader, and we also had a look at the Commodore 64.

"We already had our own Basic interpreter for a CP/M80/CP/M86 MSDOS system and the decision to use the Z80 in the Amstrad was driven by the fact that we couldn't possibly have written both the firmware and the Basic in three months.

"There were a number of constraints which came from Amstrad's original thinking — the casing and keyboard and the inclusion of a cassette recorder and monitor. That was all settled and had to be taken on.

"The monitor is a pixel VDU — the simplest sort. When you do the sums you find the Amstrad has to be the way it is. It is a straightforward 16K of memory for the

display — two colours at 640 x 200, four colours at 320 x 200 or 16 colours at 160 x 200. You can 'suck' 16K from Ram just fast enough to refresh the screen.

"The sound uses the GI chip — AY-3-8912. If you look at the number of sound chips there aren't very many and the GI has three channels.

"A Centronics port seemed appropriate, for a printer. Having the built-in cassette player made life easier because its electronics are a bit special.

"Add in a custom gate array and there you have the machine."

The main thrust behind the firmware was to make it as open as possible for other languages and software. "We tried to keep a firm distinction between the firmware and the Basic. The Basic simply takes the commands keyed in, packs them up and passes them to the firmware. The HiSoft Pascal written for the machine, for example, has all the graphics and sound facilities that the Basic does."

Nearly all the features of the machine are implemented in the firmware and Basic. "We wanted to avoid 'magic numbers' in the Basic. The Commodore machine has some very good hardware features but, without Simons' Basic, you have to spend your time 'poking' away with magic numbers. Similarly, we knew we wanted to avoid confusing VDU19-type commands that the BBC suffers from.

"The Arnold is intended to be as easy to program as possible. After all, even an experienced programmer, faced with a series of Pokes to various machine-code addresses written some time ago, may have trouble working out what is going on."

The firmware is written as a series of sub-routines. There are no variable interfaces — no system variables to Poke around with. Everything is written to use routines. For example, the *Sound* command in Basic picks up the key commands, organises the parameters and picks up the machine-code command *Sound Cue* in the firmware. All of the machine code sub-routines in the firmware are documented. Amsoft — Amstrad's computer division — will be publishing in full the firmware documentation.

"Anybody writing software for the Amstrad should never need to go near the hardware. The only possible point would be if you want particularly fast and flashy screen routines. In this case we decided that it wasn't appropriate to provide generalised routines."

Software houses writing for the machine have been asked by Amsoft to write using the firmware provided, rather than reinventing the wheel.



One interesting feature of the CPC464 is its use of 'windows'. "We wanted the machine to have separate text and graphics windows." The way it works is to define an area of the screen as, say, a graphics window and then anything plotted outside the area of the window is 'clipped' and not displayed.

"We thought that one text window was a bit mean so we have got eight. The text windows are tied up with the eight text streams. Each stream has its own window, its own cursor, and its own *Pen* and *Paper* commands. "You select a stream which you can then write to — and it will then plonk it out in that stream."

Another feature of the machine is its real-time controls. At a machine code level the firmware incorporates a number of hardware interrupts which, linked to an internal timer, can be used to trigger a sub-routine. Frame fly-backs from the screen can also be used to 'kick' a routine.

At the level of Basic two commands are provided: *After* (*After n Gosub*) which jumps to the subroutine after *n* where *n* is a time in 1/50sec; and *Every* (*Every n Gosub*) which jumps to the subroutine every *n* — and gives a periodic effect.

Similar mechanisms are also provided for the sound commands. Sound management is all done from the interrupt path so, unlike the Dragon, the processor can carry on processing when a sound is being generated.

With something around 12 weeks to complete the software on the Amstrad, the Locomotive team had to work flat out. The majority of the Basic was already written, but it was rearranged and some new features were added. The firmware was written piecemeal in modules. Each of the five modules (1 sound, 3 screen, 1 keyboard) were fully tested before going on to the next. "We wrote them in a sensible order so that if the fundamental routines took longer to write than we expected then at least we had written them by the time we had to deliver the software to Amstrad!

"We handed over our finished software 14 weeks ago and the machines at the launch had finished Roms in them." ○

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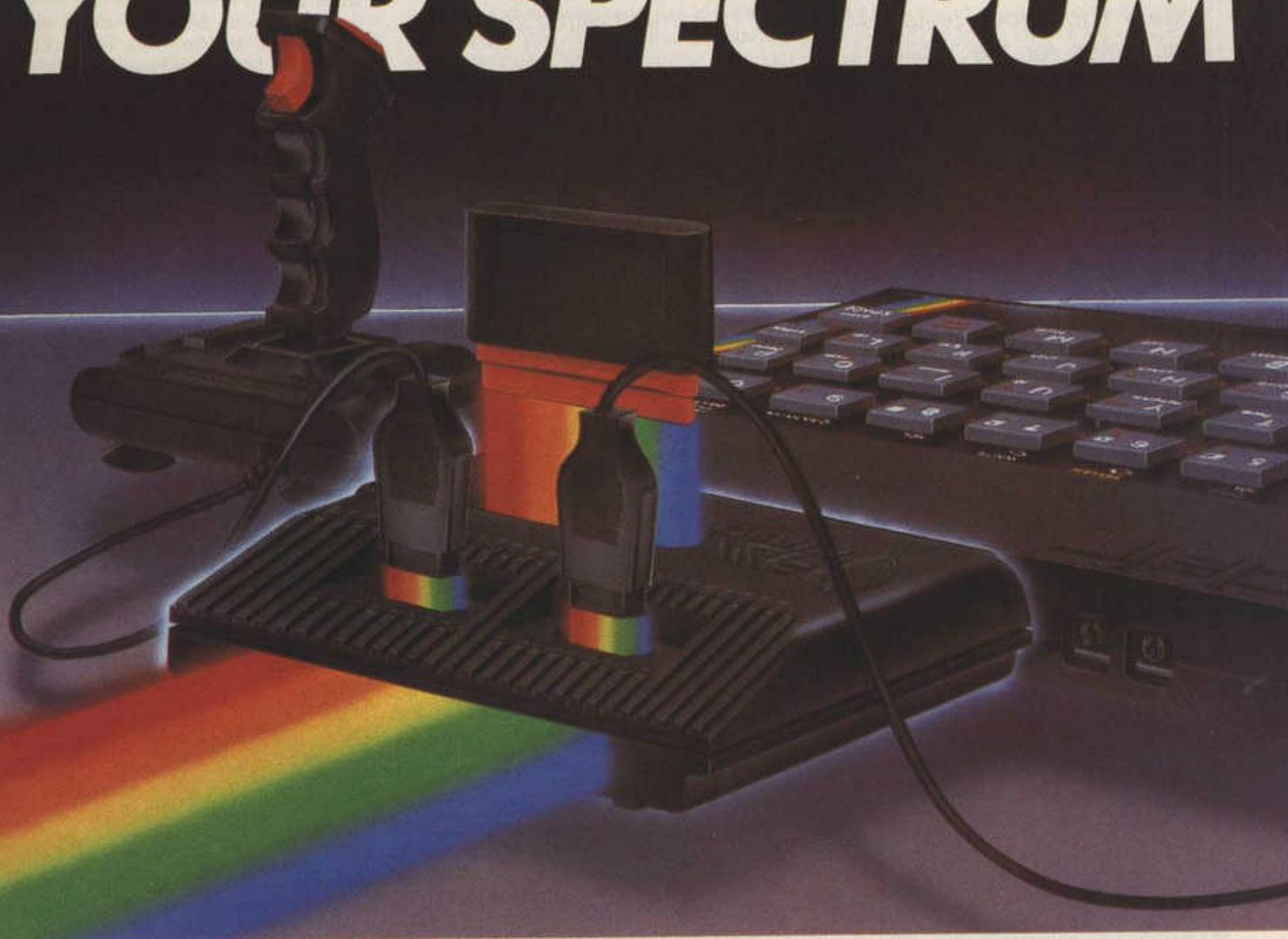
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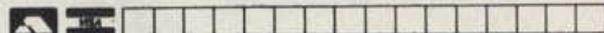
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A secure future

Gary Thorogood tests his skill and judgement with a selection of games for the Vic20.

With the name of Commodore 64 on everyone's lips (or so it seems), Vic 20 owners may be excused for thinking that they are in the possession of a quaint and ancient relic, the sole function of which is to act as a glorified calculator or as a medium for playing the most primitive of arcade-style games. This is not, of course, the case and there appear to be plenty of software houses up and down the country willing to prove that a limited memory counts for less than the unlimited imagination of a talented programmer.

Space Escort by Romik Software is a case in point, using the machine's resources to the full. Your task is to accompany 26 space liners to the newly conquered planet of Sistoria. You are given nine fighters to repel the four waves of attack that you will encounter on your mission. Along the journey you will be met by a whole host of weird and wonderful opponents — Space Flies, Xethus Spirals

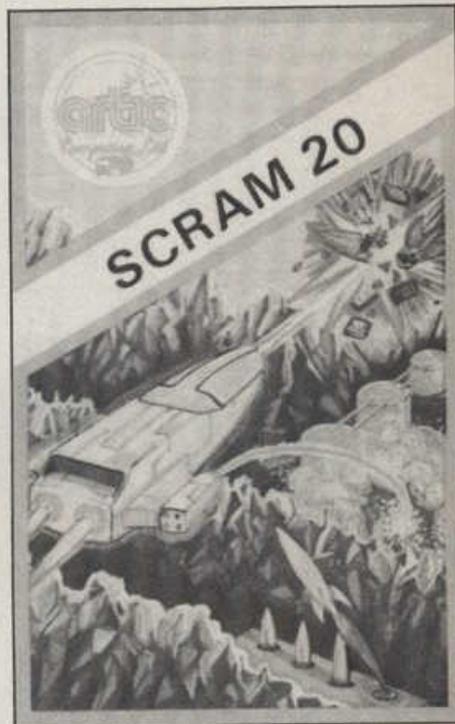
enough happening on the screen to keep you fully occupied. The game has some interesting control devices allowing you to pause the action at any time should you need to catch your breath and to continue a new game where the previous one left off.

Scram 20 by Artic Computing Ltd. is another game calling for all your reserves of manual dexterity. You must manoeuvre a spaceship through various hazards in order to destroy the enemy base. Points are amassed for eliminating the numerous obstacles and your fuel supply must be constantly replenished by means of bombing fuel dumps that are scattered along the trail. There are five sections to *Scram 20*, each providing a new and deadlier threat to your survival. The earlier bombs and U.F.O.s may be formidable opponents but your nerve will really be tested by the Zoids and Superzoids lying in wait as you near the base. It is an exciting and demanding game and with five controls to operate, the use of a joystick is virtually essential.

Space Snake by Commodore, although set in the distant heavens, is more technically down-to-earth. With the use of only two keys (up and down) you must guide the snake, or its very rough approximation, between deadly satellite mines and into a number of tunnels containing randomly placed eggs that have to be eaten. As you progress the game becomes faster, the cosmos more littered with mines and the tunnels more winding and treacherous. *Space Snake* is an enjoyable game, mixing a couple of old ideas into a new formula but after a while the game can become rather repetitive.

What *Space Snake* lacks and what *Bengo* by Mr. Micro has in its favour, is a great deal of humour and a way of bringing something fresh to what are, after all, variations on two or three basic formulae. In this game you must move Bengo the Eskimo among the dastardly Snow Yeti who are purported to be

half-blind and half-witted. They are not as docile as they sound, however — they can smell a good Eskimo lunch and will chase you in between blocks of ice in order to satisfy their hunger. Your only means of defence is to hurl the blocks across the icy plains and hope to kill the Yeti in the process. It is an enjoyable game and with nine levels of play and a diminishing time factor it calls for quick reflexes and a steady hand. The graphics are colourful (the action is set against the background of the Northern Light) and the intricately detailed



characters are three dimensional. You can play around in the frozen wastes until your heart (or the Yeti's stomach) is content whilst whistling away to the accompanying tune of *Hot Butter*. One point, this excellently packaged cassette can only be played with a joystick.

All the games we've looked at so far have been designed for the unexpanded Vic but if you do have an expansion unit, there are programs on the market which cater for a larger memory and which, on the whole, are more ambitious in design and sophisticated in execution.

A good example is *Teddy* by Audiogenic which will need an 8K expansion at least. You are a bear living in the heavily vegetated woods, supplementing your diet (and gaining points) by eating the occasional picnic basket or the pieces of fruit that are dotted about the forest. The tranquility of this Arcadian setting is disturbed by groups of lake snakes hissing venomously as they meander through the trees on your trail. Your only hope is to bite their tails which will kill them. However, if you miss and bite the creature in the middle it will merely sub-



and Giga Kamikazi to name but three. If you are skilful enough to destroy your adversaries, you land safely on the planet and then return to escort the remaining 25 liners. *Space Escort* is a fast moving, action-packed game with bright and colourful graphics, loud and vibrant music and

divide, thereby doubling the threat. The characters are well defined; at each level the snakes become more menacing as they squirm along to the nicely ironic tune of *The Teddy Bear's Picnic*, while the bear looks the epitome of cuddliness and vulnerability. The emphasis is on humour and I think that you'll find *Teddy* an amusing game to play. There is even a Hall Of Fame capability so that you can record the bravest teddy bears in your family.



Patience by Commodore requires 3,8 or 16K expansion and is based on the popular parlour game. The object is to place the four suits of cards in ascending order on their respective packs by means of carefully worked out moves. The screen is set out in exactly the same way as the real thing and you have at your disposal all the controls necessary for dealing, moving and placing the cards. *Patience* requires a great deal of thought and planning and can be very rewarding should you succeed in getting all the cards out in the correct order (no two games are alike as the pack is reshuffled after each one).

It is obviously a program for the less adventurous games player but will, I think, involve all the family.

Commodore Super Games Pack 2 also requires expansion and consists of two cassettes featuring four programs. The first of the four, *BlokIt* is based on the principle of noughts and crosses where you have to arrange five rectangular blocks in a row in either a horizontal, vertical or diagonal direction. The computer will try to stop you doing so by placing its own blocks in your path and attempting to build a row of its own. *BlokIt* is a slow game but one that requires strategic thought.

Cannonade is a game for two players in which you have to destroy the opponent's cannon by firing shells through a hole in the dividing wall. The angle and speed of the shot are pre-determined by the figures you enter into the computer before the game begins. *Cannonade* is, in effect, a variant of *Battleships* and is one of the slowest and most uneventful games I've yet played. Should you have the willpower to continue and actually hit your opponent, then a new game begins with the hole and the cannons resituated.

In *Road Rally* you must drive your car (or to be precise, a string of diamond shapes) along a road, negotiating treacherous bends whilst avoiding the sides of the road. The longer you survive, the greater the points awarded. You can choose the width of the road you require ranging from the virtually impossible to the ridiculously easy.

Skittles is the most interesting of the four games included in the package. It may be played with one or two contestants or even

two teams. There are six different formats, each requiring a different degree and type of skill but all are basically variations on the same theme — knocking down more skittles than your opponent. *Skittles* probably has a higher boredom threshold than the other three games but after a few attempts, the experienced games player will be looking for something a bit more mentally and physically taxing. All the programs in the pack are variations on familiar patterns while the graphics are pedestrian and lifeless. They demonstrate little of the imagination shown by many of the independent software

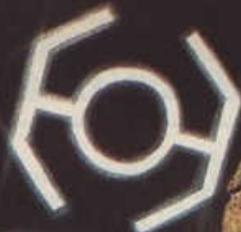
manufacturers.

Countdown by Paramount (requiring 8 or 16K expansion) is a good example of this. The plot is so convoluted that space does not permit me to go into any great detail other than to say that your task is to defuse a time bomb and thereby avert a national disaster. Within a very limited time scale you must escape from a house, make your way through the jungle and then ease along a sewer in order to reach your objective. All manner of obstacles must be overcome, including killer security devices, man-eating plants and poisonous tendrils. Along the way you must pick up pieces of gold and purloin four keys so that the bomb can be safely deactivated. There are three levels of skill based on varying time limits and three screens, all very colourful and intricately detailed. *Countdown* will test your resources of skill and ingenuity to the full and like all the best games, will both infuriate and thrill you.

All in all, this collection of puzzles and games is proof enough that the output of software for the Vic 20, whether expanded or unexpanded, has far from diminished in either quantity or quality. There is enough intelligence, wit and originality amongst today's programmers to convince me that the future remains secure. Thanks for the memory 64, but I'll stick to the Vic.

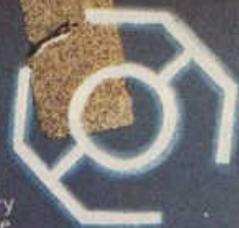
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| | |
|---|-------------|
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| "Awesome" | Jeff Minter |
| "I prefer elephants" | Hannibal |
| "Don't shoot me, I'm only the piano player" | Elton John |
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This is the start of PCW's Education Special, a series which will run over the next few issues. We will be looking at a selection of educational software for various machines, giving some idea of the state of the market, and the variety of material available.

The series begins with a set for very young children on the Spectrum, and a survey of some educational programs for Dragon 32.

Buns and bagpipes

Andy Pennell looks at the Learning Box series from Arrow

Learning Box is the title of a range of educational programs recently released for the 48K Spectrum from Arrow. There are eight packages in all, and divide into two distinct sections — four intended for children of three to six years, and four for older children up to the age of eight.

Each program is supplied in a large video-cassette box, with colourful artwork, and look professional. Opening the boxes reveals several items — there is a Story Book, containing, among others, the tales of Hansel & Gretel and Red Riding Hood. There is also a Parents Guide, which explains all the connections required to the Spectrum, how to load the programs, and their use. A very good idea is the inclusion of double-sided keyboard overlays, which simplify the cluttered Spectrum keyboard to a few distinct, coloured areas, so the child does not have to be at all keyboard literate. As well as all this there is the cassette itself, containing on one side the program, and on the other Toni Arthur reading the related story. Due to the packaging used, it can be very difficult indeed to remove the cassette from the plastic filler, and I expect most children and many adults could have problems removing it. Each program consists of several exercises, in gradual order of difficulty, which can be done at any speed. They are designed to be used initially by both parent and child, but after a short while the child should be able to do each exercise unaided.

All the programs are written in machine-code, and practically fill the Spectrum memory. They all use lots of colour and sound to keep the children entertained. The graphics in all the programs are all excellent, and very large. The graphics that Five Ways (the authors) have put into their programs makes many Spectrum games programs look positively crude, with well drawn colourful shapes. Another nice feature is that when alphanumeric are required, instead of using the Spectrum's character set they have designed their own, which are most at least twice the size of the standard characters, and very nicely formed with true descenders.

Having dealt with their common features, I shall discuss each package in turn, in approximate order of difficulty. *Five Little Ducks* is sub-titled *I Can Count*, and introduces the concepts of sorting, matching and counting objects. It does this by

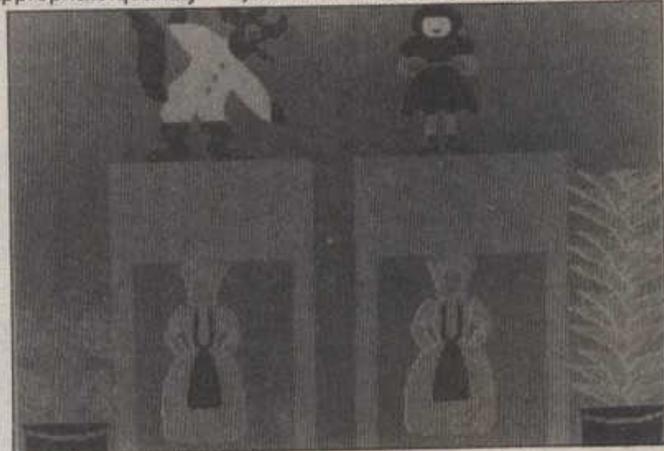
using the ducks of the title, together with some very good 'quack' sound effects and neat graphics to produce ten gradual exercises that should end with the child being able to recognise and understand numbers up to five. The best scene is where various numbers of ducks, wings flapping, fly over a lake before diving in. Even Ultimate would probably be impressed by it!

The follow-on is *Nine Currant Buns* which deals with simple sums. This was my favourite, mainly because of the cutest addition sign I have ever seen — if you think that sounds strange, I shall explain. When an addition is shown on the screen in large digits, below it are the appropriate quantity of objects, and the '+' sign changes into a delightful little man and puts the two piles of objects together. The reaction from all, both young and old who have seen it is the same — "Aaaaah".

The third in the lower age-group section is *Red Riding Hood* which teaches the child to recognise letters and words, preparing him/her for reading. It does this by encouraging the child to match combinations of colours, pictures and words, using characters and objects from the story. In fact, this is really two programs in one, as the parent can switch between *Red Riding Hood* and *Goldilocks*, giving two different vocabularies and sets of pictures. The different games of Snap within the program cleverly adjust their speed to suit the players, so that the attention of the child is maintained whatever their ability. Along similar lines, and following on comes *Goldilocks* which extends the exercises so that the child becomes more familiar with groups of words, then sentences. It uses similar methods to *Red Riding Hood*, and like it has two complete sets of words and pictures. There was one aspect of *Goldilocks* that I thought was not done well enough. A sentence with one or two nouns replaced with pictures appears on the screen, and the child has to choose which

of three words that Goldilocks points to is suitable. When a child makes a correct choice, the picture disappears, and I would like to have seen it remain, along with the word. It's only a minor gripe really, as the rest of the program is just as good as the others.

The first of those for older children up to the age of eight is *Mr Mac's Day*, which helps teach the child the time. It does this using a character called Mr Mac, a train driver, who also seems to be a very natty little dancer in his spare time. The exercises take the child through Mr Mac's busy day, with continual reference to a large, on screen clock, which can be adjusted in five minute intervals. To begin with, there is a stunning animation sequence which starts with Mr Mac climbing out of bed, follows him to work, and then to his Scottish dancing session in the evening. This must be the first and only time a Spectrum has been used to make bagpipe sounds! The graphics in this section just have to be seen to be believed, as they really are cartoon quality. As well as some clever, but fun to do exercises on the normal 12-hour clock, there is one on the Digital Clock, a sign of the times, and another on the 24-hour system. *Mr Mac's Day* is another excellent



Scene from *Red Riding Hood*

piece of software from Five Ways. Unfortunately the next package, *The Magic Shop* was not as impressive. It is intended to teach the child about money, and the use of the different denominations of coins, but I feel that it does not come up to the very high standard of the others in the series. It is very up to date though, including the 20p and £1 coins, while omitting the ½p, but I found it rather difficult to use, as it didn't seem to put the right sort of information on the screen, particularly the coins the child chooses. This is a shame, as the ideas used, which are based on buying weird objects to make spells, are very good, but the presentation lets it down.

Luckily the next package, *The Enormous Turnip* quickly redeemed Five Ways' reputation, with its exercises to improve spelling skills, and the formation of words from sounds. It effectively uses the characters and events from the story, along with the



Hansel and Gretel

statutory brilliant graphics to do this in a very neat way. The final package under scrutiny is *Hansel and Gretel* which teaches some of the more complex letter combinations, while increasing the child's vocabulary. It contains some quite frighten-

ing graphics, particularly of the Terrible Tree, and more clever animation. Particularly good is the sequence when Gretel pushes the Witch into the oven, rescuing her brother. The final exercise is a Hangman variant, which I found rather difficult at times! If you complete the word in time, you are rescued by your father and "There's no place like Home" is played, but if you fail the tree gets you, and it sounds as if something pretty horrible happens, but you are thankfully spared the graphics.

In conclusion, the programs in the Learn-

ing Box series (with the possible exception of *Magic Shop*) are all excellent, and should entertain most children while educating them very effectively. Those teachers who scoff at the Spectrum in primary schools should see these programs — they would probably sell their Beebs to buy a few Spectrums if they did. The only possible area of improvement would be for a Speech option, using perhaps the popular Currah unit, but they still offer a lot of fun and teaching for the reasonable price of £9.95 per package.

| Supplier | Program | Age | Price |
|---|----------------------------|---------|-------|
| Arrow 17-21 Conway Street London W1P 6JD | <i>Five Little Ducks</i> | 3-6 | £9.95 |
| | <i>Nine Currant Buns</i> | 3-6 | £9.95 |
| | <i>Red Riding Hood</i> | 3-6 | £9.95 |
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| | <i>Mr Mac's Day</i> | up to 8 | £9.95 |
| | <i>The Magic Shop</i> | up to 8 | £9.95 |
| | <i>The Enormous Turnip</i> | up to 8 | £9.95 |
| | <i>Hansel and Gretel</i> | up to 8 | £9.95 |

A higher plane

Keith and Steven Brain survey a range of programs for Dragon 32

As the Dragon has never really featured in the 'school micros' fight it is perhaps surprising that the range of 'educational' software for it continues to increase. On the other hand perhaps this is a reflection of the sad fact that it is no good giving every school a micro (of any make) if you don't also give money for software, and that most commercial educational software seems to be bought by 'concerned' parents rather than educational establishments!

Programs concerned with numeracy are common and in this selection we have looked at a number of offerings which are pitched at various age ranges. It is probably fair to say that the difficulties of producing good programs for the very young are minor compared to using the full potential of computer assisted learning for the older child, and that this tends to be reflected in both the number and quality of the material available for the more mature mind. Whilst simple games and pretty colours and sound may impress the average 4-5 year old they do not have the same impact on more cynical 11-16 year olds who are blasé about getting their names onto the high-score table of this month's favourite arcade game.

Ampalsoft's two-cassette *Maths Level One* goes a little further in exploring number relations and gives you a choice of two levels of difficulty. Scores are kept and you can change the sequence of exercises, and number of tries per exercise — although perhaps this is beyond the capabilities of the 4-6 year old, and since the instructions are in small print on a separate card it presupposes that the users can read. One to four children can play at the same time so it can be a group activity, but although there were some nice ideas our overall impress-

ion was that it was rather slow and it would probably need the constant attention of an adult. *Maths Level Two* is a similar two-cassette set from Ampalsoft which moves to a higher plane and includes 19 tests covering addition, subtraction, charts, tens and units, multiplication etc, at various difficulty levels, but which is not very awe-inspiring.

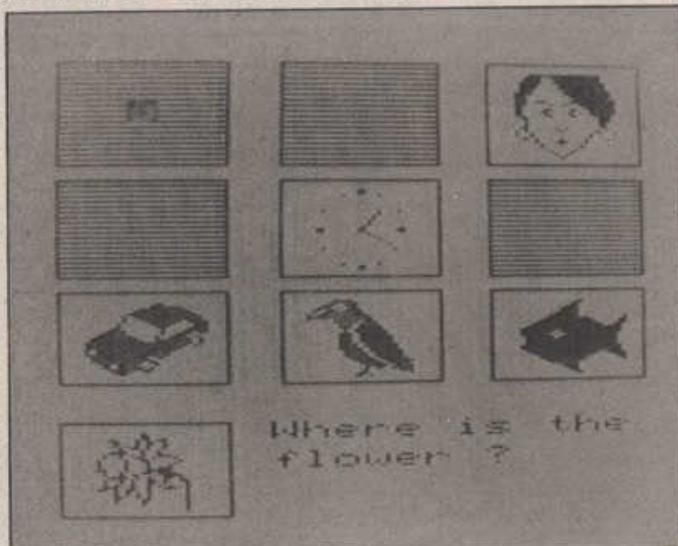
Number Puzzler was written for Dragon Data by Applied Systems Knowledge of whom we have already formed a high opinion for some of their other educational programs. We were not disappointed as the program used large upper and lower case, hi-res graphics and sound, very effectively. You have the choice of playing against the computer or another player at a number of games, including a number version of noughts and crosses and 'magic squares'.

Number Gulper from the same source was similarly impressive. This is a version of *Pacman* using joysticks or keys in which you have to 'gulp' up the required number of the correct signs to produce the number displayed. The final mathematical program considered was *Maths 'O' Level Revision Part One* from Ampalsoft which gives comprehensive coverage of the typical school syllabus with problems included.

The answers to these problems can be displayed and, if necessary, a more detailed explanation can be called for. It seemed quite useful and it makes a change from doing your set homework, but woe betide you if you do this instead!

The other major basic skill which must be learnt is the ability to deal with letters and words.

Words, Words, Words from Applied Systems Knowledge is versatile and interesting as it offers a series of scenarios such as 'the city', 'the street' and 'the house' from which objects to spell are displayed, and the various sections are well linked together. Another winner from ASK. *Hide and Seek* (ASK again!) consists of two different programs on opposite sides of the cassette which are aimed at helping memory development and early reading. Pictures are displayed and then covered up



ASK's *Hide and Seek* in progress

with shutters and you must match pictures, type in the name of a picture, or find the missing picture. This is certainly one of the best educational programs we've seen.

continued on page 23

TURTLE SOFT



SPRITE WRITE

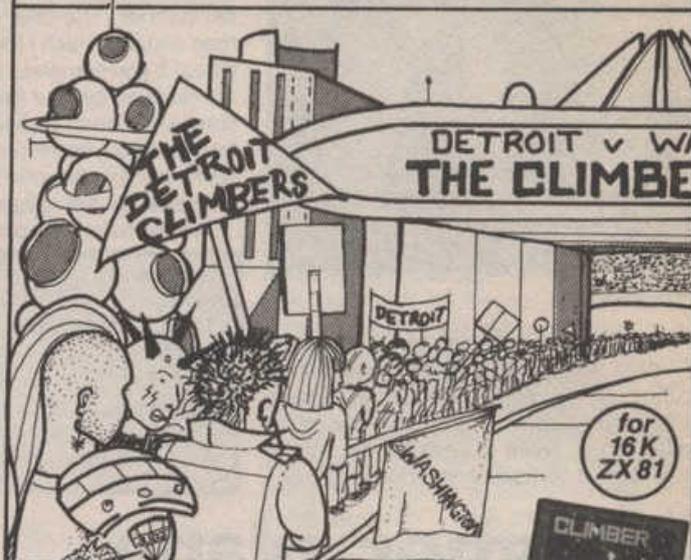
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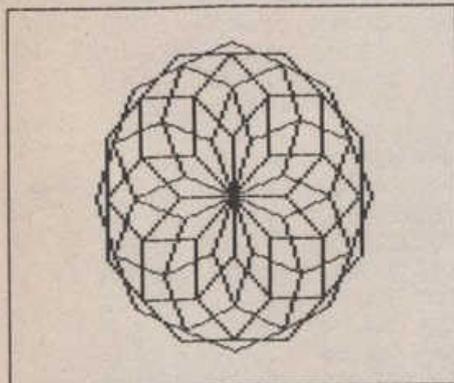
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PCW

Education special

Once the fundamental basics of numbers and letters have been mastered more philosophically demanding areas can be considered. Dragon Data's *Circus Adventure* is designed for children of primary school age and is billed as 'a beginner's adventure game'. It seems that you can only go 'up or down (north or south)' or 'left or right (east or west)' alternately so that you cannot backtrack so progress is rather haphazard, but you are rewarded by pictures (low-res) and music. It is not exactly mind-blowing (and it would perhaps have Tony Bridge in fits of hysterics) but we suppose that everyone has to start somewhere. *School Maze* is a similar program in which you must move around the school looking for a missing computer tape. The least said about this particular tape the better — if we lost it we wouldn't bother to go looking!

Salamander's *Turtle Graphics* promises to be 'a method of drawing pictures with your computer which is both fun and educational, yet simple enough to be enjoyed by the young or inexperienced computer user and the enthusiast alike.' It consists of a tape and a 28 page manual which includes details on how to transfer the program to disc. You can produce pictures by controlling a 'turtle' which moves around the screen according to the traditional 'left', 'right', 'forward' etc commands. Unfortunately, although the pictures are produced on the hi-res screen, the commands are entered on the normal low-res text screen ('command screen'), so



you cannot see what you are doing! This is totally unnecessary as hi-res text screen driver routines are now common and it rather spoils the attraction of the package.

Editing of command lines is good and pictures can be scaled, and coloured. A useful 'library' function is provided which can store up to 30 'words' which define particular movement patterns, which can be saved and used in commands. An option is included which allows you to also simultaneously plot your masterpiece on to one of the variously named four-colour plotters (MCP-40 etc), but regrettably there is no routine to dump the finished product onto a standard graphics printer. This appeared at first sight to be an interesting offering which allows you to explore shape

relationships, but we can't help wondering how long the interest would last for the 'not-so-young and inexperienced'.

Computer manuals are infamous for their general inadequacy, inaccuracy or even (dare we say it) incompetence, so it is not perhaps surprising that someone has tried to remedy the situation by producing *Basic Tutorials* which the new user can use to learn new skills and test their own progress. Ampalsoft offer both Beginners' and Advanced level packages, each containing two cassettes. The former starts from absolute basics with "What is a computer?" and continues with "What is Basic", variables, assignment statements, arithmetic operations, simple input and output, *Print @*, *Goto*, conditional statements and loops. A tutorial section is followed and then you are advised to follow a 'practical' session before continuing. The practical work sets you problems, and you can also look at the 'solution', but it seems a pity that they do not use the computer to check your answers or run demonstrations of the programs. The influence of the 'O' Level Computer Studies course is apparent — but in real life do people always use *End*? The 'Advanced' package covers sound and graphics, subroutines, user functions, arrays and data, string manipulation etc. Inevitably such programs are on tran-

sient value, as once you have mastered them you no longer have any need for them (unless, of course, you can persuade one of your friends...). When deciding whether you should buy such programs you should perhaps balance the value of your time, and your other commitments, against the time it takes to unravel the manual.

Since we live in a real world where the cost of the product must depend upon its sales potential, it is probably inevitable that it is difficult for the quality of small-volume educational packages to stand comparison with games, but certainly some of this selection were very impressive, although others left a lot to be desired.

Educational Series

TURTLE GRAPHICS

Salamander SOFTWARE

FOR THE DRAGON 32/64

| Supplier | Program | Age | Price |
|--------------------------|----------------------------|---------|--------|
| Dragon Data | <i>Number Gulper</i> | 4-11 | £10.95 |
| Kenfig Industrial Estate | <i>Words, Words, Words</i> | 5-8 | £10.95 |
| Margam | <i>Hide and Seek</i> | 4-11 | £10.95 |
| Port Talbot | <i>Number Puzzler</i> | 4-11 | £10.95 |
| West Glamorgan | <i>Circus Adventure</i> | 4-8 | £7.95 |
| SA13 2PE | <i>School Maze</i> | 4-8 | £7.95 |
| Ampalsoft | <i>Maths 'O' level</i> | | |
| P.O. Box 19 | <i>Revision Part One</i> | 16+ | £14.95 |
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| Cheshire | <i>Maths Level Two</i> | 6-7 | £14.95 |
| | <i>Basic Tutorial</i> | | |
| | <i>Beginners Level</i> | general | £14.95 |
| | <i>Advanced Level</i> | general | £14.95 |
| Salamander Software | <i>Turtle Graphics</i> | general | £9.95 |
| 17 Norfolk Road, | | | |
| Brighton | | | |
| East Sussex | | | |
| BN1 3AA | | | |

The point of the plot

Mark Lawrence presents a machine code plotter program

This program is written in machine code and so has the advantage of being able to plot on the full 256 x 192 pixel screen as opposed to Basic where you can only plot on a 256 x 176 pixel screen. Likewise, all the commands available have this facility so it is, for example, possible to copy the whole screen to the ZX printer.

As well as commands for drawing and plotting, there are commands available for copying to the ZX printer, filling in shapes, saving a screen to tape, loading a screen from tape, changing every occurrence of a specified ink or paper colour to another,

storing screens in memory, retrieving screens from memory, and swapping the screen with one stored in memory.

The plotting point is moved around the screen with the keys 5 to 8 and the above commands are activated using the keys listed in the menu incorporated within the program.

To enter the program first type in the short Basic program and Save "draw" Line 1, then verify it. Now type in the hex loader and run it. Enter 30000 as the start address as it is not possible to enter it to its correct address yet. The short Basic program will

handle this. Now enter the code and Save "draw code" Code 30000, 1760 then verify it. Clear the machine, by entering Randomize USR 0, and load the program from the start. If the code has been entered correctly a menu should be displayed. Should you not obtain this display type in the check program and load the code to 30000 again. Now check the code against the listing and poke any incorrect entries.

When saving a screen to tape, start the tape and then press s. No message will be displayed as this would destroy the bottom line. To fill a shape, position the cursor within the shape and then press the f key. The routine will ask you for the colour.

The fill routine in this program is actually one previously published in Popular Computing Weekly but converted to work on the full 256 x 192 screen.

```

Draw Basic
>_IST
  10 CLEAR 23999:LOAD ""CODE 24000
  20 RANDOMIZE USP 24000
>

```

```

DRAW CODE
50C0 AF 67 6F 22 50 62 21 54
50C8 62 77 2B 3C 77 CD 8B 0D
50D0 CD 29 5E CD 20 61 CD E0
50D8 60 CD 7A 60 CD C2 80 CD
50E0 81 60 CD 0D 82 FE 10 CC
50E8 20 61 FE 1B CC 65 60 FE
50F0 08 20 04 CD 6B 0D AF FE
50F8 09 CC F3 5F FE 0F CC 27
5E00 5F FE 20 CC 1F 5F FE 1F
5E08 CC FF 5E FE 1A CC E5 5E
5E10 FE 27 CC CD 5E FE 01 CC
5E18 9E 5E FE 18 CC 8E 5E FE
5E20 11 CC 29 5E FE 2B 20 AE
5E28 C9 3A 54 62 F5 CD CD 5E
5E30 CD 8B 0D 21 2E 40 11 0F
5E38 83 86 04 CD 2E 62 2E 60
5E40 11 13 63 06 9B CD 2E 62
5E48 21 80 48 11 AE 83 06 DA
5E50 CD 2E 62 21 24 50 11 8B
5E58 64 06 18 CD 2E 62 AF CD
5E60 97 22 21 00 58 11 01 58
5E68 01 60 00 36 17 ED B0 01
5E70 A0 01 36 8D ED B0 01 40
5E78 00 36 30 ED B0 01 C0 00
5E80 36 07 ED 80 CD 8D 62 F1
5E88 32 54 62 C3 B3 5E 21 CD
5E90 61 22 8D 5E CD 9E 5E 21
5E98 C4 61 22 8D 5E C9 CD 93
5EA0 61 21 E0 50 11 FA 62 06
5EA8 15 CD 2E 62 CD E3 61 FE
5EB0 05 30 F9 CD C1 5E EB E5
5EB8 CD AC 61 E1 CD C4 61 AF
5EC0 C9 87 5F 16 00 21 53 62
5EC8 19 5E 23 56 C9 CD 70 60
5ED0 21 54 62 7E 5F 3C FE 05
5ED8 20 01 AF 77 7B CD C1 5E
5EE0 CD BF 61 AF C9 11 11 00
5EE8 D5 DD E1 AF 37 CD 56 05
5EF0 DD 21 00 48 11 00 1B 3E

```

```

5EF8 FF 37 CD 56 05 AF C9 DD
5F00 21 62 82 11 11 00 AF 37
5F08 CD C2 04 DD 21 00 40 11
5F10 00 1B 3E FF 06 32 76 10
5F18 FD 37 CD C2 04 AF C9 F3
5F20 06 C0 CD AF 0E AF C9 CD
5F28 93 61 21 E0 50 11 EB 62
5F30 06 0F CD 2E 62 CD E3 61
5F38 CD AC 61 ED 5B 50 62 4F
5F40 3A 8D 5C E6 F8 81 32 8F
5F48 5C 4B 42 42 CD 96 5F 4B
5F50 04 78 FE AE D2 6F 5F C5
5F58 D5 CD 1B 61 CD D1 22 D1
5F60 C1 C5 D5 CD D5 2D D1 C1
5F68 3C 3D FE 01 C2 4C 5F 42
5F70 4B CD 96 5F 4B 05 78 FE
5F78 01 DA 95 5F C5 D5 CD 1B
5F80 61 CD D1 22 D1 C1 C5 D5
5F88 CD D5 2D D1 C1 3C 3D FE
5F90 01 C2 70 5F AF C9 4B C5
5F98 D5 ED 43 7D 5C CD 1B 61
5FA0 CD EC 22 D1 C1 0C 79 FE
5FA8 FF D2 C4 5F C5 D5 CD 1B
5FB0 61 CD D1 22 D1 C1 C5 D5
5FB8 CD D5 2D D1 C1 3C 3D FE
5FC0 01 C2 97 5F 4B C5 D5 ED
5FC8 43 7D 5C CD 1B 61 CD EC
5FD0 22 D1 C1 8D 79 FE 01 DA
5FD8 F2 5F C5 D5 CD 1B 61 CD
5FE0 D1 22 D1 C1 C5 D5 CD D5
5FE8 2D D1 C1 3C 3D FE 01 C2
5FF0 C5 5F C9 CD 93 61 21 E0
5FF8 50 11 8B 62 06 14 CD 2E
6000 62 CD 0D 62 FE 23 28 84
6008 FE 13 20 F5 DD 21 5F 62
6010 DD 77 00 11 D0 62 CD 2E
6018 62 06 14 CD 2E 62 CD E3
6020 61 DD 77 01 2E E7 06 07
6028 11 E4 62 CD 2E 62 CD E3
6030 61 DD 77 02 D0 7E 00 FE
6038 23 20 17 D0 7E 01 17 17
6040 17 DD 77 01 D0 7E 02 17
6048 17 17 DD 77 02 3E 38 32
6050 FD 61 DD 56 01 DD 5E 02
6058 CD F4 61 3E 07 32 FD 61
6060 CD AC 61 AF C9 21 53 62
6068 7E EE 01 77 CD 70 60 C9

```

| | | | | | | | | |
|------|----|----|----|----|----|----|----|----|
| 6070 | 21 | 64 | 00 | E5 | D1 | CD | B5 | 03 |
| 6078 | AF | C9 | 06 | 04 | 76 | 10 | FD | AF |
| 6080 | C9 | 21 | 53 | 02 | DD | 21 | 50 | 62 |
| 6088 | CB | 4E | 28 | 0A | DD | 7E | 00 | FE |
| 6090 | 00 | 28 | 03 | DD | 35 | 00 | CB | 56 |
| 6098 | 28 | 0A | DD | 7E | 00 | FE | FF | 28 |
| 60A0 | 03 | DD | 34 | 00 | CB | 5E | 28 | 0A |
| 60A8 | DD | 7E | 01 | FE | BF | 28 | 03 | DD |
| 60B0 | 34 | 01 | CB | 66 | 28 | 0A | DD | 7E |
| 60B8 | 01 | FE | 00 | 28 | 03 | DD | 35 | 01 |
| 60C0 | AF | C9 | F5 | 21 | 53 | 62 | 7E | E6 |
| 60C8 | E1 | 77 | 3E | EF | DB | FE | E6 | 1C |
| 60D0 | EE | 1C | B6 | 77 | 3E | F7 | DB | FE |
| 60D8 | CB | 67 | 20 | 02 | CB | CE | F1 | C9 |
| 60E0 | F5 | ED | 4B | 50 | 62 | CD | 1B | 61 |
| 60E8 | 47 | 04 | 3E | FE | 0F | 10 | FD | 47 |
| 60F0 | 7E | DD | 21 | 53 | 62 | DD | 4E | 00 |
| 60F8 | DD | 21 | 8D | 5C | A0 | CB | 41 | 28 |
| 6100 | 06 | DD | 21 | 52 | 62 | AB | 2F | 72 |
| 6108 | 7C | D6 | 40 | CB | 2F | CB | 2F | CB |
| 6110 | 2F | C6 | 58 | 67 | 14 | DD | 7E | 00 |
| 6118 | 77 | F1 | C9 | 3E | BF | C3 | AC | 22 |
| 6120 | 21 | E0 | 5A | E5 | D1 | 13 | 01 | 20 |
| 6128 | 00 | 36 | 47 | ED | B0 | CD | 93 | 61 |
| 6130 | 21 | E0 | 50 | 11 | 73 | 62 | 06 | 10 |
| 6138 | CD | 2E | 62 | CD | E3 | 61 | CD | 97 |
| 6140 | 22 | 11 | 97 | 62 | 06 | 10 | CD | 2E |
| 6148 | 62 | CD | E3 | 61 | 4F | 11 | A7 | 62 |
| 6150 | 08 | 14 | CD | 2E | 62 | CD | E3 | 61 |
| 6158 | C8 | 07 | CB | 07 | CB | 07 | 81 | 32 |
| 6160 | 52 | 62 | 11 | 83 | 62 | CD | 2E | 62 |
| 6168 | CD | E3 | 61 | 21 | 00 | 58 | CB | 07 |
| 6170 | CB | 07 | CB | 07 | 4F | 3A | 52 | 62 |
| 6178 | E6 | 07 | 81 | 32 | 8D | 5C | 79 | 01 |
| 6180 | 00 | 03 | 5F | 7E | E6 | 07 | 83 | 77 |
| 6188 | 23 | 08 | 78 | B1 | 20 | F5 | CD | AC |
| 6190 | 61 | AF | C9 | F5 | 21 | E0 | 50 | 11 |
| 6198 | 00 | 5B | 06 | 08 | C5 | 06 | 20 | 7E |
| 61A0 | 12 | 13 | 23 | 10 | FA | 2E | E0 | C1 |
| 61A8 | 10 | F2 | F1 | C9 | 21 | 9F | 61 | 3E |
| 61B0 | 1A | 23 | 36 | 77 | E5 | CD | 93 | 61 |
| 61B8 | E1 | 36 | 12 | 28 | 36 | 7E | C9 | 21 |
| 61C0 | 00 | 40 | 18 | 03 | 11 | 00 | 40 | 01 |
| 61C8 | 00 | 1B | ED | B0 | C9 | F5 | 11 | 00 |
| 61D0 | 40 | 01 | 00 | 1B | 1A | F5 | 7E | 12 |
| 61D8 | F1 | 77 | 23 | 13 | 0B | 78 | B1 | 20 |
| 61E0 | F3 | F1 | C9 | E5 | 21 | 08 | 5C | 36 |
| 61E8 | 00 | 7E | D6 | 30 | 38 | FB | FE | 08 |
| 61F0 | 30 | F7 | E1 | C9 | F5 | 21 | 00 | 58 |
| 61F8 | 01 | 00 | 03 | 7E | E6 | 07 | BA | 20 |
| 6200 | 04 | 7E | 92 | 83 | 77 | 23 | 0B | 78 |
| 6208 | B1 | 20 | F0 | F1 | C9 | C5 | D5 | E5 |
| 6210 | CD | 8E | 02 | 78 | FE | FF | 28 | F8 |
| 6218 | 3C | E1 | D1 | C1 | C9 | F5 | C5 | D5 |
| 6220 | E5 | 06 | 08 | 1A | 77 | 13 | 24 | 10 |
| 6228 | FA | E1 | D1 | C1 | F1 | C9 | F5 | C5 |
| 6230 | D5 | E5 | D5 | E5 | 1A | D6 | 20 | 26 |
| 6238 | 00 | 6F | 29 | 29 | 29 | 11 | 00 | 3D |
| 6240 | 19 | EB | E1 | CD | 1D | 62 | D1 | 13 |
| 6248 | 23 | 10 | E7 | E1 | D1 | C1 | F1 | C9 |
| 6250 | 33 | 78 | 16 | 00 | 04 | FA | 64 | FA |
| 6258 | 7F | FA | 9A | FA | B5 | FA | D0 | 13 |
| 6260 | 07 | 04 | 03 | 73 | 63 | 72 | 65 | 65 |
| 6268 | 6E | 20 | 20 | 20 | 20 | 00 | 1B | 00 |
| 6270 | 40 | 78 | 80 | 42 | 6F | 72 | 64 | 65 |
| 6278 | 72 | 20 | 63 | 6F | 6C | 6F | 75 | 72 |
| 6280 | 20 | 3F | 20 | 50 | 61 | 70 | 65 | 72 |

| | | | | | | | | |
|------|----|----|----|----|----|----|----|----|
| 6288 | 20 | 63 | 6F | 6C | 6F | 75 | 72 | 20 |
| 6290 | 3F | 20 | 20 | 20 | 20 | 20 | 20 | 43 |
| 6298 | 6E | 68 | 20 | 43 | 6F | 6C | 6F | 75 |
| 62A0 | 72 | 20 | 3F | 20 | 20 | 20 | 20 | 42 |
| 62A8 | 61 | 63 | 6B | 67 | 72 | 6F | 75 | 6E |
| 62B0 | 64 | 20 | 63 | 6F | 6C | 6F | 75 | 72 |
| 62B8 | 20 | 3F | 20 | 49 | 6E | 6B | 20 | 6F |
| 62C0 | 72 | 20 | 50 | 61 | 70 | 65 | 72 | 20 |
| 62C8 | 3F | 20 | 28 | 49 | 2F | 50 | 29 | 20 |
| 62D0 | 43 | 68 | 61 | 6E | 67 | 65 | 20 | 66 |
| 62D8 | 72 | 6F | 6D | 20 | 3F | 20 | 20 | 20 |
| 62E0 | 20 | 20 | 20 | 20 | 74 | 6F | 20 | 3F |
| 62E8 | 20 | 20 | 20 | 57 | 68 | 69 | 63 | 68 |
| 62F0 | 20 | 63 | 6F | 6C | 6F | 75 | 72 | 20 |
| 62F8 | 3F | 20 | 57 | 68 | 69 | 63 | 68 | 20 |
| 6300 | 73 | 63 | 72 | 65 | 65 | 6E | 20 | 3F |
| 6308 | 20 | 28 | 30 | 2D | 34 | 29 | 20 | 4D |
| 6310 | 65 | 6E | 75 | 41 | 20 | 20 | 53 | 74 |
| 6318 | 6F | 72 | 65 | 20 | 73 | 63 | 72 | 65 |
| 6320 | 65 | 6E | 20 | 69 | 6E | 20 | 6D | 65 |
| 6328 | 6D | 6F | 72 | 79 | 2E | 20 | 20 | 20 |
| 6330 | 20 | 20 | 20 | 42 | 20 | 20 | 52 | 65 |
| 6338 | 74 | 72 | 69 | 65 | 76 | 65 | 20 | 73 |
| 6340 | 63 | 72 | 65 | 65 | 65 | 6E | 20 | 66 |
| 6348 | 72 | 6F | 6D | 20 | 6D | 65 | 6D | 6F |
| 6350 | 72 | 79 | 2E | 43 | 20 | 20 | 43 | 68 |
| 6358 | 61 | 6E | 67 | 65 | 20 | 61 | 74 | 74 |
| 6360 | 72 | 69 | 62 | 75 | 74 | 65 | 73 | 2E |
| 6368 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 6370 | 20 | 20 | 20 | 46 | 20 | 20 | 46 | 69 |
| 6378 | 6C | 6C | 20 | 61 | 20 | 73 | 68 | 61 |
| 6380 | 70 | 65 | 2E | 20 | 20 | 20 | 20 | 20 |
| 6388 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 6390 | 20 | 20 | 20 | 4C | 20 | 20 | 4C | 6F |
| 6398 | 61 | 64 | 20 | 61 | 20 | 73 | 63 | 72 |
| 63A0 | 65 | 65 | 6E | 20 | 66 | 72 | 6F | 6D |
| 63A8 | 70 | 74 | 61 | 70 | 65 | 2E | 4D | 20 |
| 63B0 | 20 | 44 | 69 | 73 | 70 | 6C | 61 | 79 |
| 63B8 | 73 | 20 | 74 | 68 | 69 | 73 | 20 | 6D |
| 63C0 | 65 | 6E | 75 | 2E | 20 | 20 | 20 | 20 |
| 63C8 | 20 | 20 | 20 | 20 | 20 | 20 | 4E | 20 |
| 63D0 | 20 | 43 | 68 | 61 | 6E | 67 | 65 | 20 |
| 63D8 | 65 | 76 | 65 | 72 | 79 | 20 | 6F | 63 |
| 63E0 | 63 | 75 | 72 | 65 | 6E | 63 | 65 | 2E |
| 63E8 | 20 | 20 | 20 | 20 | 20 | 20 | 4F | 20 |
| 63F0 | 20 | 43 | 68 | 61 | 6E | 67 | 65 | 20 |
| 63F8 | 70 | 6C | 6F | 74 | 74 | 69 | 6E | 67 |
| 6400 | 20 | 6D | 6F | 64 | 65 | 2E | 20 | 20 |
| 6408 | 20 | 20 | 20 | 20 | 20 | 20 | 53 | 20 |
| 6410 | 20 | 53 | 61 | 76 | 65 | 20 | 61 | 20 |
| 6418 | 73 | 63 | 72 | 65 | 65 | 6E | 20 | 74 |
| 6420 | 6F | 20 | 74 | 61 | 70 | 65 | 2E | 20 |
| 6428 | 20 | 20 | 20 | 20 | 20 | 20 | 56 | 20 |
| 6430 | 20 | 43 | 6C | 65 | 61 | 72 | 20 | 73 |
| 6438 | 63 | 72 | 65 | 65 | 6E | 2E | 20 | 20 |
| 6440 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 6448 | 20 | 20 | 20 | 20 | 20 | 20 | 58 | 20 |
| 6450 | 20 | 53 | 77 | 61 | 70 | 20 | 73 | 63 |
| 6458 | 72 | 65 | 65 | 6E | 2E | 20 | 20 | 20 |
| 6460 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 6468 | 20 | 20 | 20 | 20 | 20 | 20 | 5A | 20 |
| 6470 | 20 | 43 | 6F | 70 | 79 | 20 | 73 | 63 |
| 6478 | 72 | 65 | 65 | 6E | 20 | 74 | 6F | 20 |
| 6480 | 70 | 72 | 69 | 6E | 74 | 65 | 72 | 2E |
| 6488 | 50 | 72 | 65 | 73 | 73 | 20 | 61 | 6E |
| 6490 | 79 | 20 | 68 | 65 | 79 | 20 | 74 | 6F |
| 6498 | 20 | 72 | 65 | 74 | 75 | 72 | 6E | 2E |

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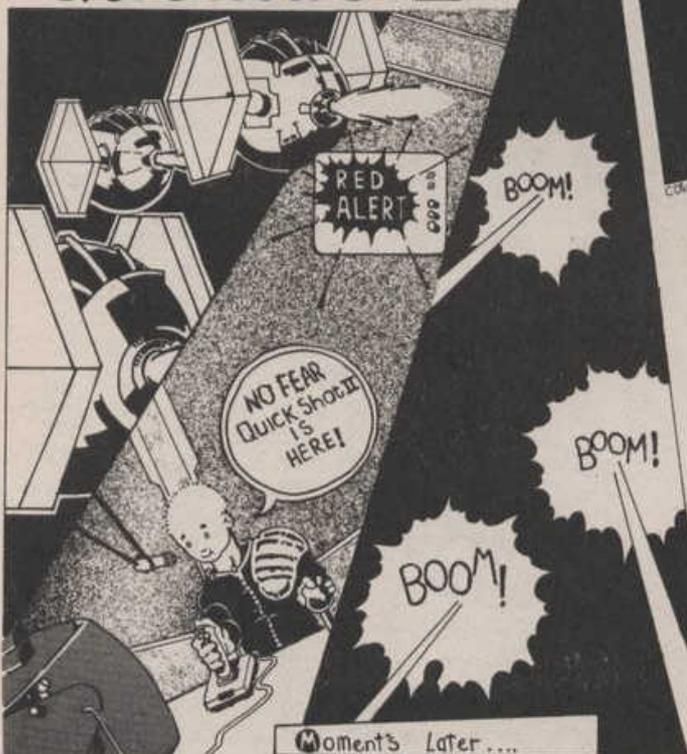
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Handle with care

Jason Orbaum and Geoffrey Campbell continue their series on Assembly language with a discussion of data handling commands

We have already discussed a few of the assembler commands in previous parts, but there are a lot more where they came from. The commands can be split into two, admittedly very broad, groups. First there are those which perform arithmetic and logic functions, and secondly there are those that perform data handling tasks. Before we deal with these, it is necessary to have very clear visualisation of how the processor stores and handles numbers.

As has been mentioned before, numbers are stored in binary form. There are two ways of storing numbers — unsigned or signed. If a number is unsigned, it can be between 0 and 255. If, on the other hand, it is signed, it can be between -128 and 127. The signed numbers are stored in two's complement form, which means that the left-most bit is treated as -128 instead of 128, as in an unsigned number. Thus:

```
01100010 = 98 but
11100010 = -30 (work it out!)
```

All the data handling commands can work on either memory or register numbers. The *LSL* and *LSR* command will shift the bit-pattern of a byte along by one, bringing a zero in on the end. The mnemonics stand for logical shift left and logical shift right. The effect of this is respectively to multiply and divide the number by two, but it will obviously give an integer answer.

If we carry this operation out on the two example numbers above, we get:

```
LSL 01100010 = 11000100
LSR 01100010 = 00110001
LSL 11100010 = 11000100
LSR 11100010 = 01110001
```

The *ASL* and *ASR* command will shift all the bits of the number along by one, in a similar way to *ASR* and *ASL*, but it leaves the sign bit (the left-most one) alone. The

mnemonics stand for Arithmetic Shift Left and Arithmetic Shift Right. If, these commands are carried out on the two example numbers above, we get:

```
ASL 01100010 = 01000100
ASR 01100010 = 00110001
ASL 11100010 = 11000100
ASR 11100010 = 11110001
```

With all four of these commands, the state of any bit that is shifted out of the bit-pattern is preserved in the C-bit of the Condition Code.

ROL and ROR

This operation is similar to the logical shifts, but the bit which comes on at the end is not a zero, but the contents of the C-bit. The state of the bit that is shifted out of the bit-pattern is preserved in the C-bit. If we assume that the C-bit contains one initially for all of these operations, we now get these results:

```
ROL 01100010 = 11000101 - C-bit contains zero.
ROR 01100010 = 10110001 - C-bit contains zero.
ROL 11100010 = 11000101 - C-bit contains one.
ROR 11100010 = 11110001 - C-bit contains zero.
```

The format for these commands is:

```
RORA
ROLB
ROL memory address
```

or any combination of register or memory and command.

The *EXG* and *TFR* commands are used to EXchanGe or TransFeR the contents of any pair of registers (as long as they are the same size — it is impossible to exchange the contents of A with those of X).

The only difference between the two is that *EXG* preserves the contents of both registers, whilst *TFR* duplicates the contents of the first specified register.

PSH and PUL

The workings of a stack were discussed



Geoffrey Campbell (left) and Jason Orbaum

in parts two and four, and these are the commands to use when accessing them. *PSHS* will put the contents of the specified registers on to the stack.

If a program contains the commands:

```
PSHS A,X,Y
PULS A,X,Y
```

then the processor will put the contents of the A, X and Y registers on the system stack, carry on with the program, and then pull A, X, and Y, in the opposite order to the order that they were pushed, to avoid getting them swapped round. The order that the registers are pushed onto the system stack is as follows:

```
PC U Y X DP B A CC
```

from left to right. The order for the user stack is the same, but, as it would be unwise to push the pointer for the stack in use, the S register is pushed instead of the U register.

As has already been mentioned, the system stores the return addresses for subroutines on the stack, so if a program fails to work, check the positioning of all *PSH* and *PUL* commands.

Next week we will finish off describing the instruction set with the arithmetic instructions.



Colour blind

Jeff Tullin presents a program that tests for colour blindness

The program was written for the BBC computer and is primarily intended as a simple means for testing for colour blindness in a local infirmary. The idea was that it should be operable by "one finger" typists, or mentally retarded people.

The program draws seven coloured blocks on the screen and plays a short piece of music. Following this, a randomly coloured block appears underneath, and

moves in stages left to right. When the moving block is underneath the matching colour, the examinee is required to press the spacebar, which will elicit a musical response depending upon whether they are correct.

At the end of the round the score is displayed and pressing any key will re-run the program. As the volume, speed, and length of the test are very much a matter of

individual preference, the escape key can be used to select a menu for altering these parameters (*Procalter*).

The structure of the program lies between lines 70-560 and, I hope, is fairly clear. Lines 379-410 ensure that the spacebar is no longer depressed before moving on.

On a final note, the program can be used to test reaction time by selecting a short "speed of reaction" time. Due to the use of mode 7 graphics, the program will not run on the Electron as it stands, but the structure of the program would allow a fairly easy translation to another mode, by changing the print statements.

```

"COLOUR-MATCH" by J. TULLIN
1984

1 *KEY10OLD:MRUN:M
10 DATA 7, 12, 17, 22, 27, 32
15 DATA 32, 129, 157, 32, 32, 32, 130, 157,
32, 32, 32, 131, 157, 32, 32, 32, 132, 157, 32, 3
2, 32, 133, 157, 32, 32, 32, 134, 157, 32, 32, 32
, 135, 157, 32, 32, 32, 157, 156
20 DATA 3, F, 3, M, 3, D, 3, M, 3, F, 3, C, 3,
F, 3, M, 3, B, 3, K, 1.5, J, 1.5, F, 4
30 DIMPOSITION(9)
50 VOLUME=-12:LIMIT=12:SPEED=70
60 ONERROR IFERR=17PROCALTERELSEREPO
RT:END
70 MODE 7
90 VDU 23;10,32;0;0;0;
110 PROCVARIABLES
130 PROCINTRO
150 PROCTUNE
170 PROCKEYPRESSED(100)
190 REPEAT
210 PROCDRAWBLOCKS
230 PROCCHOOSECOLOUR
250 REPEAT
270 PROCTESTBLOCK(COLOR)
290 NO=VALUE:VALUE=(VALUE+1)MOD8
:IF VALUE=0 VALUE=1
310 UNTILKEYPRESSED
330 PROCHECK
350 IFRIGHTTHENPROCHAPPYELSEPROCOOPS
370 FORLOOP=1TO10
390 IF INKEY$(20)<>"GOTO390
410 NEXT
430 IFRIGHTTHENSORE=SCORE+1
450 TRIES=TRIES+1
470 UNTILTRIES=LIMIT
490 PROCTUNE
510 PROCSCORE
530 PRINTTAB(4,18)CHR$(141)CHR$(134)
)"ANY KEY FOR ANOTHER ROUND"
540 PRINTTAB(4,19)CHR$(141)CHR$(130)
)"ANY KEY FOR ANOTHER ROUND"
550 DUMMY=GET
560 GOTO70
570 CLS
590 DEFPROCINTRO
610 PRINTTAB(10,1)CHR$(141)CHR$(129)
"COLOUR MATCH"
630 PRINTTAB(10,2)CHR$(141)CHR$(129)
"COLOUR MATCH"
650 PROCKEYPRESSED(50)
670 PRINTTAB(4,5)CHR$(141)CHR$(131)"
PLEASE MATCH THE COLOURS"
690 PRINTTAB(4,6)CHR$(141)CHR$(131)"
PLEASE MATCH THE COLOURS"
710 PRINTTAB(4,8)CHR$(141)CHR$(131)"
BY PRESSING THE";CHR$(133);"SPACEBAR"
730 PRINTTAB(4,9)CHR$(141)CHR$(131)"
BY PRESSING THE";CHR$(134);"SPACEBAR"
750 ENDPROC
770 DEFPROCKEYPRESSED(DURATION)
790 KEYPRESSED=INKEY(DURATION)+1
810 ENDPROC
830 DEFPROCTUNE
840 RESTORE20
850 FORTUNE=1TO13
860 READnote$,len:note=(ASC(note$)
-43)*4:len=len*4
870 SOUND1,VOLUME,note,len:SOUND2,
VOLUME,note,len:NEXT
880 FORTUNE=1TO6000:NEXT
890 ENDPROC
910 DEFPROCDRAWBLOCKS
930 PRINTTAB(0,12);:FORROW=1TO5:PRIN
TBLOCK$:NEXT
1010 ENDPROC
1030 DEFPROCCHOOSECOLOUR
1050 COLOR=RND(7)
1070 ENDPROC
1090 DEFPROCTESTBLOCK(COLOR)
1110 PRINTTAB(POSITION(VALUE),18)CHR$
(144+COLOR)"#="
1130 PROCKEYPRESSED(SPEED)
1150 PRINTTAB(POSITION(VALUE),18)"
"
1170 ENDPROC
1190 DEFPROCHECK
1210 IFNO=COLOR RIGHT=TRUEELSERIGHT=FALSE
1230 ENDPROC
1250 DEFPROCHAPPY
1270 SOUND1,VOLUME,148,2:SOUND1,VOLUM
E,152,2:SOUND1,VOLUME,180,3
1290 ENDPROC
1310 DEFPROCOOPS
1330 SOUND1,VOLUME,16,5:SOUND1,VOLUME
,4,8

```

```

1350 ENDPROC
1370 DEFPROCSCORE
1390 CLS
1410 PRINTTAB(11,8)CHR$(141)CHR$(134)
"YOU SCORED "
1430 PRINTTAB(11,9)CHR$(141)CHR$(134)
"YOU SCORED "
1440 SPACE=11:IFLIMIT>9SPACE=10
1450 PRINTTAB(SPACE,12)CHR$(141)CHR$(
133);SCORE;" OUT OF ";LIMIT
1470 PRINTTAB(SPACE,13)CHR$(141)CHR$(
133);SCORE;" OUT OF ";LIMIT
1490 ENDPROC
1510 DEFPROCVARIABLES
1530 RIGHT=0:TRIES=0
1550 value=1
1590 SCORE=0
1610 KEYPRESSED=FALSE
1630 RESTORE
1640 FORZ=1TO7:READPOSITION(Z):NEXT
1645 BLOCK$=""
1650 REPEAT:READCELL:BLOCK$=BLOCK$+CH
R$(CELL):UNTILCELL=156
1660 NO=1
1680 ENDPROC
1700 DEFPROCALTER
1710 CLS
1720 PRINTTAB(3,3)CHR$(129)"TIME ALLO
WED FOR KEYPRESS=";CHR$(130)SPEED

```

```

1730 PRINTTAB(3,5)CHR$(129)"VOLUME OF
MUSICAL PIECES =" ;CHR$(130);ABS(VOLUME)
1740 PRINTTAB(3,7)CHR$(129)"NUMBER OF
GOES PER ROUND =" ;CHR$(130);LIMIT
1750 PRINTTAB(3,10)CHR$(134)"WHAT WOU
LD YOU LIKE TO ALTER?"
1760 PRINTTAB(7,14)CHR$(130)"1";CHR$(
133);"TIME ( 10-200 )"
1770 PRINTTAB(7,15)CHR$(130)"2";CHR$(
133);"VOLUME ( 0-15 )"
1780 PRINTTAB(7,16)CHR$(130)"3";CHR$(
133);"GOES ( 1-255 )"
1790 PRINTTAB(7,17)CHR$(130)"4";CHR$(
133);"NOTHING"
1800 A=GET
1810 A=A-48:IFA<10RA>4THENGOTO1800
1820 GOTO(1820+A*10)
1830 INPUTTAB(9,21)"TIME ",SPEED:PRIN
TTAB(9,21)" " :IFSPEED
<10SPEED=10:GOTO1710
1840 INPUTTAB(9,21)"VOLUME ",VOLUME:1
FVOLUME>15VOLUME=15:VOLUME=VOLUME*TRUE
:GOTO1710:ELSEIFVOLUME<0VOLUME=0:GOTO1
710:ELSEVOLUME=VOLUME*TRUE:GOTO1710
1850 INPUTTAB(9,21)"GOES ",LIMIT:PRIN
TTAB(9,21)" " :IFLIMIT
<1LIMIT=1:GOTO1710
1860 ENDPROC
>

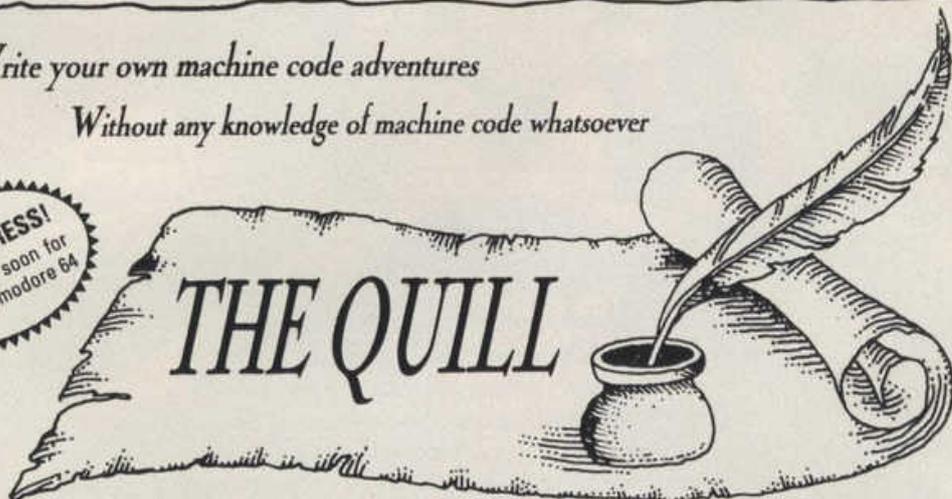
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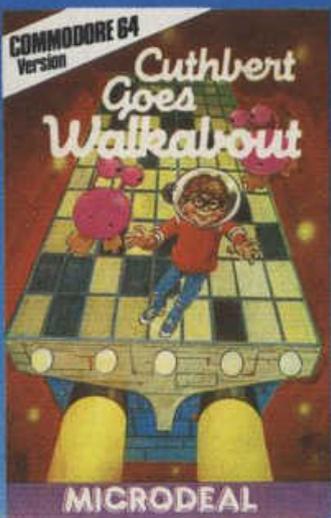
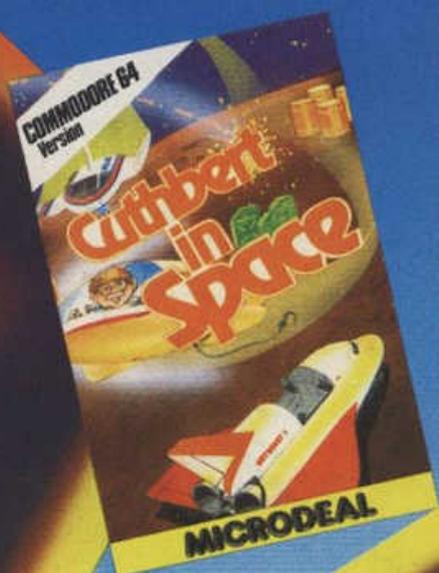


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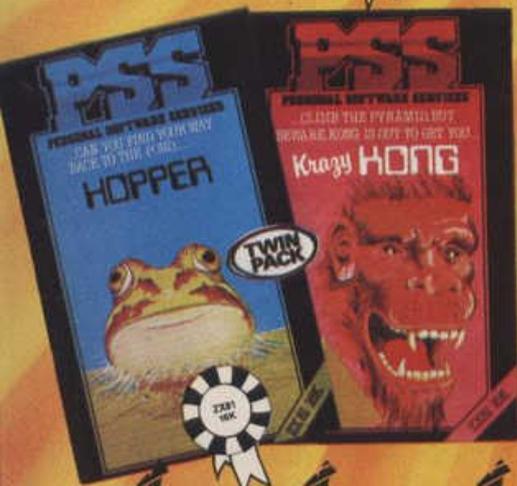
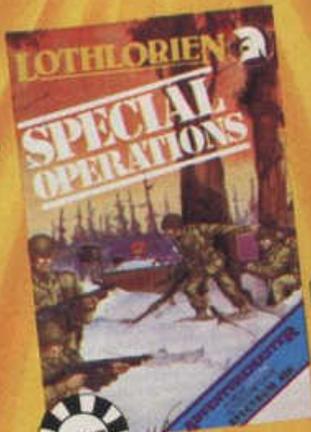
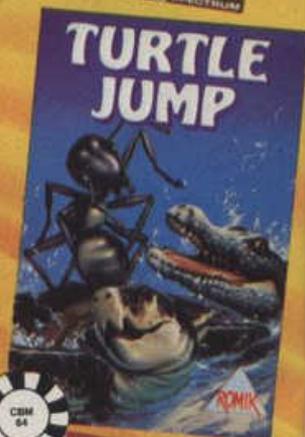
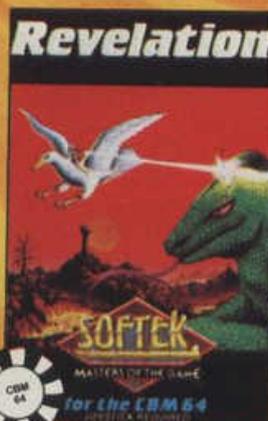
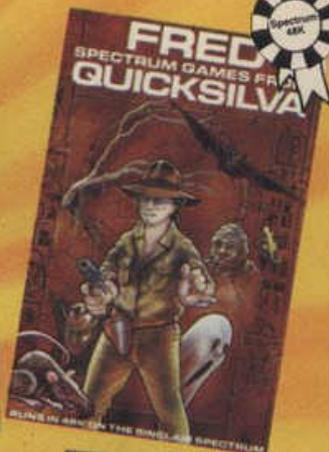
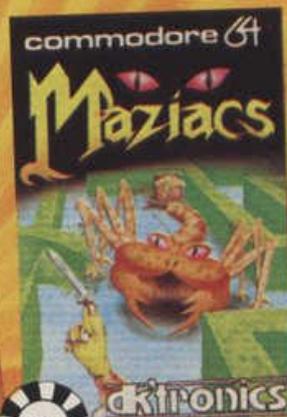
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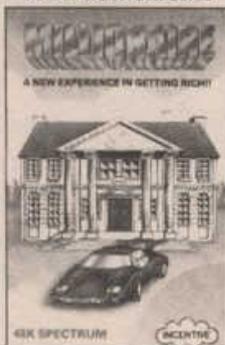
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The main menu of the program prompts you to define a sound, save it to memory, and then play any combination of the defined sounds on the keyboard.

Program Notes

| | |
|-----------|---|
| lines | |
| 30-50 | set up variables, arrays & memory locations |
| 60-110 | print main menu |
| 120 | wait for a key to be pressed |
| 130 | GOSUB to a routine depending on the key pressed |
| 1000-1999 | subroutines for defining a sound |
| 3000-3999 | reset a voice subroutine |
| 4000-4999 | save a sound subroutine |
| 5000-5110 | musical keyboard subroutine |

| | |
|-------------|--------------------------------|
| 10000-10070 | menu for defining a sound |
| 20000-20020 | program title subroutine |
| 30000-30020 | binary - decimal conversion |
| 40000-40040 | decimal - binary conversion |
| 50000-50090 | input number in binary routine |
| 60000-60190 | data for machine code |
| 60020-60400 | place data into memory |

Basically the machine code routine is used to convert keyboard entries into frequency values needed to produce a sound. The frequencies for the base octave, octave 0, can be found in lines 60195-60196, as they appear in the *Programmers Reference Guide*. These values are different to the ones in the *Users Guide*, and may be used instead.

SUPER SID

```

10 REM "SUPER SID FOR
15 REM "BY PAUL
20 POKE53280,14:POKE53281,6:POKE646,14
26 IFPEEK(50176)=128THEN30
27 PRINT"PLEASE WAIT:- LOADING DATA":GOSUB60200
30 SID=54272:MEM=49152:SO=0
40 DIMA(16),N$(9)
42 FORT=0T09:N$(T)="":NEXT
45 FORT=0T02:POKE169+T,0:POKE171+T,1:NEXT
47 POKE165,5:POKE166,5:POKE167,5
49 POKE179,0:POKE178,0
50 FORI=1T015:A(I)=0:NEXT
60 GOSUB20000
80 PRINTTAB(15)"
90 PRINT,"
100 PRINT,"
110 PRINT,"
120 GETIN$:IFIN$<"A"ORIN$>"E"THEN120
130 ROUTE=ASC(IN$)-64:ONROUTEGOSUB1000,3000,4000,5000
140 IFRUTE=5THENCLR:PRINT"
150 GOTO60
1000 GOSUB20000:GOSUB10000:PRINT"
1004 GETIN$:IFIN$<"A"ORIN$>"Q"THEN1004
1005 ROUTE=ASC(IN$)-64:ONROUTEGOSUB1020,1030,1040,1050,1060,1070,1080,1090,1100
1006 IFRUTE<10THEN1000
1007 ONROUTE-9GOSUB1110,1120,1130,1140,1150,1160,1170
1008 IFRUTE=17THENRETURN
1009 GOTO1000
1020 A$="-REQUENCY LOW":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1022 PRINTTAB(12)"
1030 A$="-REQUENCY HIGH":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1032 PRINTTAB(12)"
1040 A$="PULSE WIDTH LOW":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1042 PRINTTAB(12)"
1050 A$="PULSE WIDTH HIGH":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1052 PRINTTAB(12)"
1060 A$="OAVEFORM(17,33,65,129)":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1062 PRINTTAB(12)"
1070 A$="ATTACK":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1072 PRINTTAB(12)"
1080 A$="DECAY":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1082 PRINTTAB(12)"
1090 A$="SUSTAIN":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1092 PRINTTAB(12)"
1100 A$="RELEASE":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1102 PRINTTAB(12)"
1110 A$="-REQUECHY CUT OFF LOW":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1112 PRINTTAB(12)"
1120 A$="-REQUECHY CUT OFF HIGH":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1122 PRINTTAB(12)"
1130 A$="ESONRANCE":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1132 PRINTTAB(12)"
1140 A$="FILTER":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1142 PRINTTAB(12)"
1150 A$="FILTER MODE":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1152 PRINTTAB(12)"
1160 A$="XOLUME":GOSUB1900:DEC=A(ROUTE):GOSUB40000
1162 PRINTTAB(12)"
1170 FORT=1T016:A(T)=0:NEXT:RETURN
1900 PRINT"
1999 RETURN
3000 A$="-ESET
3010 INPUT"WHICH VOICE(1,2,3)":VC:IFVC<1ORVC>3THEN3000
3020 FORT=SID+((VC-1)*7):TOSID+((VC-1)*7)+6:POKET,0:NEXT
3999 RETURN
4000 GOSUB20000:PRINT"
4002 FORI=0T04:PRINTI,N$(I),I+5,N$(I+5):NEXT
4005 PRINT"
4007 PRINT"
4010 PRINT"
4020 GETIN$:IFIN$="
4021 IFSO=10THENSO=0
4025 IFIN$=CHR$(13)THEN4050
4030 IFC=5THENR=146
4032 IFC=0THENR=18
    
```


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Currency Converter

on Spectrum

This program was written to produce a conversion table to enable the holidaymaker to find out the value of the pound, but with a few simple alterations it could convert inches to centimetres; ounces to grams; miles to kilometres and in each case, vice versa.

The program allows you to make a copy of the table on the ZX Printer.

If you have never encountered a table of this type before, here is a brief explanation. Take for example the following line:

0.76 9 107.01
Assuming the first column is francs and the right-hand column is pounds, we can see: 9 pounds are worth 107.01 francs, and 9 francs are worth 0.76 pounds (ie, 76p).

Please note that £1.5 on the table would mean £1.50 not £1.05. The figures calculated are to the nearest hundredth of the currencies used.

Variables

| | | |
|-----|--|--|
| n\$ | Name of foreign currency | |
| r | Exchange rate | |
| L | Length of n\$ | |
| a | Control variable | |
| p | Central column figure on table | |
| g | Line number to GO TO after menu selection. | |

Program notes

10 Set-up screen. *Poke 23693,56 = Ink 0: Paper 7:Flash 0: Bright 0*
30 *At 0,0* is added to the *Input* to prevent the screen from scrolling up.
50 *At 2,0,At 2,0* is not a mistake — the first *At 2,0* clears line 2 of the screen.
 n\$(To (8 And L-8)+(L And L-8)) prevents the name of the foreign currency from spilling over onto the next line.
90 and 110 Calculate and print values.
130 Menu. *Print#0; At 0,0* prints the menu on the first of the bottom two lines.
140
170-180 *Goto* section corresponding to user's selection from menu.
190 Copy table.
 Input Inkeys clears the bottom two lines.
210 End program.
500 The *Data* corresponds with the central numbers on the table. The numbers can be changed to suit individual needs.

```

1 REM
2 REM
3 REM
4 REM
5 REM
10 POKE 23658,8: POKE 23693,56
: BORDER 0
20 CLS: PRINT INVERSE 1:"
Currency Conversion Table
30 INPUT AT 0,0;" Enter the na
me of the currency" LINE n$: LE
T L=LEN n$
40 INPUT AT 0,0;" Enter the
exchange rate:" r: IF r
<=0 THEN GO TO 40
50 PRINT AT 2,0,AT 2,0; INK 2
;" POUNDS";TAB 23;n$( TO (8 AND
L>8)+(L AND L<=8))
60 RESTORE
70 FOR a=1 TO 16
80 READ P
90 PRINT AT a+2,0,AT a+2,3;(
INT ((1/r*p)*100+.5))/100;TAB 14
;
100 PRINT INK 1;p;TAB 24;
110 PRINT (INT ((1/r*p)*100+.5))
/100
120 NEXT a
130 PRINT #0;AT 0,0;"Press "R"
TO RE-RUN, "E" TO END, or "C"
FOR A COPY,"
140 POKE 23658,8
150 PAUSE 0
160 LET i$=INKEY$
170 LET g=(30 AND i$="R")+(130
AND i$="C")+(210 AND i$="E")
180 GO TO (g AND g(>0)+(150 AND
g=0)
190 INPUT INKEY$: COPY
200 GO TO 130
210 STOP
500 DATA 1,2,3,4,5,6,7,8,9,10,1
5,20,25,30,40,50,75,100

```

Currency Converter
by Andrew Wiseman

Alphasort

on Vic20

This program sorts into alphabetical order a number of words that are entered by the user.

Firstly type in the program and *Run* it.

Then enter the number of words you wish to enter and sort. Next, enter the words one at a time. The correct alphabetical order will be displayed on the screen.

Program Notes

10-150 Instructions
190-230 Input words into array

240-310 Print sorted words
400-490 Subroutine to sort words

Variables

A Number of words
A(A) Size of array
C 3rd string variable used to swap two words in the array
B Current inputted word

```
10 REM *** ALPHA-SORT ***
20 CLR
30 PRINT " ";TAB(12);"ALPHA-SORT"
40 PRINT TAB(12);"-----"
50 PRINT:PRINT:PRINT
60 PRINT TAB(7);"THIS PROGRAM PRINTS"
70 PRINT
80 PRINT TAB(7);"OUT IN ALPHABETICAL"
90 PRINT
100 PRINT TAB(7);"ORDER THE WORDS (OR"
110 PRINT
120 PRINT TAB(7);"NAMES) YOU TYPE IN."
130 PRINT:PRINT:PRINT:PRINT:PRINT
140 PRINT "   PRESS THE SPACE BAR TO BEGIN"
150 GET A$:IF A$<>" " THEN 150
160 INPUT "HOW MANY NAMES PLEASE ";A
170 IF A<=1 THEN 160
180 DIM A$(A)
190 FOR C=1 TO A
200 PRINT "NAME";C;" IS ";:INPUT B$
210 A$(C)=B$
220 PRINT " "
230 NEXT C
240 PRINT "ALPHABETICAL ORDER IS..."
250 PRINT
260 FOR D=1 TO A
270 GOSUB 400
280 NEXT D
290 FOR E=1 TO A
300 PRINT A$(E)
310 NEXT E
320 PRINT:PRINT:PRINT:PRINT:PRINT
330 PRINT TAB(8)"ANOTHER GO ? (Y/N)"
340 GET B$:IF B$="Y" THEN 10
350 IF B$<>"N" THEN 340
360 PRINT "BYE!!!"
370 END
400 REM
410 REM SUBROUTINE TO SORT WORDS
420 REM
430 FOR B=1 TO (A-1)
440 IF A$(B)<A$(B+1) THEN 480
450 C#=A$(B)
460 A$(B)=A$(B+1)
470 A$(B+1)=C#
480 NEXT B
490 RETURN
```

Alphasort
by Gavin Aitken

Russian Roulette

on ZX81

In this short 1K program, you have to pick 3 of the 6 chambers in the gun. If you pick the full chamber, you will see the gun fire.

Program notes

10 Variables
30-130 Main part
140-200 Full or empty chamber?
201-205 Gun fire

```

1 REM RUSSIAN ROULETTE 1K ZX
81
10 LET N=INT (RND*6)+1
20 CLS
30 PRINT "RUSSIAN ROULETTE"
40 PRINT AT 3,0;"IN THE GUN,THE
ERE ARE 6 CHAMBERS."
50 PRINT "1 IS FULL,PICK ONE (
1-6)"
60 FOR K=1 TO 3
70 IF K=1 THEN PRINT "1ST";
80 IF K=2 THEN PRINT "2ND";
90 IF K=3 THEN PRINT "3RD";
100 PRINT " GUESS PLEASE?"
110 PRINT AT 15,10;" ";AT 1
5,10;" ";AT 17,10;" "
120 INPUT I
130 PRINT I;" IS";
140 IF I=N THEN GO TO 200
150 PRINT " EMPTY."
151 PAUSE 30
160 CLS
170 NEXT K
180 PRINT "VERY WELL DONE,YOU S
URVIVED"
190 STOP
200 PRINT " FULL,YOU DIE"
201 FOR A=8 TO 0 STEP -1
202 PRINT AT 15,A;" < "
203 PAUSE 5
204 NEXT A
205 PRINT AT 15,0;"X"

```

Russian Roulette

Microradio

GW6JJN



Dragon interpreter

Many of you will remember that *Microradio* recently covered the subject of NOS Basicode 2 which, if implemented on your computer in the form of an interpreter program, would make your computer compatible with a host of other makes of machine. This is, of course, ideal for radio-computing enthusiasts since it means that they can send and receive data and programs over air almost irrespective of the computer at each end.

The good news this week is for Dragon Users. The prolific

Grosvenor Software, who produced the excellent G4BMK RTTY program, has now produced a Basicode interpreter for the Dragon. This means that the Dragon will join the Commodore and BBC users who can enjoy not only Basicode communications, but the benefit of free software transmitted by the BBC Radio program *Chip Shop* among other stations around the country. If you can receive Dutch radio, free programs are also transmitted by the *Hobbyscoop* programme on NOS Radio Netherlands.

On the subject of Grosvenor Software, they have sent me a Morse Code Transceiver program for the Dragon which I will review when I receive the necessary interface. If this program measures up to the RTTY program they produced, then a new world will be opened up to Dragon users. Don't forget that you don't need an amateur radio licence, or any licence for that matter,

to receive radio signals. Any Dragon owner who has or can borrow a short wave radio receiver can receive RTTY as well as morse.

If you do not have a Dragon, don't worry since there are programs available for most micros. Those of you who are a little tired by games might like to try decoding some of these signals. There is everything from weather ships and oil tankers to the big news agencies and satellites that you can decode on the micro in your own home. This was never so easy before the advent of home computers and plugging in a radio receiver will connect your computer to the real world outside at very little cost. It will also lead to the exciting hobby of amateur radio if you're not too careful.

Grosvenor Software can be reached at 22 Grosvenor Road, Seaford, E Sussex. Staying on the subject of Dragons, those of you who read our sister magazine, *Dragon User*, will

have heard of Dagnet. It is a group of amateurs with Dragon Computers who meet each Sunday Morning at 11.00am on 144.525Mhz to discuss things like the possibilities of using their micros within the radio hobby. It can be heard over a wide area of the East Midlands so, if you are of a like mind, then I'm sure you will be welcome either to listen or to join in.

I am constantly surprised by the number of people who use Dragon micros as RTTY terminals or simply as radio helpmates for tracking satellites or learning morse. If you have any programs in this line, *Microradio* will be pleased to hear from you.

Ray Berry GW6 JJN

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

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Tony Bridge's Adventure Corner



The Quill

To start this week, some more *Knight's Quest* problems. Mike Young and his daughter Sarah are currently stuck in the stone chamber. You're right, Mike, in getting your squire to pull the lever.

"First, how do I get him to let go of the lever? I would hate to think of him stuck there for the rest of the adventure! Second, how do you get down the sheer drop without killing yourself — there doesn't seem to be anywhere to tie the rope. Third, having got to the lake, how do you release the boat to get out onto the lake itself? Do we need the dwarf to help here?"

Using the Corner Code, try these two clues for your first two questions:

RCRA / OLPL / ETAH / NEDD / CWLA / IRMF / B*DL / OOWN / NE

As for the boat — well, you could try a bit of knitting (you know, knit one, pearl one)!

It's nice to know that you have such regard for the dwarf, that's why I like this particular adventure; it has such a good feeling of atmosphere. But you will certainly need the good dwarf at a later stage (at this point you have got about a quarter of the way through the adventure). Mike continues:

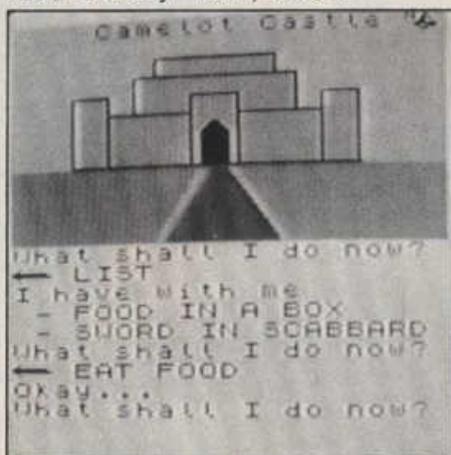
"Let me thank you for your recent clue for Artic's *Ship of Doom*. This was just what we needed and have since managed to complete the whole adventure. Personally, I feel the Artic's Adventures are not as difficult as they are sometimes made out to be (this one seemed easy compared with K's Q), although we are currently stuck in *Golden Apple*, at the ghostly shadow."

Thanks, Mike! As a bonus then, try turning off the lamp when you see the shadowy form — you never know, he might not see you then!

Don Cook, of Leeds, is trying to rescue the Princess with a "jewelled weapon" — that's the diamond spear, Don, which you'll need to kill the eagle. But I won't spoil your fun and tell you where it is (not this week, anyway!). And rescuing the Princess is not, as in so many other adventures, the end of the matter, being only a little further on from the Young's position.

Finally, Simon Clark, of Watford, is also having trouble with that pesky Princess, in another location, the water-logged dungeon, in which he keeps getting drowned. You are going to have to do a bit of work, Simon, in translating those symbols that you see. Then try saying the word that you come up with. It's a nonsense word, in the same vein as plug and Y2 and others that crop up in various classic Adventures: they all have one function — to magically transport the player from one place to another. We'll return to good old *Knight's Quest* at a later date — now on with the HHOF. The first name this week is:

David Bead, with a score of 71% after weeks of toiling (just like the rest of us!) Simon Field of Wokingham — and thanks very much for the map, which I once, rashly I admit, said was near impossible to draw. Well, I did say "near", Simon!



Sarah and Simon Drury, and their father Trevor. I'm glad to see you have so much fun playing it, even after completing it (one of the things that makes this adventure so enjoyable and worthwhile) — I hope you have as much fun with *Valhalla*.

O Gardarsson, from Reykyavik in Iceland. He has also completed Artic's A,B,C and D and is now working through E, *Golden Apple*. Other adventures you might like to look at, Mr Gardarsson, are the *Mysterious Adventures* from Channel 8, which are very like the Scott Adams series, also available now for the Spectrum.

Thomas Turnbull, of Ashington, on his CBM 64, with 85% and 77.5%. Thomas has seen the bard hit the dragon with his bow, and stab it with his arrow! More HHOF another week!

Most of you will, by now, have heard of *The Quill*. This is an adventure creation program from Gilsoft, available for the Spectrum, and soon for the Commodore 64.

When I first mentioned the program, some months ago, I expressed the hope that it would free many people from the worry of coding their adventures, and allow full reign to their imagination in composing worthwhile adventures. I'm glad to see that this has happened!

Denis through the Drinking Glass was the first *Quill'd* program I saw, and this adventure, written in witty verse, is, of course, about the first man of the land, Mark Thatcher's father. The follow up is just about with us, and is called *The Tebbit* (that's one software author who won't be getting his MBE in the next Honour's List)!

The second tape that I came across was *Mindbender*, and this one I also enjoyed a great deal. It has since been taken over, for marketing purposes, by Gilsoft themselves, and features in their new Gold Collection of *Quill'd* adventures. Other titles include *Barsak the Dwarf*, *Africa Gardens*, *Spy-plane* and *Diamond Trail*.

Quill'd adventures all tend to have the same feel — they are text, with a similar layout and responses. And if you answer 'No' to the inevitable "Play Again?", the program says "Bye" and self-destructs on the next keypress. I must admit that this does not worry me in the slightest — I am more interested in the author's imagination in setting up novel situations. And, being freed from the yoke of coding his adventure, the author can use *The Quill* to full advantage.

Several tapes have been sent to me in recent weeks from proud adventure-writers, using Gilsoft's *Quill*.

The first one out of the bag (and there is no hidden meaning to the order in which I tackle these) is *The Lost Gnomes*, merely the first in a series of Eric Bean adventures. Written by one C K Bozicek, it concerns a wily gnome called, you guessed it — Eric Bean. That's you, the player, and your task is to get all your friends and the stolen treasure back to your home.

A sample vocabulary is given in the on-screen instructions before the game begins (a good point this), and the input during play follows the usual *Quill* format, of verb followed by a noun (although the program will make a stab at recognising longer sentences), and all the usual commands are recognised (*Get Ferret*, *Drop Rock* and so on — whoops, a couple of free clues there). There are some 130-odd locations, which seems pretty good value, as the puzzles are nice and tough. A charming adventure which will prove really entertaining for the adventure fan:

ERIC BEAN ADVENTURES
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More *Quill'd* adventures next week.

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

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PHONE MODEM

H. Willis of Kingswood, Basil-don, writes:

Q I have a Dragon 32, and I have heard about phone modems and acoustic couplers. I would like to know what they are and are they available for my Dragon? If so, what could I then do with it?

A There are two main types of modem: one plugs directly into the telephone system, and is often called a phone modem (or hardwired modem) and the other fits over the telephone handset and is normally referred to as an acoustic coupler.

Various modems are available for the Dragon 32; Tandata and Prism are two manufacturers who provide suitable equipment. If you connect your Dragon up to a modem this will allow you to make use of services such as Prestel, but not yet Micronet.

LOGO GRAPHICS

J. Maniacara of Rose Hill, Mauritius, writes:

Q I recently acquired a 48K Spectrum and I am really delighted with it. However I have been wondering about the logo graphics on the introduction cassette. I know it is in machine code but the programming manual has only a short chapter on m/c. Can you recommend a good book on machine code programming and the address of the supplier?

Last week a friend coming from England brought me *Jet-pac*. I have really enjoyed playing this and I have scored 18,750 up until now. However I

do find it awkward to control it from the keyboard so I would like to have some information on joysticks and their interfaces. Your opinion will be much appreciated.

A *Spectrum Machine Language for the Absolute Beginner*, written by William Tang and published by Melbourne House, is one of the better introductory books on machine code. Melbourne House can be contacted at: Church Yard, Tring, Hertfordshire, England.

As far as joysticks are concerned there are a great many on the market suitable for the Sinclair Spectrum. If you want one that will be suitable for any game then you should buy one of the "programmable" joystick such as the one produced by Cambridge Computing. They can be contacted at: 1, Ditton Walk, Cambridge, England.

STEP BY STEP ANSWER

J. Lewis of Spalding, Lincs writes:

Q Please help! I recently purchased a Sinclair Spectrum 48K and cannot get a program onto tape. I have done what I think is correct according to the instruction manual. The only time it seemed to work the blue/yellow lines, etc, appeared plus the O.K. signal, but when I rewound the tape and did *Load* "" etc, the program was lost. It may only be a minor misunderstanding of instructions but I am finding it frustrating. Have you any simple step by step instructions?

A You should connect up your cassette recorder to the Spectrum as normal, ie, ear to ear and mic to mic, and then pull out the plug from your cassette ear socket.

Now having typed in your program, type: *Save* "name" (and press *Enter*) and the *START TAPE* message should appear. Now press *Record* & *Play* on your recorder, wait for about 10 seconds (until the header has fed through) and then press any key on the keyboard (except space). You should now get the flashing lines etc, and then the O.K.

message. Reconnect the ear lead and rewind the tape. Now use: *Verify* "name" and try to read what has been written, without losing the program stored in memory. If this does not work then try repeating the above, but with the leads switched around on *Save*, ie ear from the Spectrum to mic on the recorder and mic on the Spectrum loose. The leads should be as normal on *Load* or *Verify*. If this still doesn't work — try borrowing another cassette recorder!

TWO BYTES MISSING

T. Multon, 23 Penn Drive, Denham Green, Bucks, UB9 5JP, writes:

Q I have a Commodore Vic 20 and when I switch it on I get the expected '3583 Bytes Free' statement on the screen. But if I type '?Fre(0)' I receive the answer '3581'. Could you tell me if there is something wrong with my Vic, or if not, why there are two bytes less than is at first stated?

A There is nothing wrong with your Vic. The missing two bytes have been used by the '?Fre(0)' command.

Anyway, what's two bytes between friends?

NAMES IN ORDER

W. Grimes of Dagenham, Essex, writes:

Q I have a Sinclair ZX81 and require a program which will sort out names in alphabetical order. There is a program in the Sinclair handbook but this only sorts two strings and I can do this without a computer. Can you provide me with a program which when I enter a list of names will display them on the screen in alphabetical order?

A The listing below will work up to 100 names, each of up to 16 characters in length:

```
10 DIM AS (100,16)
20 LET N=1
30 PRINT "INPUT NAME OR '9' TO END"
40 INPUT AS (N)
50 IF AS (N) = "9" THEN LET N=N+1: GO TO 70
60 LET N=N-1: GO TO 40
70 IF N=0 THEN STOP
80 FOR I=1 TO N-1
90 IF AS (I):AS (I+1) THEN LET BS=AS (I): LET AS (I)=AS (I+1): LET AS (I+1)=BS: LET I=I-1: IF I=0 THEN GO TO 80
100 NEXT I
110 FOR I=1 TO N: PRINT AS (I): NEXT I
```

Lines 20 to 60 store the names input into the array AS.

Lines 80 to 100 sort the array. Line 110 prints the array.

VOICE PROBLEMS

L. Moran of Crumlin, Dublin writes:

Q I own a Dragon 32 computer and am having terrible problems with the *Computavoice* program. I wonder if the Dragon users amongst your readers would send in a list of the words or sentences that they have made this program say. Why don't you have a page every week devoted to Microtips for all micros? By the way, how do I get hold of British stamps so that I can enclose s.a.e.'s to reply to classified ads in your magazine?

A Well, all you talkative Dragon owners? What's all this about a page for micro tips? We've got a whole magazine devoted to that subject at the moment.

What you need to enclose with your replies are International Reply Coupons available from any post office and valid in any country. (Guess who's a philatelist then?)

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| 30 | LOOP; | LD A,(HL) |
| 40 | XOR | # FF |
| 50 | LD | (HL),A |
| 60 | DEC | BC |
| 70 | INC | HL |
| 80 | LD | A,B |
| 90 | OR | C |
| 100 | JR | NZ,LOOP |
| 110 | RET | |

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Diary

| Event | Venue | Dates | Admission | Organisers |
|---|--|--|---|---|
| Midland Computer Fair | National Exhibition Centre Birmingham B40 | May 4-6 10.00am-6.00pm May 7 10.00am-5.00pm | £2.50 adults £1.50 children | Reed Exhibitions, Surrey House, Throwley Way, Sutton, Surrey 01-643 8040 |
| Linslade Middle School Fair | Linslade Middle School Mentmore Road Leighton Buzzard | May 6 11.00am-4.00pm | 60p | Linslade Middle School, Leighton Buzzard (0525) 381664 |
| Walthamsoft 84 | Main Exhibition Hall Waltham Forest Technical College Forest Road, London E17 | May 19 10.00am-5.00pm | £1.00 | Waltham Forest Technical College 01-554 5039 |
| Apple 84 | Fulcrum Centre Slough | May 24-25 10.30am-5.30pm May 26 10.30am-4.30pm | £2.00 on door (free tickets in advance from organisers | Database Publications, 68 Chester Road, Hazel Grove, Stockport 061-456 8383 |
| 5th International Commodore Computer Show | Novotel Hammersmith, London | June 7-8 10.00am-6.00pm June 9 9.00am-5.00pm | £2.00 adults £1.00 children £3.00 family ticket | Granard Communications, 4 Babmaes St, London SW1 01-930 6711 |
| The Computer Fair | Hall D Earl's Court London | June 14 10.00am-6.00pm (trade and press only) June 15-16 10.00am-6.00pm June 17 10.00am-5.00pm | £3.00 adults £2.00 children & OAPs | Reed Exhibitions, Surrey House, Throwley Way, Sutton, Surrey 01-643 8040 |
| Micro Trade 84 (Trade only) | Barbican London | July 4-6 10.00am-6.00pm | Free | Montbuild Ltd, 11 Manchester Sq, London W1 01-486 1951 |
| Electron and BBC Micro User Show | Alexandra Palace London | July 19-21 10.00am-6.00pm July 22 10.00am-4.00pm | £3.00 adults £2.00 children | Database Publications, 68 Chester Rd, Hazel Grove, Stockport 061-456 8383 |
| Personal Computer World Show | Olympia 2 Hammersmith Rd London | Sept 19-22 10.00am-7.00pm Sept 23 10.00am-5.00pm | Not yet fixed | Montbuild Ltd 11 Manchester Sq, London W1 01-486 1951 |
| 5th International Commodore Computer Show | Leeds Exhibition Centre, Queens Hall Leeds | Sept 27-28 10.00am-6.00pm Sept 29 9.00am-5.00pm | £2.00 adults £1.00 children £3.00 family ticket | Granard Communications, 4 Babmaes St, London W1 01-930 6711 |
| Computer Graphics 84 (over 18s only) | Wembley Conference Centre, London | Oct 9-10 10.00am-6.00pm Oct 11 10.00am-4.30pm | £5.00 | Online Conferences, Pinner Green House, Ash Hill Drive, Pinner, Middlesex 01-868 4466 |
| ZX Fair | Bolton Sports Centre Bolton Lancashire | May 12 10.00am-5.00pm | 75p adults 50p children | Northern Premier Exhibitions 18, South Parade, Pudsey, West Yorkshire 0532 552854 |

FLIGHT AREA

Battle Flight is a flight simulation program for the Oric and Atmos—one of very few for the machine. It looks very sophisticated including four different kinds of graphics display — the airfield, flight area map, 3D of runway on landing and views of approaching aircraft.

The big problem with flight simulation programs that attempt to genuinely simulate a real aeroplane is the large number of controls required, which in the case of machines like the Oric and the Spectrum means a vast number of different keys to press.

This fact, in conjunction with the natural complexity of flying a plane, means that all early attempts at computer flight are likely to result in major crashes.

Still, it's worth persevering if only for the genuine pride you'll feel if you manage to fly a few miles. Up, up and away.

Program *Battle Flight*
Price £4.95
Micro Oric/Atmos
Supplier Stour Computing
16 Old Bridge
Road
Bournemouth

PAINTED

Through the long passing years echoes of *Amidar* still abound — this time it's a version for the BBC B and is retitled *Crazy Tracer*.

For those who don't know the game it involves moving a paint wheel around a screen trying to complete the outlines of squares to win points. You are chased by the inevitable bugs that object to your having this harmless good time.

The second screen — awarded if you paint in all the rectangles on the first, continues the theme but this time you must paint in the rectangles in one go otherwise you run out of paint and have to go back for more.

It is, of course, totally unoriginal but therefore retains the addictive power of the authen-

tic version. I'm surprised Acornsoft are not afraid of being sued.

Program *Crazy Tracer*
Price £9.95
Micro BBC B
Supplier Acornsoft
4a Market Hill
Cambridge
CB23NJ

FOLLOW SUIT

Bridge Player II is a souped up version of *Bridge Player I* (surprise surprise) which is the only Bridge playing program I've seen on any micro.

My personal knowledge of Bridge amounts to the fact that in some places it's a bit like whist which I learnt on my grandmothers knee — I never got any further with Bridge because I didn't have a suit.

Nevertheless after a full and frank discussion with several of my colleagues who do have suits I can offer you their comments.



These seem to be extremely favourable: "the fact that the computer completely reshuffles for each hand is a big plus point" "very good but bids conservatively". It knows something called Acol and won't allow you to make stupid moves. A must for Spectrum owning Bridge players everywhere.

Program *Bridge Player II*
Price £8.95
Micro Spectrum
Supplier CP Software
2 Glebe Road
Uxbridge
Middlesex UB8 2RD

Pick of
the week

SHOUT HELP!



The Greedy Dwarf is a BBC Text adventure from Goldstar which features, among other things, the most complex language analysis I've seen since the *Hobbit*.

Aside from the usual Verb Noun combinations — Take Rabbit, Kill Frog etc, the program includes a wide range of adverbs and adjectives necessary to master the adventure, example sentences include 'Carefully drop the flask of liquid, please' and 'shout Help' (which is what I usually end up doing.)

The objective of the adventure is recover the king's stolen gems from the dwarf Arfa who stole them. This means venturing into a maze of catacombs. The program to make me suspect we'll be hearing a lot more of this program.

Program *The Greedy Dwarf*
Price £9.95
Micro BBC
Supplier Dorling Kindersley
Software
1-2 Henrietta Street
London WC2E 8PS

GOLD MEDAL

Olympics 83 is a beautifully packaged program for the Spectrum 48K from Storm software. It is not an arcade game but rather a vast interactive database of Olympic facts and figures.

The package consists of three parts, two cassettes and a substantial booklet. The idea is that you can use the database to analyse various aspects of past performance in the games — the program includes, for example, every gold medal winner since 1896.

For such a specialised package the commands available for use of the data are very complex indeed — almost a language eg. EVENT = DISCUS > TYPE = MEN > HISTORY means find all the results in the men's Discus events.

Other commands will produce a pictorial representation — of medals won by each country for example. The second tape allows for very much the same thing but allows you to enter the results as they happen in this year's games.

For sports fans it should be a lot of fun. A Commodore 64 version is expected.

Program *Olympics 84*
Price £14.95
Micro Spectrum
Supplier Storm Software
Winchester House
Sherborne
Dorset DT9 4DL

MARAUDERS

If I knew what distinguished a great game from a lousy one I'd make a fortune. *Fire Ant* is basically a dodge obstacles maze type game but far from being tedious and boring it's excellent.

You are an ant (a harsh judgement perhaps, but there you are) and your one task in life is to rescue the Queen ant from an army of scorpions (antist?). This involves finding your way through a series of mazes and munching through walls.

Obviously one element in the game is avoiding marauding scorpions, but what makes the game particularly successful is the way — like *Manic Miner*, some of the screens require some logical thought to

New Releases

mastered it isn't merely speed of reactions.

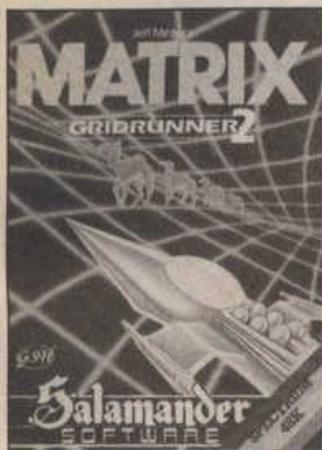
Technically there's nothing amazing here but if the game is enjoyable and addictive, which it is, this is hardly relevant.

Program *Fire Ant*
Price £7.95
Micro *Commodore 64*
Supplier *Mogul Communications*
90 Regent Street
London W1R 5PT

ANIMATED

Matrix Jeff Minter's follow up to *Gridrunner* is now available, via Llamasoft's arrangement with Salamander, for the Spectrum.

Salamander have produced versions of several of Jeff's games and whilst all have retained the high speed appeal of the originals none have been particularly well programmed — were it not for the sheer brilliance of the game design they would look absurd placed against an Ultimate offering.



With *Matrix* things are looking up. The speed of the original is maintained but here Salamander seem to have done an especially good programming job — characters are animated and the game has 20 levels of varied but intense action.

Program *Matrix*
Price £6.95
Micro *Spectrum*
Supplier *Salamander Software*
17 Norfolk Road
Brighton
East Sussex
BN1 3AA

NEW OWNERS

Recently Prentice Hall released a tape called *100 programs for the Spectrum* — now they have done the same for the Electron.

In the Electron's case there may be a greater need for such a package — it's a much more recent machine than the Spectrum and consequently has a newer ownership, more likely to be looking for a lot of programs quickly.

As I have said before, 100 programs for just over £10 means that none of the programs are marvellous, although some of them could be used as building blocks for larger, more substantial programs.

Program *100 Programs for the Acorn Electron*
Price £11.50
Micro *Electron*
Supplier *Prentice-Hall*
66 Wood Lane End
Hemel Hempstead
Herts
HP2 4RG

HIDEOUS DETAIL

Maziacs, a game which was considered a classic on the ZX81 is now available on the Commodore 64. It is closely related to the Spectrum version that was released last year — being issued by the same company DK'Tronics.

The idea of the game, which in many ways anticipated the *Atic Atac* style graphic adventures that are now so familiar, is to fight your way through a maze to a treasure chest. Hindering your way is an army of strange spidery creatures portrayed in sickeningly hideous detail, you can fight them if you have a sword and if you have the strength (did you find enough food?)

The other big problem is that you only get a brief indication of whereabouts the gold is hidden and have to memorise as much of the map as possible — the exception to this being provided by wretched prisoners who are strung up along the route, who can point you in the right direction.

Program *Maziacs*
Price £6.95
Micro *Commodore 64*
Supplier *DK'Tronics*
Unit 6, Shire Hill
Industrial Estate
Saffron Walden
Essex CB11 3AQ

EERIE APPEAL

Battlezone was one of the classic arcade games. It used three dimensional line graphics in a tank versus tank game of tac-



tanks (done for memory reasons) actually gave the whole game an eerie appeal.

3D Tankzone for the BBC does justice to the original, using high resolution wire graphics to create the same effects. That said, the structure of the game is pretty simple — shoot anything that moves but don't get shot.

Program *3D Tankzone*
Price £8.95
Micro *BBC*
Supplier *Dynabyte Software*
31 Topcliffe Mews
Wide Lane
Morley
Yorks

SUBTRACTION

Mirrorsoft have issued the next batch of original software following a well received initial batch. The two games *Count with Oliver* and *Look Sharp* are both educational aimed at the younger age ranges.

Count with Oliver teaches counting combined with colour recognition in the first part,

entitled *Toyshop* and teaches subtraction in the second section — *Lollipops* — as Oliver gradually stuffs himself (growing visibly fatter all the time.)

Although there is nothing very staggering here in terms of approach, what Mirrorsoft are doing consistently right is using the Spectrum's graphics to the full.

Program *Count With Oliver*
Price £7.95
Micro *Spectrum*
Supplier *Mirrorsoft*
Holborn Circus
London EC1P 1DQ

ROLE PLAYING

Sunken City is a graphic adventure for the Dragon 32. It is single key press, role playing, in style with your task within the game being to discover a legendary *Sunken City*.



The game appears to be in Basic with only around five different commands available, which probably makes the game unsophisticated by current standards. But the proof is in the pudding...

Program *Sunken City*
Price £7.95
Micro *Dragon 32*
Supplier *Slik Software*
19 Sancroft Street
London SE11 5UG

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

Spectrum*

- 1 (2) Jet Set Willy (Software Projects)
- 2 (1) Atic Atac (Ultimate)
- 3 (3) Chequered Flag (Psion)
- 4 (5) Hunchback (Ocean)
- 5 (6) Flight Simulation (Psion)
- 6 (4) Scuba Dive (Durrell)
- 7 (7) Pogo (Ocean)
- 8 (9) Cyrus IS Chess (Intelligent)†
- 9 (8) Lunar Jetman (Ultimate)
- 10 (-) Alchemist (Imagine)

*All 48K except where noted. † 16K.
(Figures compiled by WH Smith and Son, London)

ZX81*

- 1 (2) Fantasy Games (Psion)
- 2 (5) Space Raiders (Psion)
- 3 (1) Mothership (Softsync)
- 4 (7) Scramble (Quicksilver)
- 5 (5) Flight Simulation (Psion)
- 6 (8) Invaders (Quicksilver)
- 7 (3) Space Raiders (Psion)
- 8 (4) Asteroids (Quicksilver)
- 9 (9) Defender (Quicksilver)
- 10 (-) Chess (Psion)

* All 16K
(Figures compiled by Boots/Websters)

Vic 20

- 1 (1) Snooker (Visions)
- 2 (5) Krazy Kong (Interceptor)
- 3 (2) Flight 015 (Ferranti Davenport)
- 4 (-) Submarine Commander (Thorn/EMI)
- 5 (-) Escape MCP (Rabbit)
- 6 (9) Carrier Attack (Rabbit)
- 7 (10) Dambuster (Rabbit)
- 8 (6) Jet Pac (Ultimate)
- 9 (7) Emmet Attack (Commodore)
- 10 (8) Grid Runner (Llamosoft)
- 10 (-) Mine Madness (Thorne/EMI)

(Figures compiled by Boots/Websters)

Dragon

- 1 (1) Dragon Chess (Oasis)
- 2 (3) Hungry Horace (Melbourne House)
- 3 (4) Chuckie Egg (A&F)
- 4 (2) Ugh! (Softek)
- 5 (6) Pedro (Imagine)
- 6 (-) Eightball (Microdeal)
- 7 (5) Kriegspiel (Beyond)
- 8 (-) Culbert in the Jungle (Microdeal)
- 9 (7) Up Periscope! (Beyond)
- 10 (-) Frogger (Microdeal)
- 10 (-) Scramble (Microdeal)

(Figures compiled by Boots/Websters)

Commodore 64

- 1 (2) Quick Thinking (Mirrorsoft)
- 2 (3) Caesar the Cat (Mirrorsoft)
- 3 (1) Manic Miner (Software Projects)
- 4 (8) Ugh! (Softek)
- 5 (4) Hunchback (Ocean)
- 6 (6) Mr Wimpy (Ocean)
- 7 (-) Pirates and the Snowman (Commodore)
- 8 (9) International Football (Commodore)*
- 9 (5) Revenge of the Mutant Camels (Llamosoft)
- 10 (-) Colossus Chess (GDS)

*Rom cartridge
(Figures compiled by Boots/Websters)

BBC*

- 1 (-) Killer Gorilla (Program Power)
- 2 (4) Chuckie Egg (A&F)
- 3 (3) Daredevil Dennis (Visions)
- 4 (2) Fortress (Pace)
- 5 (5) 3D Space Ranger (Microbyte)
- 6 (-) Dodgy Dealer (Computer Consultants)
- 7 (-) Dambusters (Alligata)
- 8 (1) Mr Wimpy (Ocean)
- 9 (7) Snooker (Visions)
- 10 (-) Cyclon Attack (A&F)

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

Atari

- 1 (-) Zaxxon (Datasoft)
- 2 (3) Slinky (Cosmi)
- 3 (1) Warlock (Calisto)
- 4 (2) Rally Speedway (Adventure International)*
- 5 (6) Saga 4 Voodoo Castle (Adventure International)
- 6 (-) Aztec Challenge (Cosmi)
- 7 (-) Savage Pond (Starcade)
- 8 (9) Saga 5 The Court (Adventure International)
- 9 (8) Enchanter (Infocom)†
- 10 (-) Time Warp (English Software)

* Cartridge † 32K disc ‡ 48K disc
(Figures compiled by Calisto Computers, Birmingham 021-832 6458)

Books

- 1 (1) Disc Systems for the BBC Micro, Sinclair (Granada)
 - 2 (-) Commodore 64 Programmers Reference Guide, Commodore (Commodore)
 - 3 (-) Mastering Machine Code on the ZX Spectrum, Baker (Interface)
 - 4 (3) Interfacing Projects for the BBC Micro, Smith (Addison Wesley)
 - 5 (-) Child's Guide to the BBC Micro, Dewhurst (Cambridge)
 - 6 (2) Mastering the Commodore 64, Jones and Carpenter (Horwood)
 - 7 (8) 68000 Assembly Language Programming, Kane and Leventhal (Osborne)
 - 8 (7) Advanced Graphics with the BBC Microcomputer, Angell and Jones (Macmillan)
 - 9 (5) Introducing Logo, Allan (Granada)
 - 10 (-) QL Companion, Allan (Pitman)
- (Figures compiled by Watford Technical Books, Watford (0923) 23324 Prestel 25844)
(Last week's position in brackets)

SARCASTIC

One of the things kids who own micros often say to justify owning it is that they hope to get a job in computers and their micro will help them learn all about it.

The correct response for the sarcastic and sadistic parent at this point is to say 'Ah it speaks *Cobol* does it' at which point kid looks confused and parents smile self-righteously.

Because you see, *Cobol* is just about the business language at the moment but few micros speak it and learning *Basic* doesn't help much. For those people who are sincere in their intention to get a job in computing *Practical Cobol for Microcomputers* could be just the thing. This book discusses the language and includes a number of practical examples.

As versions for the language do become widely available for micros, this book could prove very useful — *Cobol* is pretty much standardised; consequently most of the programs in the book should work on any version of it.

Book *Practical Cobol for Microcomputers*
Price £6.95
Micro General

Supplier Sigma Technical Press
5 Alton Road
Wilmslow
Cheshire
SK9 5DY

REFERENCE

Since one of the more sensible things you can do with your BBC is wordprocessing, a book on this subject is a fairly sound idea — hence *Word Processing on the BBC Micro*.

Although the book hardly adds to the various manuals, it does usefully connect all the bits and pieces together. It can do this because it specifically assumes you are using *Wordwise* with an Epson printer — which is probably fairly likely. Thus, for example, you are shown exactly how to usefully implement control characters on the Epson from *Wordwise*. Good for quick reference.

Book *Word processing on the BBC Micro*
Price £5.25
Micro BBC (+ *Wordwise* and *Epson*)
Supplier The National Computing Centre
Oxford Road
Manchester
M1 7ED

This Week

| Program | Type | Micro | Price | Supplier |
|-------------------------|------|--------------|--------|-----------------|
| Demolator | Arc | BBC | £6.95 | Visions |
| Bedbugs | Arc | BBC/Electron | £6.95 | Optima |
| Boxing/Galactica | Arc | Commodore 64 | £5.50 | I.G. Programs |
| Mastering the Commodore | Ed | Commodore 64 | £9.95 | Wiley |
| Multisound Synthesizer | Ut | Commodore 64 | £14.99 | Romik |
| Pottit | Arc | Commodore 64 | £6.99 | Romik |
| Splat! | Arc | Commodore 64 | £6.50 | Incentive |
| Turtle Jump | Arc | Commodore 64 | £6.99 | Romik |
| Gruneberg Spanish | Ed | Dragon | £12.95 | Dragon Data |
| S 22 | Ut | Dragon | £39.95 | Ashby |
| Stock Control | Ut | Dragon 32 | £19.95 | Aphros |
| CBS Forth | Ut | Lynx | £19.95 | Cubsoft |
| Revenge of Drosoph | Arc | Nascom | £8.00 | G Rowland |
| Atlantis | Ad | Spectrum | £4.95 | Odyssey |
| Basic + | Ut | Spectrum | £12.95 | Prosign |
| Craze | Ad | Spectrum | £3.50 | Odyssey |
| Crazier | Ad | Spectrum | £3.50 | Odyssey |
| Friendly Face | Ut | Spectrum | £6.95 | Monitor |
| Golden Quest | Ad | Spectrum | £7.50 | Marshallgate |
| It's the Wooluf | Arc | Spectrum | £5.95 | Crystal |
| Mugsy | Ad | Spectrum | £6.95 | Melbourne House |
| Rubik | S | Spectrum | £2.00 | Cheep Games |
| Satari | Ad | Spectrum | £3.50 | Odyssey |
| Stronghold of Lori | Ad | Spectrum | £3.50 | Odyssey |
| Temple of Vran | Ad | Spectrum | £7.50 | Incentive |

| | | | | |
|--------------------|-----|----------------|-------|-----------------|
| The Fall of Rome | S | Spectrum | £6.99 | Argus |
| Time Search | Ad | Spectrum | £5.95 | Millenium |
| Tomb of Rews | Ad | Spectrum | £4.95 | Flashing Swords |
| Tradewind | Ad | Spectrum | £5.00 | WD Software |
| Vari Calc | Ut | Spectrum | £4.50 | G Deville |
| Chemistry A Level | Ed | Spectrum/BBC | £5.95 | Calisto |
| Physics A Level | Ed | Spectrum/BBC | £5.95 | Calisto |
| Horse Racing | S | T199/4a | £9.95 | C Flavell |
| Aztec Gold | Ad | Texas TI 99/4a | £6.95 | Lizard |
| Lionel and the Lad | Arc | Texas TI 99/4a | £7.95 | Intrigue |
| Mania | Ad | Texas TI 99/4a | £5.95 | Intrigue |
| Postman's Knock | Arc | Texas TI 99/4a | £4.95 | Lizard |
| 20 Games | Arc | ZX81 | £3.95 | I Thomson |

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

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



The outer limits

"The message is being repeated over and over. I'll put it through the cabins' speaker."

"... May day, may day. Is there anybody out there? This is the Forts of Falnon. We are under attack, in the name of the Emperor help us. Forts One and Three are already down, we have suffered severe casualties, they are closing for the kill..." At this point the message ended with a rising scream and the sound of air rushing into space. As the poor man died he must have hit the repeat message control.

"List our options, Neep."

"We are marooned in this sector, no habitable planets that we could reach within your life time travelling at sublight. You have supplies for approximately one year on board the Hawk. Your only hope is to board Fort two and find the parts and expertise to fix the Hawk. There is, of course, one small problem; the alien fleet."

"The chances of destroying the fleet?"

"Small, but not as bad as you may think. I have set up a communication link with the central Pseudo Conscious Intelligent constructs surviving on Forts two and three. They are both badly impaired, but should be able to manoeuvre the Forts to give us some protection."

"Well Neep, the sooner we get this done, the happier I'll be. It's been good knowing you!" I turned and waved at Neep, one of his arms waved back. With the Gravity Inertia Compensation damaged, I felt my body thrown violently back into the seat as Neep accelerated the ship towards the Forts of Falnon. I scanned the monitor screens in front of me — as I watched the first wave of Alien vessels appear at the top of the screen.

"Put audio on online, Neep. Anything that might help predict their movements."

"There isn't much, but I am picking up a fair

amount of radio waves. Converting to sound, Aereus." The cabin was filled with the unearthly noise being generated by the monsters.

I fired a shot up past Fort Two. The Caloric Fire travelled upward into space, and a satisfying buzz came through the speakers as energy burnt off it. The display clearly showed the path of the fire — all the systems seemed to be working.

Suddenly a curling cord of energy dropped from one of the aliens and blossomed into a feverish explosion on Fort three.

"Final systems check, Neep. Control to me on my mark. Acknowledge."

"Systems functional, safety devices overridden, overall ship status Amber 76. Control on your mark."

"Counting: Five-Four-ThreeTwoOneMark: Control to me." I grasped the joystick more firmly and sent the ship soaring across the inky blackness. The aliens dropped steadily closer, the atmosphere in the ship warmed, the fire button became hot to the touch, Neep whispered warnings and information into my ear. Outside it looked as though a sun was being born, with deadly bands of energy criss-crossing in front of distant stars.

The aliens went down, one by one in neat underwater explosions. A command saucer appeared above the bulk of the alien fleet, glowing ultraviolet blue. Swinging the Hawk round, I fired. The saucer dodged, but too late. A searing violet flame ripped across the fleet and four of the alien craft dissolved.

With the Hawk pushed beyond its limits by Neep we were able to run around the alien ships, and dodge their deadly coils of energy which sought to capture and destroy us. The Forts Of Falnon were taking a terrible toll, I only prayed that no one was near the outer skins.

As the battle progressed, I felt myself becoming more and more detached, as though there were two of me; one fighting, the other watching as though the whole battle were just part of a space opera on 3D tv. The watching part of me saw one of the alien craft shimmer and distort, mutating through lethal unstable forms. As it mutated deadly energies flew from it; the watcher told the fighter, who swung the Hawk round and fired.

The watcher saw the final alien explode, saw the fighters' hands fall from the control console. The watcher and the fighter closed their eyes.

"Control to you Neep. How's the ship?"

"Magnificent Aereus, we still live. The ship is in overall status Red 43. We have a few hours to secure the life support systems. Imperative we approach the forts now."

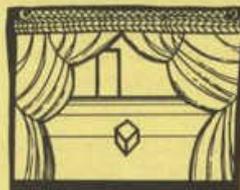
Mark Eyles

Stage fright

Puzzle No 105

The Muddlecombe Players amateur dramatics scenery department has just finished an extra couple of items needed for its next production. These are a wooden rostrum and a plain wall 'flat'.

The rostrum consisted of a wooden framework, cuboid in shape, with each of the six rectangular faces covered with plywood. The 'flat' was just a plain rectangular structure, one and a half times as high as it was wide.



When these pieces were being painted it took the same quantity of paint to cover both items, which was not surprising, as the area of the six rectangular faces of the cuboid were together equal to the area of the one face of the 'flat'.

If the height, width and length of the rostrum and the height and width of the 'flat' were all an exact number of feet with no two dimensions being the same, what was the smallest size possible for both items?

Solution to Puzzle No 100

The problem relates to finding any integral factors of 1111111. The program divides this sum by successive odd numbers until an exact division is found.

```
10 LET D = 3
20 LET C = 1111111/D
30 IF C = INT C
   THEN GOTO 60
40 D = D + 2
50 GOTO 20
60 PRINT D,C
```

Both of these numbers represent the two prime factors of 1111111 and so there can be no ambiguity in the answer of 4649 television sets at £239 each.

Winner of Puzzle No 100

The winner is Graham Maguire, Kepler Street, Seaforth, Liverpool, who receives £10.

Rules

If the puzzle can be sensibly solved using a computer, then the winner will have included a listing of the program used to find the correct answer.

The closing date for entries to Puzzle No 105 is May 18.

The Hackers



AUTOMATA

- ... but seriously,
- PIMANIA** - the cult adventure that's for real!
16K ZX81 £5 BBC 32K £10 Dragon 32 £10 Spectrum 48K £10
 - GROUCHO** - the Pimania sequel, Concord-QE2-USA prize
Free rock music on the flipside. Spectrum 48K £10
 - PI-EYED** - the comedy cartoon arcade game, starring the PiMan. Free protest disco record. Spectrum 48K £6
 - PI-BALLED** - A triumph of the arcade programmer's art. Starring the PiMan. Free offensive Reggae music. Spectrum 48K £6
 - MORRIS MEETS THE BIKERS** - exciting arcade fun, as seen on TV. Outrageous free doo-wop record. Any Spectrum £6
 - YAKZEE** - Bruddy wonderfurr game of ruck and skirr. An oriental masterpiece for Dragon 32 plus Spectrum 48K £5
 - GO TO JAIL** - Play the game find out what all the fuss is about, cookie. Spectrum 48K £6
 - OLYMPIANIA** - He's back! He's going for gold! He's sober! Free National Anthem on the flipside. Spectrum 48K £6
 - THE PIMAN'S GREATEST HITS** - amazing stereo L.P. cassette £3
 - "I'M A PIMANIAC"** - T-Shirts (state size) £5

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