

40 Rock. ©

POPULAR Computing WEEKLY

35p 15-21 December 1983 Vol 2 No 50

This Week

Games designers

Graham Taylor looks at three different games designers — programs which enable you to write your own arcade and adventure games. See page 18.

Commodore 64

Czes Kosniowski explains how trigonometry functions can be used for different programming techniques on page 30.

Valhalla

Graham Taylor talks to John Peel of Legend about the making of *Valhalla*. See page 16.

New releases

All the latest software games including *Jumbly* from DK'Tronics. See page 80.

★ STAR
Abandon Earth
on Vic20. See
page 10.
GAME ★

News Desk

Oric 2 gets go-ahead

FOLLOWING its take-over by Edenspring Investments, Oric has put back plans for an IBM PC compatible micro.

Instead, the company will go ahead with development of a new home computer — the Oric 2 — that will compete with the Electron and Commodore 64 machines.

The Oric 2 will be broadly similar to the first Oric machine. It will run the same form of Basic in an improved Oric Rom containing some extra commands including *Verify* and *Merge*. According to Tansoft's Paul Kaufman, though, "All the existing Tansoft software will work with the new machine."

With 64K Ram, the Oric 2 will have more memory than the Oric 1. Most of the additional memory will be used as video Ram. The computer will also feature a full-size full-travel keyboard and a completely new manual.

The Oric 2 is scheduled for launch in early March and will appear after the new Sinclair 'professional computer', now expected in late February.

What future now for Atari?

THERE is increasing speculation that Warner Communications may sell its ailing Atari computer division.

This follows the recent purchase by Australian publisher Rupert Murdoch of 6.7 percent of Warner Communications. Murdoch paid \$98m for 4.4m shares, making it Warner's largest single shareholder.

The most likely attraction of Warner Communications is its extensive film library and 50 percent share in Warner Amex Cable Communications. Murdoch is already heavily involved in cable and satellite communications with News America, Skyband and Satellite Television UK, and the Warner's film library would make a rich killing.

Warner Com- **Publisher Rupert Murdoch**

munications is in deep financial trouble, mainly brought about by its Atari computer division which has lost in excess of \$500m in the last nine months.

It is now considered possible that Murdoch may try to swap his shares for Warner Bros Pictures.

In the event of a Murdoch
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AQUARIUS
SEE PAGE 55

VALHALLA

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FOR SALE! Spectrum software, 3D Tanx, Orbiter, £3.50 each, Gulpman £3, Mined Out, Frenzy, Roman Empire, Escape, £2.50, Winged Avenger £2, all good condition. R. A. Kidd, 20 Buckfast Close, Ipswich, Suffolk.

WANT A GREAT BYTE THIS XMAS. Spectrum software half list price, Mad Martha's 1+2, Scrabble, Zoom, Zip-Zap and probably all others in this column. N.B. all originals. Phone Reading 697095.

Continued on page 73

BRITAIN'S BEST-SELLING MICRO WEEKLY



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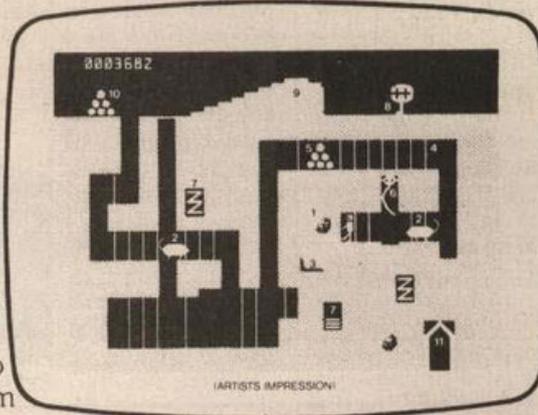
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All the time the Gremlin (8) is busy digging it's way through your waste earth pile (9) to reach the entrance to your mine. Once it does you have no



ACTUAL ZX-81 SCREEN DISPLAY

escape!! - so you must stop it getting there by returning to the surface to replenish the main mound (9) with the smaller pile of earth which appears on the surface as you dig (10). The deeper you dig the more points you score -

but the further you have to go to replenish that mound! Once all nuggets have been collected, a cave opens (11) allowing you to pass through to the next stage - if you can reach it! This gives you more rats - but less snakes to destroy them with!!

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

Programs should, whenever possible, be computer printed.

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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

Newspaper magnate Rupert Murdoch has spent nearly \$100m in acquiring a 6.7 percent share of Warner Communications. This makes Mr Murdoch, in the form of his News Corporation, the largest single shareholder in Warner.

This information is of more than esoteric interest because Warner numbers Atari among its subsidiaries. Atari, once the jewel in Warner's crown, has lost more than \$536m so far this year.

Both Warner and Rupert Murdoch would appear to be anxious to rid themselves of Atari as soon as possible. Warner can hardly continue to absorb losses on such a massive scale, while Murdoch's interest lies in Warner's film and tv operations. Atari has suddenly become persona non grata in a very big way.

However, while Warner and Murdoch might wish to offload Atari, who would want to buy it? Given the current state of the micro market, it is extremely unlikely that anyone will be able to turn Atari round and start making a profit — at least not in the short-term.

US companies, aware of the problems that have beset Texas, Mattel, Osborne and other micro firms, are unlikely to see any advantage in buying Atari. But European companies might see Atari as a useful entry to the American market, which is potentially the most profitable in the world.

Next Thursday

Can you guide Santa up and down chimneys and ladders in time to deposit all his presents? Find out in next week's star game for the Spectrum.

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BLASTERMIND! ★

SPECTRUM 48k £5.50

At first glance this might seem to be just another version of a very popular game. How wrong can you be!!! True, the start is simple enough. The Spectrum picks a code of numbers or colours with a selection of levels of difficulty — and invites you to do the same. You then take it in turns to guess each others code from the clue supplied after each guess. An extremely well written, fast and very clearly displayed game, with almost inevitable defeat. This was exactly as intended but unfortunately *something went wrong*. During the programming strange uncomplimentary messages began to appear on the screen. At first they were so few they were not taken too seriously, but soon they could no longer be ignored. Somehow the Spectrum had been given a personality — a rather devious, supercilious, dislikeable, hateful, horrible mind.



Side B contains a version of the game compatible with the excellent Currah µSpeech unit — even worse!!

The Quest of Merravid ★

VIC 20 (16k) £7.95 or Commodore 64 £7.95

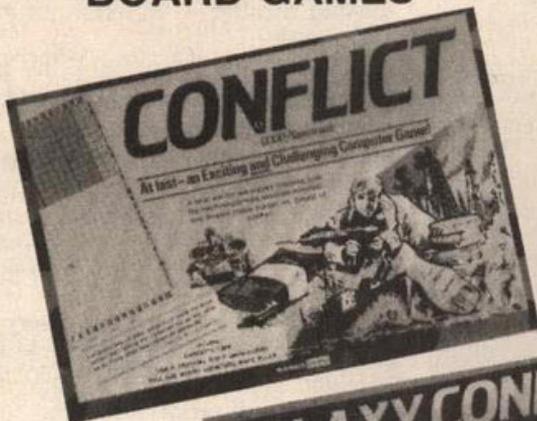
A really challenging and enjoyable adventure, written by a confirmed adventure addict who grew tired of the ease with which he solved other adventures himself. Will accept and act on sentences containing up to nine words.

The adventurer becomes Merravid, charged with the task of finding, taking and then returning the magic Firestone of the Dwarves. However, overcoming the many novel and original hazards is no easy matter. Careful and imaginative thought is required if progress is to be made and the Firestone tracked down to the lair of the Dragon of Thargon. Even then the Dragon has to be defeated and the stone retrieved. A compulsive, extremely enjoyable and very user friendly adventure.



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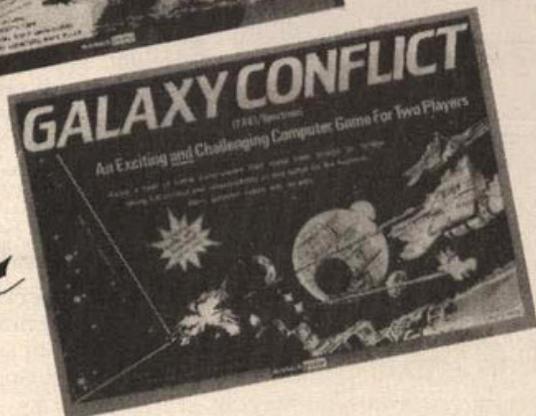
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His master's voice sounds from Commodore

COMMODORE will launch its long-awaited *Magic Voice* speech synthesiser unit in January, priced around £50.

The small hardware add-on plugs into the expansion port on the Commodore 64. Software held in Rom inside the unit gives it a vocabulary of 234 words and letters which, with the exception of Z (*Zee*), are pronounced in an acceptable mid-Atlantic accent.

As well as the complete alphabet and the numbers 1 to 12 a selection of phonetic sounds are included to enable new words to be built up.

The unit is controlled from Basic with the simple command Say "X".

A number of 'speaking'

Atari future

Continued from page 1

take-over of Warners' film and cable interests, Atari could be sold off to a European electronics conglomerate. Warners would still retain its music and book publishing interests.

Both Thorn EMI and Philips have been mentioned as possible buyers of Atari, with the latter being the more likely candidate. The Dutch electronics giant Philips has so far failed to make any real impact in the computer and video games market. Sales of its G7000 video games machine come a poor third behind Atari's own VCS and Mattel's Intellivision.

Speculation that Philips might take over Atari has been increased by the announcement in July that Warners and Philips plan to merge their record music interests.

Philips at present has a 50 percent stake in Polygram. The other half is owned by the German company Siemens. Two new companies are to be formed between Polygram and Warners in which Siemens is to hold a considerably reduced interest.

Commenting on suggestions of a Philips take over of Atari, Graham Clark, managing director of Atari UK said: "I am aware of the speculation but it would appear to be the result of confusion with the Philips-Warner record deal.

"Any take-over of Atari would seem very unlikely from what I know."

Rom cartridge programs are planned to accompany the *Magic Voice*. These plug into a cartridge port on the top of the unit. Among these are the *Magic Garden* and *Magic Toolbox* educational series of talking books from Edata, the *BJ Bear* educational programs, two arcade games *Wizard of Wor* and *Gorf* and *Magic Desk 2*.

Dragon 'poke' runs into problems

DRAGON software houses selling programs which use the so-called 'speed-up *Poke*' are running into problems of software incompatibility.

In earlier versions of the Dragon 32, the command *Poke 65495,0* (Hex: HFFD7,0) can be used to increase the operating speed of the Dragon's 6809E processor. A number of software houses have taken advantage of this fact to make their games run faster.

The problem is that around 20 percent of Dragons now

being produced will not accept the speed-up *Poke* command and therefore the games will not run. Among the programs affected are Beyond Software's *Up Periscope* and C-Tech's *Flight Simulation*.

The Dragon's 6809E processor is rated at a maximum operating clock speed of 1MHz and runs in normal use at 0.98MHz. The speed-up *Poke* increases the clock rate to 1.8MHz. It then depends on the tolerance of individual chips whether a particular machine will accept the *Poke* command.

One company which has found a solution to the problem is Microdeal. Its programs offer a menu choice at the start of each game where the Dragon owner can choose to play a version either with or without the speed-up *Poke*, depending on whether or not the Dragon concerned will accept it.

Dragon's Cathy Hyde says: "We do not recommend that Dragon users use the *Poke* because we cannot tell what long-term harm it will cause the machine. It is not just the Dragon's processor which has been designed to run at 1MHz, but the whole design of the computer. The peripheral interface adaptor which communicates with the keyboard and parts of the Ram have also been designed to work best at less than 1MHz."

Paintings by numbers



KOALA Painter, from Audiogenic, is a graphics tablet for the Commodore 64. Consisting of a tablet and stylus, disc-based software and manual, it enables users to draw directly on to the screen.

There are facilities for selecting colour, creating mir-

ror images, copying one part of a picture to another and erasing mistakes. The user can choose between eight brush sizes and 16 colours.

Koala Painter costs £89.95 including VAT from Audiogenic, PO Box 88, Reading, Berks RG1 2SN.

Little new at ZX fair



THE eleven and a half thousand visitors to the 9th ZX Microfair on December 3 and 4 found little new hardware or software on display.

Apart from East London Robotics' demonstration of its revolutionary new Trick-Stick Spectrum joystick, interest once again centred around new Spectrum software.

Richard Shepherd showed a new adventure by Invincible Island author Peter Cooke - Urban Upstart.

Silversoft, which has been rather quiet in recent months, had three new titles - Freez' Bees, Robot Riot and Sam Spade.

Microsphere displayed a new 48K game, Wheelie.

Adventure house Phipps Associates launched its first arcade titles - House of the Living Dead, Killer Knight, and Loony Zoo.

And Gilsoft offered a new adventure written using its games-designer program The Quill - Magic Castle.

One trend that is very noticeable with recent shows is that increasingly the Microfairs are becoming dominated by retail exhibitors. More and more software shops are attending, with fewer and fewer of the software houses choosing to show.

Rotten apples

APPLE, continuing its fight against counterfeit 'rotten' Apples, last week failed in an attempt to ban the sale of Taiwanese-made copies of its Apple II in Australia.

An Australian court ruled that the two machines - the Apple II and The Wombat - were clearly distinguishable by their names and that the Wombat distributor was not guilty of misrepresentation.

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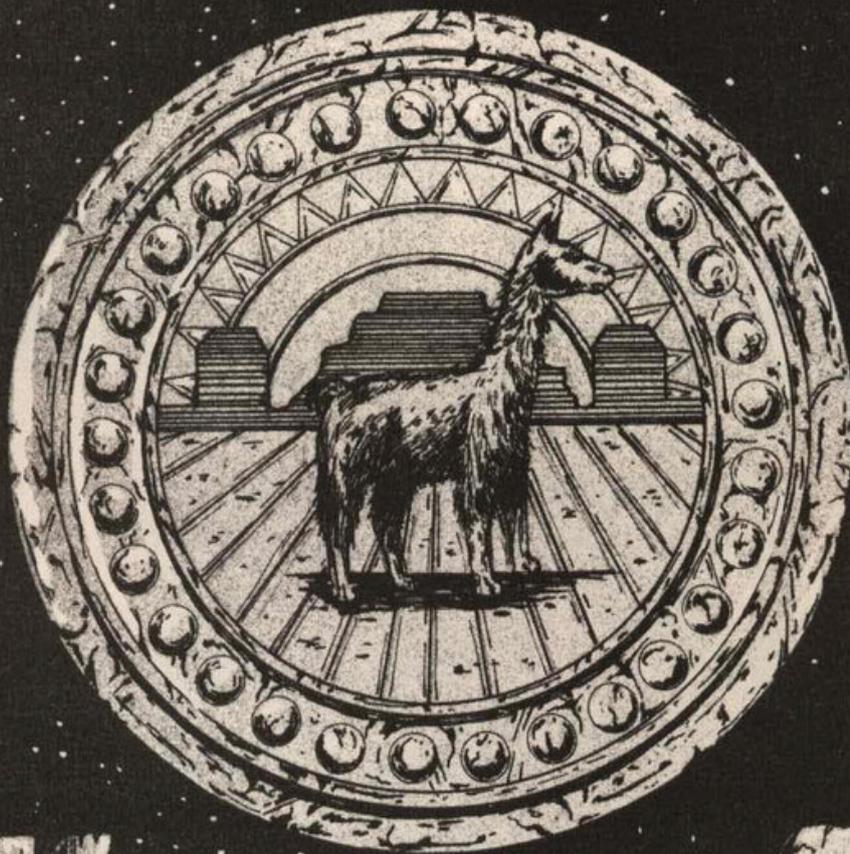
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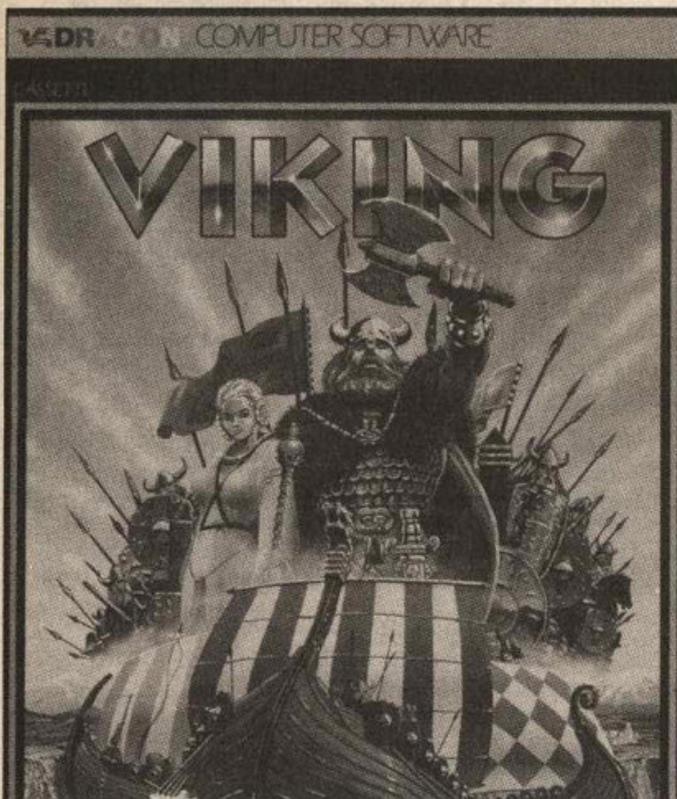
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LLAMASOFT

US Viking for Dragon



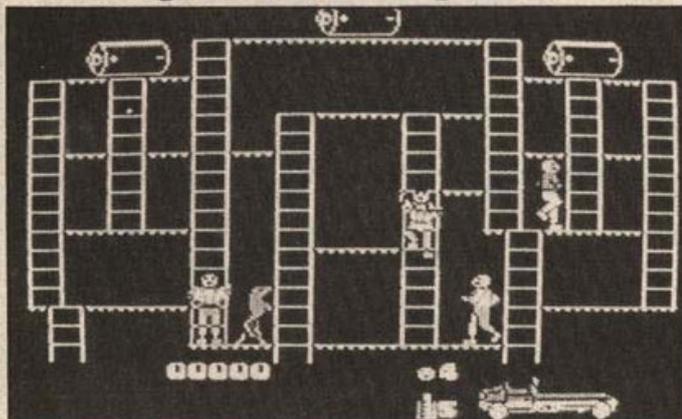
DRAGON has continued to follow its American software path with the launch of seven Dragon 32 titles, all previously available in the US for the Tandy Color Computer.

The licences have been agreed by Dragon with a number of US Tandy houses —

Softlaw Corporation (*Cimeeon Moon*), Computerware (*Bloc Head* and *Synther 7*), Prickly Pear (*Viking*, *Shaft* and *Tee Off*) and Spectral Associates (*Whirlybird Run*).

"We have had to go to the States because the 6809 chip, around which the Dragon is

Teddy bear's picnic



AS Imagine's *Ah Diddums* and Audiogenic's *Teddy* show, bears are in vogue.

After Christmas, Artic programmer John Ritman — author of *3D Combat Zone* — will continue the trend with *Bear Bovver*, his new game for the 48K Spectrum.

As Ted the bear you must leave the security of your electric car and climb a series of ladders to drop down a new set

of batteries for it. In so doing it is important to avoid the bovver bears and their strange-looking pet.

John says: "It's a tactical arcade game. You can either run straight for the batteries and try to get through as many screens as you can or you can deliberately try to group the bears on a battery when you drop it — you get really high scores for that."

based, has been rather neglected in the UK. Good software in this country is either written for the Z80 or 6502 processor," commented Dragon's Clive Johnson.

Pricing of the new titles is related to the level of royalty payment Dragon has agreed for the titles. *Whirlybird Run* from Spectral Associates costs as much as £12.95 for a single cassette title.

"It is difficult to get in contact with good individual writers and by going to established US software houses we can tap into their authors," said Clive.

At present there are no plans for any of the American companies to write material specially for the Dragon: "It wouldn't be worth their while, when they can write for both the Dragon and Tandy machines at once," he added.

Byting back



MICRO Format is offering a useful new type of add-on — the Byte Bat.

The 17 inch-long foam rubber baseball bat is ideal for those occasions when you just cannot stand it any more — and wish to take out your programming frustrations on your micro.

More details from Micro Format, 1271 West Dundee Road, Suite 16A, Buffalo Grove, Illinois 60090, USA. The Byte Bat costs \$9.95 (about £7) excluding postage and packing.

IBM contract

AB Electronics, manufacturer of Acorn's BBC and Electron micros, has won a multi-million pound contract to supply parts for the IBM Personal Computer.

IBM refused to disclose details of the contract, but AB admitted it was its biggest deal yet. Some indication of the size of the contract can be seen from AB's turnover — nearly £40m this year.

Business and accounts

GEMINI has announced a range of software titles for serious micro users.

The five packages provide home business, accounting, and mail handling programs.

Combination Home Pack 1 contains *Database*, *Home Accounts*, *Mailist*, *Spreadsheet Analysis* and *Graphplot* for the Electron (on cassette) and BBC (on cassette, 40- or 80-track disc) machines priced at £79.95.



Combination Home Pack 2 contains *Database*, *Home Accounts*, *Graphplot* and *Mailist* for the 48K Spectrum (on cassette) priced at £59.95.

The other three titles are *Combination Business Packs 1* to 3, the first two for the BBC machine and the last for the Electron, featuring more advanced versions of the programs in the *Combination Home Packs*.

From February 1, the complete range of business and utility programs will be available for the Commodore 64 computer.

Details from Gemini Marketing, 18a Littleham Road, Exmouth, Devon.

Mattel shows no improvement

MATTEL, the US toy and video game giant, is continuing to show big losses.

Despite dropping its Aquarius microcomputer and announcing its intention to withdraw completely from the highly competitive home computer market, Mattel has recorded a substantial third quarter loss of \$46.3m. A healthy profit in its toy division was more than cancelled out by an \$82.4m. loss in its electronics and computer division.

SCREENPLAY

134 St. Vincent Street, Glasgow G2 5JU. Telephone 041-248 2481

CHICKAROO: A word recognition game for children. Find the missing letter in the name of this game which can be used by up to four players.

PIRATES: A childrens game based on word recognition. Identify the concealed word before you reach the end of the plank or else face the perils of the deep.

A vocabulary of 100 words is supplied with both of these games, however, parents have the option of adding their own data files.

BBC EDUCATIONAL

THE ILLUSTRATOR: A graphics design package which can be used in a graphics Modes 1 or 2 to generate full colour illustrations on the screen of your micro. This package allows graphics and text to be mixed on screen and saved on tape for later use.

MAD MONTY: A fast and furious version of the snake in the garden game for the MODEL B BBC MICRO. Monty — the well known python — lives in a garden inhabited by juicy flowers. Help him munch his lunch but mind those rocks and walls!

BBC GAMES AND UTILITIES

MAD MONTY: It's mealtime for MONTY the MAD python and frogs are on the menu! Guide him round the garden gulping frogs and munching magic mushrooms — beware those toadstools and if you keep your cool mouse may be on the menu.

THE ANIMATOR: The perfect DRAGON graphics tool allows you to define your own characters and then make them spring to life on the screen. The animated routine can then be saved on tape and combined with others to create your own games.

DRAGON 32

MAD MONTY: This version of the snake game has 7 screen layouts and five speeds from sublime to ridiculous. Monty munches frogs for lunch and is partial to the odd mouse for afters.

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COMMODORE 64

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LETTERS

Storage solution

For those of us lucky enough to own a Sinclair Microdrive, there is the slight problem of the storage of cartridges which are about 1/8 the size of the ugly old tape cassettes.

My suggestion is to use the lid (the clear plastic half) of an empty cassette box. After all, we have plenty of spare tapes now we can store so much on a tiny cartridge.

Stand the cassette box lid on its edge to form a tray with a high back and stand your Microdrive cartridges in it. The lid will stand on a working surface or the back can be glued to the edge of a shelf. Leave the insert sheet in for an index record.

Yours, one of the chosen few.

Vic Phillips
17 Elizabeth Avenue
Ibstock
Leicester

Computer loonie

I would like to know if anyone could help out a poor old computer loonie. I want a Phoenix-type game for the Commodore 64 — it must have the full five screens.

Can anyone help before I crack up? Could you also let me know the company, etc. Help!

Mark Roebuck
59 Ings Walk
South Kirkby
Pontefract
W Yorkshire

I am afraid that I don't know of any Phoenix games for the Commodore 64, but I am sure they must exist. Perhaps our readers will be able to supply some details.

Ace club

Re Phil Murray's letter of December 1. The Jupiter Ace Users Club is alive and well, has over 350 members, and is just about to issue its fourth newsletter. We welcome new members and suggest Phil writes to us. Subscription is £7 for 1984. Newsletters 1-4 cost an additional £7. Cheques payable 'Rem-

soft'. Here endeth the commercial.

Now that Jupiter have gone down the plughole, it's even more necessary for Ace users to stick together and share information.

By the way, the new Forth computer from Microkey is set for launch in January. It doesn't replace the Ace, merely complements it (128K, 3 1/2" Sony drives, good keyboard, interfaces, etc . . .).

John Noyce
Remsoft
18 George Street
Brighton BN2 1RH

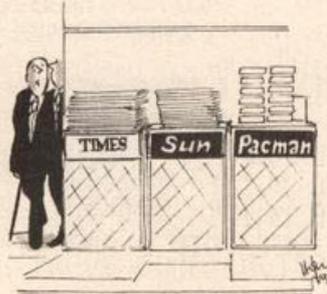
PS. Yes, I've met the theoretical ideal language types (re Jeremy Ruston's article). They're a pain. Forth is a lot more versatile than people give it credit. But even so, it's horses for courses.

Microdrive problems

Andrew Pennell and friend are not the only people to have experienced difficulties with the new Sinclair Interface 1 and Microdrive. In my own case both worked perfectly, with no sign of any problems, until a month had passed. At that point I'd either get a syntax error when attempting to initiate a Microdrive Save or Load command into the computer directly or a 'Non-sense in Basic' message when trying from within a program.

Sinclair have now replaced my Interface 1 (no 12) with another issue 2 (no 422). Unfortunately, I haven't really been able to check whether this works correctly as last week my Spectrum gave up the ghost after I plugged in Interface 2!

What concerns me about the whole situation is that we Spectrum Issue 1 owners have waited over a year for the much promised Microdrive.



"Any truth in the rumours about Rupert Murdoch and Warner Communications?..."

Are we now to discover that the useful life of a Spectrum is only just longer than that period?

Ian Maule
5 Beaconsfield Road
New Malden
Surrey KT3 3HY

Rom omission

Thank you for forwarding Gareth Rowland's letter, as it highlighted an omission in my article in the 20-26 October issue on making Rom calls. There should be eight steps, not seven! If step 3.5 "STX >\$A6" is not included, the technique will not work. I apologise for the frustration this will have caused people. The eight steps should be as follows:

- 1) Create tokenised BASIC line.
- 2) LDX >\$A6: PSHS X
- 3) LEAX @LINENAME,PCR
- 4) STX >\$A6 -missing step
- 5) LDA ,X
- 6) ANDCC ##FE
- 7) JSR 12345 (or whichever)
- 8) PULS X: STX >\$A6

Peter Whittaker
Cambridge

Interrupt mistake

With regard to the use of interrupts on the Spectrum by Alan Went (PCW 24-30 November).

The general article was very interesting, but he made a basic mistake in assuming that during the interrupt acknowledge cycle the data bus would contain 255 decimal. Although the data received will normally be 255, this is not always true. The actual value can be any-

where between 0 and 255, the problem being that some add on units do not decode the Ireq and Read lines correctly.

Also, there are no true pull up resistors on the data bus which rely on the pull up effect of the memory devices, etc, to ensure 255 — this cannot be guaranteed to work.

To ensure that the interrupt will respond as required, it is necessary for it to work no matter what value is returned. To do this, we must set aside 257 bytes for an interrupt vector table. Each byte of this table contains the same value such that no matter what value is added to the I register we always jump to the correct address (257 bytes are needed, as the first byte of the vector address could be at the 256th byte ie returns 255).

In my 48K Spectrum I use Feh (254 dec) as the value stored in the table. This means that the interrupt address is at Fefeh (65278 dec). The vector table is placed at address FdooH to Feooh (64768 to 65024 dec).

The use of the I register at FDH does not cause any 'snow' on the screen, as this only happens between 40H and 7FH, the memory for the 16K Spectrum. But, this does cause problems for 16K owners who are unable to use this technique. The accompanying brief routine will set up the interrupt.

Anyway, thanks for an interesting magazine, keep up the good work.

D Allday
Lyans
Rusper Road
Ifield
Crawley
Sussex RH11 0LR

Address	Data	Code	Remarks
FE56	F3	ON DI	;ensure interrupt does ;not occur during change
FE57	2100FD	LD HL,OFDOOH	;set table
FE5A	0600	LD B,0	
FE5C	36FE	LOOP LD (HL),OFEH	
FE5E	23	INC HL	
FE5F	10FB	DJNZ LOOP	
FE61	3EFD	LD A,OFDH	;set I register
FE63	ED47	LD I,A	
FE65	ED5E	IM 2	;Set interrupt mode
FE67	FB	EI	
FE68	C9	RET	
FE69	ED56	OFF IM 1	;turn off special
FE6B	C9	RET	; reset to orig mode (no need to reset I reg.)
FEFE			Interrupt routine starts here.


```

79 PRINT"YOU CAN FIRE USING THE RED BUTTON"
80 PRINT"BUT WATCH OUT THE LAUCHER USES THE LATEST"
81 PRINT"ANTI-MATTER BEAMS WITCH PASS THROUGH THERE TARGET TO HIT MORE"
"
82 PRINT"TO LAUCH ONE OF THE FOUR SCIENTIST FULL BACK ON THE JOYSTICK"
88 FORT=1T08000:NEXTT
99 GOTO121
101 POKE56,28:POKE52,28
102 FORT=7168T07168+184:READA:POKET,A:NEXT
103 DATA0,0,0,0,0,1,3,7,0,0,0,0,255,255,255
104 DATA1,3,15,15,255,255,255,255,128,192,240,240,255,255,255,255
105 DATA0,0,0,0,0,128,192,224,15,31,63,255,31,31,15,15,255,60,60,255,255,255,25
5,255
106 DATA255,204,204,255,255,255,255,255,240,248,252,255,248,248,240,240,7,7,3,3
1,1,0,0
107 DATA192,192,128,128,128,0,0,0,7,7,7,0,0,0,0,224,224,224,0,0,0,0,0
108 DATA3,3,1,1,0,0,0,0,224,224,192,192,128,128,0,0
109 DATA0,42,42,255,42,42,0,0,0,84,84,255,84,84,0,0
110 DATA34,85,85,149,8,0,0,0
112 DATA0,28,28,8,62,8,20,34
113 DATA0,24,24,36,66,255,255,54
114 DATA0,0,16,16,16,16,0,0,0
115 DATA56,126,255,126,254,248,60,8
116 DATA126,90,255,189,189,36,66,36
120 FORI=7424T07431:POKEI,0:NEXT:RETURN
121 PRINT"LOAD "
160 POKE198,3:POKE632,19:POKE633,13:POKE634,13

0 REM****VARIABLES****
1 A$="XXXXXXXXXXXXXXXXXXXXXXXXXXXX":X=10:CR=25:LI=4:ZX=20
2 D$="XXXX":V=0:M=0:TI$="000000":COL=30720:SC=0:YT=0:GG=0:S=0
10 REM****MAIN ROUTINE****
11 GOSUB100
15 GOSUB6000
16 GOSUB10000
17 IFV=1THENM=M-1:GOSUB10000
18 IFV=2THENM=M+1:GOSUB10000
20 PRINT"TIME: ";RIGHT$(TI$,3)
21 PRINTTAB(10)"XXXXXXXXXXXXXXXXSCORE ";SC
29 REM****SET UP PHASES****
30 IFTI$>"000199"THEN60000
40 IFTI$="000100"THENPOKE36879,8:ZX=10:S=1
41 IFTI$="000125"THENPOKE36879,42:ZX=5
42 IFTI$="000145"THENPOKE36879,27:S=0:ZX=20
43 IFTI$="000155"THENPOKE36879,93:ZX=5:S=0
50 GOTO15
99 REM****SET UP SCREEN****
100 POKE36869,255:POKE36879,CR
1000 PRINT"X":FORT=8164T08185:POKET,230:POKECOL,230:POKET+COL,6:NEXT
1002 DEFFNR(X)=INT(RND(1)*X+1):FORI=1T050:A=FNR(395)+7702
1003 POKEA,174:POKEA+30720,FNR(6):NEXT
1040 PRINTA$TAB(11)"S"
1045 FORI=1T020:A=FNR(40)+7834:POKEA,171:POKEA+COL,FNR(6):NEXT
1050 FORI=1T035:A=FNR(100)+7966:POKEA,21:POKEA+COL,INT(RND(3)*8):NEXT
1052 FORI=1T0INT(RND(1)*20):A=FNR(40)+7834:POKEA,22
1053 POKEA+COL,FNR(6):NEXT
1055 PRINT"XXXXXXXXXXXXXXXXXXXXX"
1056 PRINT"X"
1057 IFLI=4THENPRINT"RRXXXXXXXXRR":RETURN
1059 IFLI=3THENPRINT"R XXXXXXXRR"
1061 IFLI=2THENPRINT" XXXXXXXRR"
1063 IFLI=1THENPRINT" XXXXXXX R"
1065 IFLI=0THENPRINT" XXXXXXX"
1067 GOTO4000
1070 AA$="ALL YOUR MEN HAVE GONE":GOTO20000
1080 END
2000 AA$="YOU HIT YOUR SHIP SO IT FIRED BACK."
2001 GOTO20000

```



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```

3999 REM****LAUNCH MEN****
4000 IFYT>4THEN1070
4004 MI=8120+X+1:NI=MI+COL
4005 GOSUB10000
4006 GOSUB30004
4007 POKEMI,Q:POKENI,0
4009 MH=5:GOSUB6000:MH=0:POKEMI,32
4011 MI=MI-44:NI=NI-44:IFMI<7768THENRETURN
4012 GOTO4005
4050 END
6000 REM****JOYSTICK****
6001 POKE37137,0:POKE37154,127
6002 U1=PEEK(37137):U2=PEEK(37152)
6003 IF(U1AND4)=0ANDMH<>5THENYT=YT+1:LI=LI-1:Q=18:GOTO1055
6008 IF(U2AND128)=0ANDX<18THENX=X+1:GOTO6500
6010 IF(U1AND16)=0ANDX>3THENX=X-1:GOTO6500
6013 IF(U1AND32)=0ANDGH<>5THEN8000
6016 RETURN
6500 PRINTA$;TAB(X)" S "
6509 RETURN
6900 POKEBP,8:POKEBC,10:POKE36877,190:FORI=15TO0STEP-.2
6901 POKE36878,I+144:NEXT:POKE36877,0:POKE36878,8:POKEBP,32
6909 RETURN
7999 END
8000 REM****FIRE****
8001 BP=8120+X+1:BC=BP+30720
8002 GOSUB30000
8003 POKEBP,20:POKEBC,S
8005 GH=5:GOSUB6000:GH=0:POKEBP,32
8006 BP=BP-44:BC=BC-44:IFBP<7702THENRETURN
8007 GOTO8002
8900 REM
10000 REM***MOVE MOTHER SHIP***
10001 PRINTD$;TAB(M)" @ABCAD ■■■■■■■■■■ EFGGFH ■■■■■■■■■■ IJKLMN "
10002 FORT=1TOZX
10003 IFM<1THENV=2
10004 IFM>14THENV=1
10005 POKE36878,15:POKE36876,220:FORL=1TO5:NEXTL:POKE36876,0:POKE36878,0
10006 RETURN:END
20000 POKE36878,15:FORXX=15TO0STEP-3:POKE36880,RND(1)*3+11:POKE36881,RND(1)*2+3
20001 POKE36877,160+XX:FORDE=1TO10:NEXTDE,XX:POKE36877,0
20010 PRINT"☹":POKE36878,8
20011 GOTO40000
28888 END
29999 REM**SCREEN DETECTION**
30000 IFPEEK(BP)=21THENS=SC+100:GOTO6900
30001 IFPEEK(BP)=171THENA$="☹☹☹☹YOU HIT A MINE":GOTO20000
30002 IFPEEK(BP)=120RPEEK(BP)=130RPEEK(BP)=14THEN2000
30003 IFPEEK(BP)=22THENS=SC+10:GOTO6900
30004 IFPEEK(MI)=90RPEEK(MI)=100RPEEK(MI)=11THENS=SC+100:GG=GG+1:GOTO6000
30005 IFPEEK(MI)=120RPEEK(MI)=13THENS=SC+100:GG=GG+1:GOTO6000
30006 IFPEEK(MI)=21THENS=SC-100:Q=32:RETURN
30007 IFPEEK(BP)=110RPEEK(BP)=100RPEEK(BP)=9THEN2000
30008 IFPEEK(MI)=171THENQ=32:A$="☹☹☹☹YOU HIT A MINE":GOTO20000
30009 IFPEEK(MI)=22THENQ=32:SC=SC-100:RETURN
30010 RETURN
39999 REM****END ROUTINES****
40000 REM
40001 POKE36869,240:POKE36879,8:PRINT"☹☹"
40002 PRINTA$
40003 PRINT"☹☹BUT YOU GOT ";GG:PRINT"OF YOUR☹☹ MEN SAFTLY OUT"
40004 PRINT"☹☹AND SCORED";SC:PRINT" PTS."
40005 PRINT"☹☹IN A TIME OF ";RIGHT$(TI$,3)
40008 FORT=1TO5000:NEXTT:PRINT"☹"
40010 POKE36879,27
40011 END
60000 A$="YOUR TIME IS UP":GOTO20000

```

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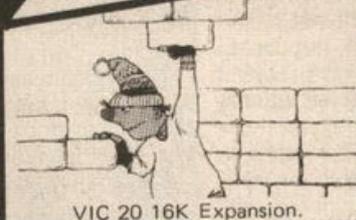
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The legend continues

Graham Taylor looks at the men behind Valhalla — a Norse legend brought to life

To date, Legend Software has released one game — a game that, depending on which chart you believe, has occupied one of the top five positions since the day of its release and looks set to remain there all Christmas and beyond. The game is *Valhalla*.

For a game which is doing so well, surprisingly little has been heard about the company. But, romantics who like stories of 12-year-old whizz kids are going to be disappointed. *Valhalla* is the end result of nearly nine months of coding by a team of seven, the majority of whom are very experienced programmers.

The almost military operation was masterminded by managing director John Peel. "The idea that we should do an animated graphics adventure goes back nearly two years. It really is the first logical step on the way to an interactive movie — something indistinguishable from a real film, except that you are one of the characters.

"The idea of interactive movies is pretty dramatic. We wanted a name for the company that would imply something romantic and grandiose — the name Legend was no accident, we spent days ploughing through dictionaries."

Valhalla has graphics and characters loosely based on Norse myth. Backgrounds depict forests, castles, caves and lakes and the characters are dressed with helmets and armour — as is appropriate to the theme.

In fact, though, such details were not decided until a very late stage of development: "They are incidentals really. We had outlined several different plots and *Valhalla* happened to be first. Once the Movisoft operating system was functional, aspects like shapes of character and types of background were mere detail."

It's Movisoft that ensures that *Valhalla* will be no one off. "Timing for *Val II* is less a matter of coding and more a question of market timing. Once demand for *Valhalla* has calmed down a bit and is ticking over

we'll issue it — I think we're looking at next spring."

Needless to say, *Val II* will not be called *Val II* but John would give away few details about it. "It won't be staggeringly different, but it will definitely be an improvement — we've learnt a lot from *Valhalla*."

John Peel has been involved in computer software for quite a while. He started Premier Publications, which later became Premier Microsystems — now familiar for a Dragon disc drive. He sold that company to set up another one familiar to Spectrum owners, Microl.

"Microl was an idea waiting for a computer. When the Spectrum was announced we were ready — the first product, *Use and Learn*, came out within days of the computer."

Microl was successful in an unspectacular way, and became the means of financing *Valhalla*. "The cost of *Valhalla* was at least £70,000 with all the development work and other outgoings. We were committed to selling a lot of programs to break even."

VALHALLA

The company has already recouped its costs and more. "I'm afraid we have bought the obligatory black Turbo Porsche, but the rest will be ploughed back into other projects."

Legend will be licencing Movisoft to other companies. The hope is that it will become the adventure game equivalent of CP/M — so standard that many computer manufacturers will allow for its easy implementation on their new machines.

"What's important is the size of memory — 48K is more or less mandatory — but I don't anticipate many new machines having less than that.

"Movisoft is not really specific to the Spectrum's Z80 processor at all. We did it on that machine simply because we could and it has sold the most," adds John.

This is borne out by the fact that *Valhalla* will be issued on the Commodore 64 in

February: "The Commodore 64 version of the game will be similar to the Spectrum one, but obviously the graphics will be better. For one thing, the characters will be more than one colour and we should also be able to do more with the backgrounds."

The team responsible for *Valhalla* was Graham Asher, Richard Edwards,



Managing director John Peel

Charles Goodwin, James Learmont, Jan Ostler and John. Several of the team were ex-IBM employees. None of the team had ever played a computer adventure before starting on the project, although some were *Dungeons and Dragons* fans.

Jan Ostler was responsible for many of the overall themes and ideas and, particularly, the characterisation. "The first thing I did when work began in earnest was to buy every adventure game I could lay my hands on — I spent a fortune.

"I was amazed at the lack of professionalism — most of them were full of spelling mistakes and obvious bugs — the only exception was *The Hobbit*."

John agreed: "I was sufficiently impressed to have a technical analysis done on it — the gist of that was 'well yes, but we can do better'.

"If we have done better, I think it's down to working as a team, giving people different and separate responsibilities. It's really impossible to do a big project like this any other way — take the analogy with conventional movies, imagine one person being not only the cameraman and the director but also having to design his own camera."

The success of that design can be seen in the number of technical achievements in *Valhalla*. Two aspects are particularly interesting — the seeming independence of the characters and their ability to continue with what they are doing, not only as you watch, but even when you are typing in commands.

VALHALLA

The character independence was achieved by a technique known in artificial intelligence circles as "fuzzy logic". This involves a deliberate smearing of fixed patterns, using random processes. Put simply, instead of saying "under condition X, Character Y will do Z", the situation is changed so that Y might not do Z under condition X although the character probably will.

"Actually it's nothing like as simple as sticking in a random number from time to time. Rather, there are multiple levels of generators controlling the events, some are predictable, others are not — we control how they interact."

The way action and input can occur at the same time — a technique known as concurrency — is less easy to explain.



Apparently, "the concurrency is achieved by using vectored interrupts in conjunction with registers and stack 'lookaside' copies," said John. Now you know.

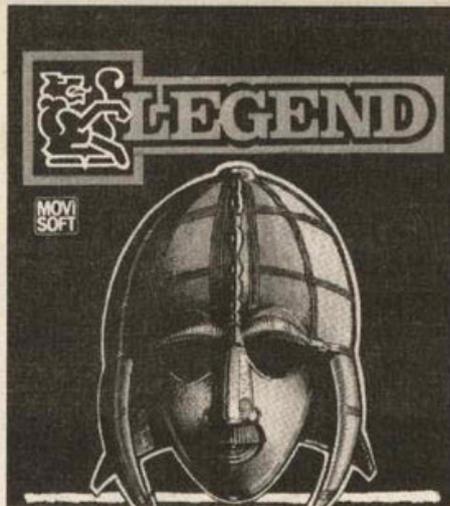
In keeping with its name, Legend's plans for the future are dramatic and grandiose. "We're waiting for the hardware to a certain extent, to get the kind of graphics we want to do, we need a lot more memory.

"We're also interested in the idea of speech. Quite honestly, the only thing stopping anyone from having a speech unit with decent human-like speech is that no one has got round to designing a new chip — everyone is still using the Texas chip, that's why they all sound like Daleks."

Another area that interests Legend is speech recognition. "It's not that difficult to get a computer to recognise speech, but it's difficult to do it under normal conditions, ie, when everyone shouts at once."

Assuming these problems are solved, John is very enthusiastic about the outcome. "With plenty of memory, plus good speech, plus speech recognition, there is no reason why there should not be a program visually indistinguishable from a tv picture with characters whom you can speak to and who will answer back — the potential market is enormous."

John actually sees a day in which there will be something like a video library, with all sorts of different interactive movies on all sorts of themes which people hire for



the evening. "You could have just as many themes as normal videos — cowboys, horror, science fiction and so on.

"A whole new kind of artistic talent might develop — if we can make Movisoft simple enough to operate so that only a small amount of actual programming knowledge is necessary, then creative people could use the system to design plots and characters like a scriptwriter or a director."

So far as the future is concerned John doubts that many of the micros being launched now will survive. "There are some nice machines, but quite honestly I don't see how they are going to survive — in this country Sinclair and Commodore have got it sewn up — or at least they have

if they choose to play rough. I don't think we'll see more than three or four manufacturers survive in the next few years — then we'll see the kind of standardisation under which systems like Movisoft can flourish."

Some of the lessons learnt from *Valhalla* will bear fruit in non-adventuring areas, says Jan. "There is no sensible reason why computers should be the province of males between 15 and 35, but people just haven't discovered how to write programs for women. We have something planned that will help to change that situation."

Legend are giving little away, but it seems such a project would involve some of the artificial intelligence techniques used in *Valhalla* to an even more sophisticated degree.

Legend seems a peculiar mixture of daydreamers, who've proved their dreams are at least partly possible, and fairly hard-bitten realists playing close attention to the market and its requirements. It may be that this mixture was a vital part of the success of the project.

John Peel sums up *Valhalla* in the following way: "I would call it a qualified success — certainly we've proved that a number of things are possible on a cheap home computer that everybody said were impossible. More than that, I think we've introduced the basic concept to people. Naturally there are a lot of things I would change about *Valhalla*, things which could have been done better even on a Spectrum — wait until the next one."

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In the driving seat

Graham Taylor looks at three games designers and compares the results

Does the following pattern sound familiar? You buy a computer after months of planning and saving. For a while you play with it avidly, you even learn a reasonable amount of Basic programming. There follows a period of increasing disenchantment as you realise that your own programs are never likely to reach the standards of the top software houses — gradually your computer gets left on the shelf more and more, a sad, lonely sight.

What we all hope to get from having a computer is a kind of technological Lego — an endlessly changeable toy. The problem is that just buying commercial programs doesn't bring the satisfaction of creating them yourself.

If this does sound familiar, then now is the time to bring out your machine from the top shelf and dust it down. The fun may come back to computing — the games designers have arrived.

These packages allow you to create your own games, using various kinds of menus or special languages. The result is a far more professional game that is faster than anything written in Basic. The price you pay is some degree of restriction in the kinds of game you can create.

Although the packages reviewed here are predominantly Spectrum-based, you can expect to see similar programs being made available for other machines shortly.

To begin with though, *CoCo II*, a program for the Vic20 that's been around for quite a while, but hasn't been distributed

widely in this country.

You design your game in two distinct sections — *Player* and *Opponent*. Within each section you use a simple, Basic-like, language to determine the pattern of movement and the score values. Movement is by a minimum of four pixels at a time, which means that the end result is bound to be fairly jerky.

The language is easy to use: the eight points of the compass are assigned numbers, with one extra number for 'track', ie, for the opponent and player to follow one another. Movement is then a matter of a series of commands like *Move 1 5*, *Move 4, 12* etc meaning SW for 5, 4 pixel units, then W for 12 units.

Shapes are designed using a simple user-defined graphics generator, operated by joystick — you just fire to turn a pixel on or off. The program comes with an extensive manual and one sample game which, unfortunately, doesn't really show the program off at its best.

The problem with *CoCo II* is that the end results are rather disappointing — they are not really very much better than you could do with only a limited knowledge of Basic — the only exception to this being the ease with which you can create shapes, but then there are plenty of programs around to help you do that for far less money.

In terms of the quality of the end result, *Games Designer* from Quicksilver is a far more impressive package. The program

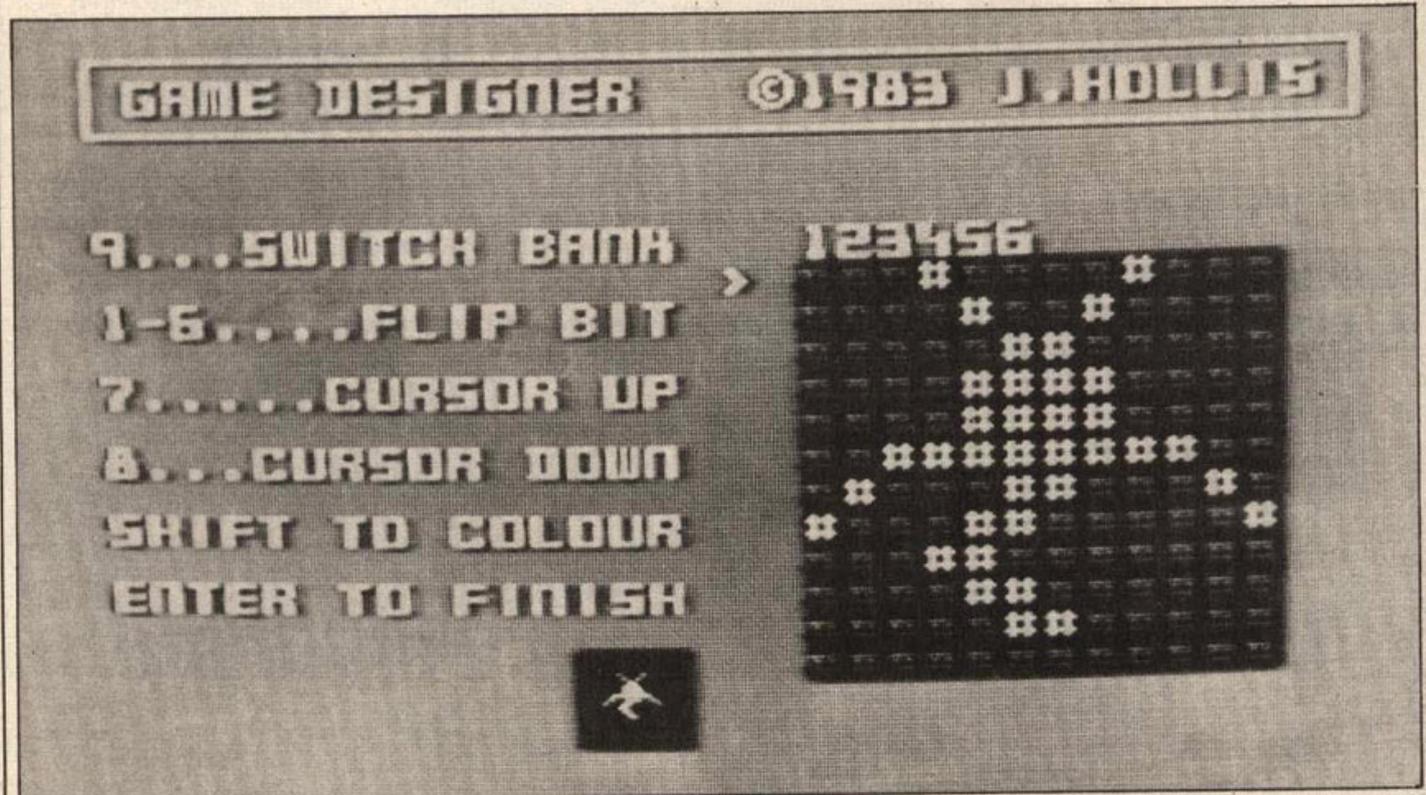
comes with eight ready-made games, any of which might have been marketed successfully in its own right in the early days of Spectrum games.

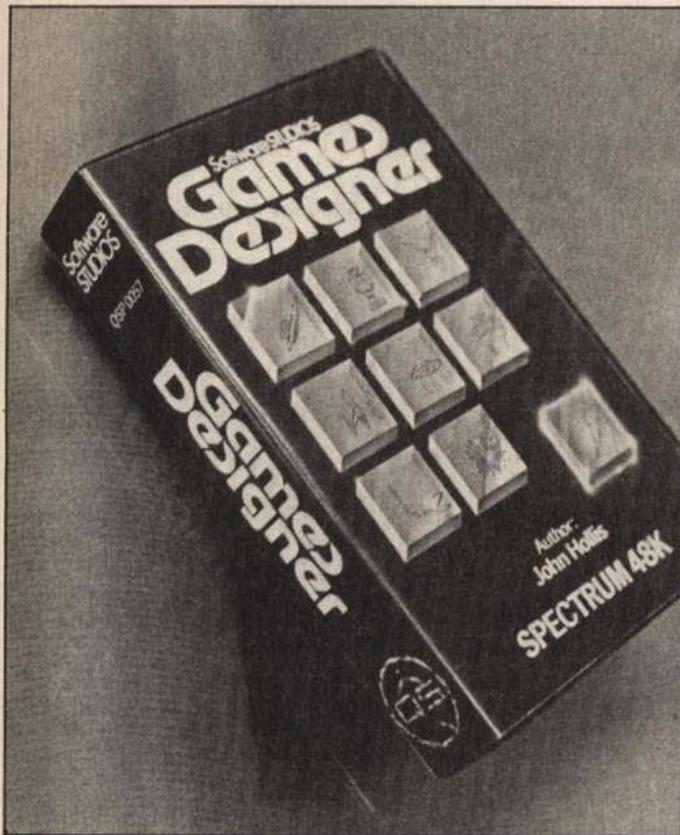
The main reason for the quality of the games is the provision of a sprite generator within the program — independent graphic shapes whose movements can be individually defined. Sprite movement is smooth and fast and is the basis for most arcade machines. Using simple cursor controls any shape may be assigned, up to 32 sprites, as may any colour.

Any of four game formats can be selected — *Invaders*, *Defender*, *Asteroids* or *Beserk* type. The difference between the game lies in the screen layout and the position and manoeuvrability of the missile base/spacehip; eg, *Invaders* format gives you a base at the bottom of the screen, with waves of aliens attacking from the top, and base movement limited to left and right. In *Asteroids* format, the spaceship is placed centre screen with the enemy swirling around it — the base can move in all directions.

Using a series of menu options, sounds can be assigned to shapes using a simple but effective sound generator. The movement and attack waves are selected — ie, how many aliens move where and at what time. Movement is almost infinitely variable and is programmed in a similar way to *CoCo* with numbers assigned to directions. A line display shows you the pattern of movement you are creating.

Other options on the menu allow for a star background and optional features like whether or not your ship has a shield. You may also select which, if any, of your waves of attackers are able to fire back at you.





One of the most impressive features of the *Games Designer* is the animation of the aliens. By designing two appropriate sprites, a menu option allows you to switch quickly between them — thus, space invaders can wave their arms threateningly, or spheres can appear to spin.

If you like fairly straightforward alien bashing, then *Games Designer* is for you — you really can create games as good as those available commercially, but to your own specifications. The only criticism I would make is that you really don't have much choice over the basic structure of each game, since you must adopt one of the four predetermined formats.

As proof that the idea of programs for creating games aren't limited to arcade-style games, Gilsoft have now released *The Quill* — a program for constructing text adventures.

To use *The Quill* properly requires some effort and some experience — it is abso-

lutely essential to go through the examples in the manual. But, although it requires the most effort to get a tangible result, *The Quill* is perhaps the most satisfying of all the programs mentioned.

The program again works by the use of menus. It is vital to plan out your adventure completely before you start — decide how many rooms there will be and where they will be in relation to one another; eg, bathroom west from bedroom, etc. You also need to decide what objects are located where and what conditions must be met to solve various obstacles, eg, the torch must be switched on before you go down to the cellar otherwise you fall and break your neck.

Using the menu, you enter the text associated with each room and the objects found there. The most difficult section is

the list of acceptable verbs, this includes not only those vital to the plot, eg, 'Kill vicious monster' but other inputs to which you want the game to respond with something other than "I don't understand . . ."

The crux of this input response is the use of flags — put simply these are 29 on/off switches used to determine various courses of action; eg, you may decide that flag 15 is set on when someone picks up the screwdriver. Later on, opening a safe may depend on whether or not you have the screwdriver; ie, is the flag set or not? It's not difficult to use, but it does require logical thought, particularly if you want to create brain-teasing puzzles in the game.

For an adventure fan, possibly the only thing more satisfying than solving puzzles is creating your own and watching someone else trying to solve them — particularly when you can populate your adventure with people and places known to those likely to try and solve it. Gilsoft will even let you market your *Quill*-written adventure — they only ask for a mention. *Quill* supplies the programming (in machine code), all you have to provide is some thought, planning and perseverance.

Despite the odd reservation, all these packages can be recommended, They might breathe new life into your micro, merely by putting you back in the driving seat and letting you find out what you can do.

Firm	Program	Cost
Gilsoft 30 Hawthorn Road Barry South Glamorgan CF6 8LE	<i>The Quill</i>	£14.95
Games Designer Software Studios Quicksilver 13 Palmerston Road Southampton Hampshire	<i>Games Designer</i>	£14.95
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VALHALLA

One hundred and eighty

Andy Wilson concludes his series on structured programming for the ZX81

Last week we looked at assembly language. I now hope to give a few more tips on using the routines.

As the procedures must be defined before they are called it is best to have all the procedure definitions at the beginning of the program. Alternatively, you could throw your scruples to the wind and use a *Gosub*, with the definitions at the end of the program.

Procedures can be called from within other procedures, or even iteratively; ie, a procedure can call itself, but keep one eye on the procedure stack!

One of the shortcomings of the routines is that parameters cannot be passed to and from procedures. We can, however, simulate this facility in the same way we might when using *Gosubs*, eg:

```
500 LET X = Y
510 LET XFACTORIAL = USR CALLPROC
520 LET Y = X
```

With an appropriate procedure *XFactorial* this will work out the factorial of Y, or any other variable we may wish to use.

Listing 7 is an example of a full program written using the routines. It is supposed to simulate the electronic darts scoreboards often seen in pubs. It has the advantage that the score of each dart can be entered individually, with a constant display of the running scores, and the current thrower's round score and score needed to finish.

You will, I hope, notice the total absence of the dreaded *Gotos* and *Gosubs*. You will also, in all probability, notice the lack of the explanatory REMs whose virtues I extolled

earlier. This is a deliberate move intended to show how easy it can be to follow the gist of a reasonably structured program.

Although I have not used REMs to actually explain the program, I have used them to help clarify the structure. REMs followed by a line or more of spaces are used to separate parts of the program, while REMs followed by graphic shifted 7s are used to underline procedure names.

The program was written 'top down'; that is the outline of what procedures would be needed, and how they would relate to each other, was decided before any actual code was written. Naturally this outline has often changed by the time a program is complete, but this method still helps make it easier to understand. You should get a rough idea of how the program works simply by looking at the procedure names and where they are called.

Nevertheless, I expect some explanation of the program would not go amiss. If you intend to type in the program I suggest you do so first, after *Loading* the machine code of course, then *Run* it. This should make things much clearer.

I will give a brief explanation of each procedure, in reverse order, starting with:

Intro: I hope you can guess what this does. Called by the main program.

Scrollup: as the name suggests scrolls the screen up one line, keeping the current print line the same. The top line, T\$, is reprinted so we don't lose it. Note the *Print* after *Scroll* to avoid upsetting the

display. Called by *Play*.

DartIn: checks the score entered is, in fact, a possible dart throw, and sees if it is a double or treble. Called by *ScoreIn*.

ScoreIn: inputs the score and converts it from a string to an integer. Called by *Round*.

Round: gives a player three throws, adds each dart to the round score and takes it away from the score needed to win. It then makes sure the player hasn't 'bust'. Called by *Play*.

Play: firstly looks at the print line to see if the screen needs scrolling. It then plays a *Round* for each player. If the player hasn't bust it updates the score and prints the new one. Called by the main program.

Win: if a player's running score is 0 and his/her last dart was a double or a bull we call *Win*. A polite message is printed, a note is taken of who won, I is set to 2 in order to leave the *For* loop, and the *Won* flag is set. Called by *Round*.

Main Program: starts by calling the *Introduction* and setting up two strings for the headings and spaces. The rest of the program is repeated until the reply to the "Play Again?" prompt is not 'Y'. After initialising the variables and the screen we keep *Playing* until the *Won* flag is set.

Presuming you know how to play darts that should have been quite easy to follow. I hope you have found these articles interesting and maybe even useful. If you were looking for tips on saving memory or speeding up your games you have read the wrong articles, but if you've got this far you must have got something from them, and any comments or even criticisms, constructive of course, would be very welcome.

LISTING 7
=====

EXAMPLE PROGRAM

```
10 REM **DARTS SCOREBOARD**
=====

20 LET PLAY=USR DEFPROC
25 REM
30 LET LINE=LINE+1
40 IF LINE=18 THEN LET SCROLLU
P=USR CALLPROC
50 FOR I=1 TO 2
60 LET ROUND=USR CALLPROC
70 LET S(I)=S(I)-(ROUNDSCORE R
ND NOT BUST)
80 PRINT AT LINE,I*10;S(I)
90 NEXT I
100 RAND USR ENDPROC
110 REM

200 LET ROUND=USR DEFPROC
205 REM
210 LET ROUNDSCORE=0
220 PRINT AT 19,0;"PLAYER ";I;"
>
230 LET BUST=0
240 LET DARTS=0
250 RAND USR REPEAT
255 PRINT AT 20,0;"YOU NEED ";T
260 LET DARTS=DARTS+1

270 LET SCOREIN=USR CALLPROC
280 PRINT AT 19,DARTS*4+8;D$
290 LET ROUNDSCORE=ROUNDSCORE+D
ARTSCORE
300 IF S(I)-ROUNDSCORE<2 THEN L
ET BUST=1
310 IF S(I)-ROUNDSCORE=0 AND (M
ULT=2 OR DARTSCORE=50) THEN LET
WIN=USR CALLPROC
320 PRINT AT 19,26;(STR$ ROUNDS
CORE) AND NOT BUST;"BUST" AND BU
ST AND NOT WON
330 POKE UNTIL,DARTS=3 OR BUST
340 RAND USR CHECK
350 FOR F=1 TO 30
360 NEXT F
370 PRINT AT 19,0;S$;TAB @;S$;T
AB @;S$
380 RAND USR ENDPROC
390 REM

400 LET SCOREIN=USR DEFPROC
405 REM
410 RAND USR REPEAT
420 LET ERROR=0
430 INPUT D$
440 LET DARTIN=USR CALLPROC
450 POKE UNTIL,NOT ERROR
460 RAND USR CHECK
470 LET DARTSCORE=VAL D$*MULT
480 LET D$=C$+D$
490 RAND USR ENDPROC
495 REM

500 LET DARTIN=USR DEFPROC
505 REM
```

```

510 IF D$="" THEN LET D$="999"
520 LET MULT=1+(D$(1)="D")+2*(D$(1)="T")
530 LET C#=D$(1) AND MULT>1
540 IF MULT>1 THEN LET D#=D$(2 TO )
550 FOR F=1 TO LEN D$
560 IF D$(F)<"0" OR D$(F)>"9" THEN LET ERROR=1
570 NEXT F
580 IF NOT ERROR THEN IF (VAL D$>20 AND VAL D$<>25 AND VAL D$<=20) OR (VAL D$>20 AND MULT>1) THEN LET ERROR=1
590 RAND USR ENDPROC
595 REM

600 LET WIN=USR DEFPROC
605 REM
610 PRINT AT 19,25;"YOU WON"
620 LET WINNER=I
630 LET I=2
640 LET WON=1
650 RAND USR ENDPROC
660 REM

700 LET SCROLLUP=USR DEFPROC
705 REM
710 SCROLL
720 PRINT TAB 31;" "
730 LET LINE=17
740 PRINT AT 0,0;T$
750 RAND USR ENDPROC
760 REM

800 LET INTRO=USR DEFPROC
805 REM
810 PRINT TAB 8;"DARTS SCOREBOARD";TAB 8;"=====
820 PRINT AT 5,0;"SCORES SHOULD BE ENTERED IN THE FORM SHOWN BELOW. E.G.:-"
830 PRINT AT 0,0;"SINGLE 7" "=" 57","DOUBLE 18" "=" 114","TRIPLE 20" "=" 120","OUTER BULL" "=" 25"
840 PRINT AT 15,10;"PRESS A KEY"
850 PAUSE 4E4
860 RAND USR ENDPROC
870 REM

1000 REM *MAIN PROG STARTS HERE*
=====
1005 LET INTRO=USR CALLPROC
1010 DIM S(2)
1020 LET S$=""

1030 LET T$=""          PLAYER 1 P
1040 RAND USR REPEAT
1050 CLS
1060 LET S(1)=501
1070 LET S(2)=501
1080 LET WON=0
1090 LET LINE=1
1100 PRINT AT 0,0;T$
1110 PRINT AT 1,10;S(1);TAB 20;S(2)
1120 RAND USR REPEAT
1130 LET PLAY=USR CALLPROC
1140 POKE UNTIL,WON
1150 RAND USR CHECK
1160 PRINT AT LINE,WINNER*10;"WON"
1170 PRINT AT 21,0;"PLAY AGAIN ?" (Y/N)
1180 INPUT U$
1190 PRINT AT 21,0;S$
1200 POKE UNTIL,U$<>"Y"
1210 RAND USR CHECK
1220 STOP
1230 REM

9997 REM **AUTO-RUN**
=====
9998 SAVE "DARTS"
9999 RUN

```

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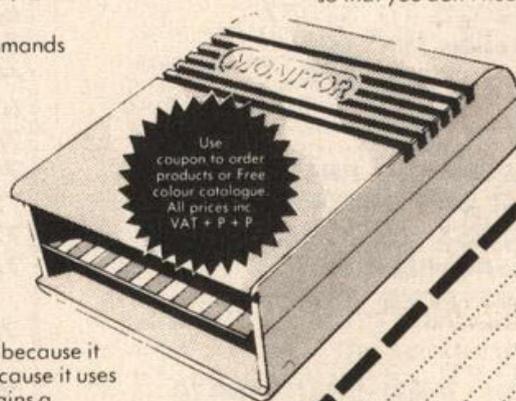
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One page at a time

Richard Walton presents a modified print routine for listing programs

The Dragon *List* routine is inconvenient if a long program is to be edited. Although *Shift @* can be used to stop the listing at any time, an automatic "paging" of the listing is much more convenient.

The accompanying program provides such a facility. It does this by intercepting the Dragon's normal routine.

An assembler listing is provided to show how the routine works. In addition, a Basic program is given for users who do not

have an assembler.

The program uses a number of useful addresses as follows:

H16A or *362*: this is called by Basic whenever a key is pressed. The program intercepts this call. Normally this address contains a 57 code (*Rts*) but the program replaces this with a 126 code (*Jmp*).

H167 or *359*: this is called whenever a character is printed. This is intercepted in the way described previously.

The Rom routine to get a character from the keyboard is also used. This is at address *41194*.

When the Basic program is Run, the machine code is *Poked* into reserved memory from address *32001*. The program contains a check on the Data statements and will stop if an error is found. The *Pokes* in lines 710 to 730 set up the interrupts which call the program.

The program can be called by pressing down-arrow key when required. A further pressing of the key returns to normal Basic print routine, which makes the running of programs more convenient.

When first entering and testing the program listing, leave out line 770 or you won't be able to alter it. ■

```

100 'IMPROVED DRAGON LISTING
110 'ROUTINE - R.WALTON.
120 '19/11/83
130 CLEAR 200,32000
140 FOR I=32001 TO 32008
150 READ A$:A$="&H"+A$
160 A=VAL(A$):POKE I,A
170 T=T+A
180 NEXT I
190 IF T<>439 THEN PRINT"DATA
    ERROR IN 620":STOP ELSE T=0
200 FOR I=32009 TO 32016
210 READ A$:A$="&H"+A$
220 A=VAL(A$):POKE I,A
230 T=T+A
240 NEXT I
250 IF T<>442 THEN PRINT"DATA
    ERROR IN 630":STOP ELSE T=0
260 FOR I=32017 TO 32024
270 READ A$:A$="&H"+A$
280 A=VAL(A$):POKE I,A
290 T=T+A
300 NEXT I
310 IF T<>789 THEN PRINT"DATA
    ERROR IN 640":STOP ELSE T=0
320 FOR I=32025 TO 32032
330 READ A$:A$="&H"+A$
340 A=VAL(A$):POKE I,A
350 T=T+A
360 NEXT I
370 IF T<>622 THEN PRINT"DATA
    ERROR IN 650":STOP ELSE T=0
380 FOR I=32033 TO 32040
390 READ A$:A$="&H"+A$
400 A=VAL(A$):POKE I,A
410 T=T+A
420 NEXT I
430 IF T<>521 THEN PRINT"DATA
    ERROR IN 660":STOP ELSE T=0
440 FOR I=32041 TO 32048
450 READ A$:A$="&H"+A$
460 A=VAL(A$):POKE I,A
470 T=T+A
480 NEXT I
490 IF T<>771 THEN PRINT"DATA
    ERROR IN 670":STOP ELSE T=0
500 FOR I=32049 TO 32056
510 READ A$:A$="&H"+A$
520 A=VAL(A$):POKE I,A
530 T=T+A
540 NEXT I
550 IF T<>965 THEN PRINT"DATA
    ERROR IN 680":STOP ELSE T=0
560 FOR I=32057 TO 32066
570 READ A$:A$="&H"+A$
580 A=VAL(A$):POKE I,A
590 T=T+A
600 NEXT I
610 IF T<>853 THEN PRINT"DATA
    ERROR IN 690 OR 700":STOP
620 DATA 20,01,12,B1,0A,26,1D,B6
630 DATA 7D,03,B1,01,26,0C,86,00
640 DATA B7,7D,03,86,39,B7,01,67
650 DATA 20,0A,86,01,B7,7D,03,86
660 DATA 7E,B7,01,67,39,20,01,12
670 DATA 34,06,B6,7D,28,B1,C8,25
680 DATA 0B,7F,7D,28,4F,BD,A0,EA
690 DATA B1,20,26,F9,35,06,7C,7D
700 DATA 28,39
710 POKE 360,&H7D:POKE 361,&H26
720 POKE 363,&H7D:POKE 364,&H01
730 POKE 359,126:POKE 362,126
740 CLS:PRINT:PRINT"
    PROGRAM INSTALLED"
750 PRINT:PRINT"  PRESSING
    <DOWN-ARROW> TOGGLES"
760 PRINT"  PROGRAM ON AND OFF"
770 NEW
    
```



7D01	30	PRT #000C
7D01 2001	40	BRA @START
7D03 12	50	@TOGGLE NOP
7D04 B10A	60	@START CMPA #10 DOWN ARROW
7D06 261D	70	BNE @OUT IF NOT THEN RETURN
7D08 B67D03	80	LDA @TOGGLE
7D0B B101	90	CMPA #1 IS ROUTINE ON
7D0D 260C	100	BNE @SETLIST IF NOT PUT ON
7D0F B600	110	LDA #0
7D11 B77D03	120	STA @TOGGLE SET OFF FLAG
7D14 B639	130	LDA #57
7D16 B70167	140	STA 359
7D19 200A	150	BRA @OUT
7D1B B601	160	@SETLIST LDA #1
7D1D B77D03	170	STA @TOGGLE SET ON FLAG
7D20 B67E	180	LDA #126 JUMP TO NEW ROUTINE
7D22 B70167	190	STA 359
7D25 39	200	@OUT RTS
7D26 2001	210	BRA @START1
7D28 12	220	@STORE NOP
7D29 3406	230	@START1 PSHS D
7D2B B67D28	240	LDA @STORE NO OF CHARS PRINTED
7D2E B1C8	250	CMPA #200
7D30 250B	260	BLO @OUT1
7D32 7F7D28	270	CLR @STORE
7D35 4F	280	CLRA
7D36 BDA0EA	290	@HOLD JSR 41194 GET* ROUTINE
7D39 B120	300	CMPA #32 SPACE PRESSED
7D3B 26F9	310	BNE @HOLD IF NOT WAIT
7D3D 3506	320	@OUT1 PULS D
7D3F 7C7D28	330	INC @STORE
7D42 39	340	RTS
7D43	350	END



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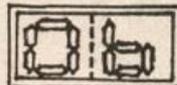
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In reverse

Trevor Toms continues his machine code series for the Spectrum — part three

Last week we looked at the storage on simple data items and glanced at how the same ideas could be extended into the machine code equivalent of arrays. The next stage of this development is to consider how expressions can be evaluated and assigned to variables.

The direct comparison with Basic is that we are trying to write the equivalent of:

```
LET x = b(4) * 6 + 2
```

in machine code.

The first step is to rewrite your expression in "reverse Polish" notation — just like calculators of a few years back (and today if you're lucky enough to afford a Hewlett Packard!).

So our expression above would be written as:

```
b(4) (stack)
6 (stack)
*
2 (stack)
+
```

giving a final result which will be stored in data area X using methods adopted last week.

Each operator (eg, * or + in this case) operates on the top two stacked items to give a resulting value on the top of the stack. If you've used Forth, you'll be very familiar with this concept — in fact, one reason why Forth is so fast is because the concepts translate very readily into machine code.

As a good guideline, try to keep to a strict convention regarding the use of registers in your routines. Personally, when writing a "Basic translation" program I use the HL registers to hold the "latest result" of any expression, the DE registers to hold array subscripts or second operand from an arithmetic operation, and the stack to hold the "latest result" when a nested expression is required.

Once again, it is worth stressing that this is not necessarily the best way to write machine code, but it is safe and helps assure working code until you have built up enough confidence to spread your horizons.

So we can now translate the small example above into machine code as follows:

```
b(4) LD DE,4
CALL GET$ITEM ;see last week
6 LD DE,6 ;direct value
* CALL MUL16 ;see 1st week
2 LD DE,2 ;direct value
* ADD HL,DE ;res 11 in HL
LET x= LD (X),HL
```

Since the MUL16 and DIV16 routines leave their result in HL, you can see that the code required to evaluate this type of expression is extremely compact.

The equivalent of Basic functions be-

comes only a little more complex. By writing a series of small subroutines which operate on the value in registers HL and leave the result in HL, you can simulate most of the Spectrum functions quite easily. Listing 1 gives a handful of subroutines that simulate a fair proportion of the normal functions.

Remember that you cannot easily use floating point or strings in machine code without some degree of effort, so functions such as Sin, Log, STR\$, etc, are not included in this list. Nevertheless, you can write some extremely powerful programs without these functions. In future articles you'll see how some of these limitations can be overcome.

The routines are: Equal, Not\$Equal, Greater\$Than, Less\$Than, ZxAnd, ZxOr, ZxNot, ZxIn, ZxPeek. In each case (except the last two), the routine operates on two values supplied in the HL and DE register pairs, leaving a "true" or "false" result in

HL. As with Basic, "true" is represented by the value 1, while "false" is given by the value 0. It may have been more logical to use the value -1 (0FFFFh) for "true", but this would be inconsistent with Basic, and would therefore require some additional translation when rewriting your Basic program in machine code.

The last two are examples of the way that true binary functions can be implemented — the subroutines operate on the value in HL and leave the result in HL. In practice, you can write the "peek" routine more efficiently by using in-line code instead of calling a subroutine, but, as I have said earlier, keeping things consistent is best for now.

Below is a better example of how to use some of these routines alongside an equivalent Basic program (see also listing 2).

Next week we start to look at ways of using the Spectrum hardware from machine code — this is where things start hotting up!

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

```
5 LET result = 0
LD HL,0 ;set RESULT to zero
LD (result),HL
10 LET char = CODE INKEYS: IF char = 0 THEN GO TO 10
L10: LD A,1 ;select keyboard
CALL SELDEV
CALL AWAIT$KEY ;wait for a key
LD L,A ;put keycode into HL
LD H,0
LD (char),HL ;... and save it
20 IF (char < 48) OR (char > 58) THEN GO TO 100
LD DE,48 ;check if > 48
CALL LESS$THAN
LD A,L ;test if true reply
OR A
JR NZ,L100 ;yes — jump forward
LD HL,(char) ;reload character value
LD DE,58 ;check if > 58
CALL GREATER$THAN
LD A,L ;test for true reply
OR A
JR NZ,L100 ;jump forward if true
30 LET result = (result * 10) + (char - 48)
LD HL,(result) ;load current result
LD DE,10
CALL MUL16 ;multiply by 10
PUSH HL ;save on stack
XOR A ;clear carry flag
LD HL,(char) ;load character value
LD DE,48
SBC HL,DE ;subtract 48
POP DE ;get (RESULT * 10) into DE
ADD HL,DE ;add to latest result
LD (result),HL ;resave
40 GO TO 10
JR L10 ;jump back for more
100 PRINT result
L100: LD A,2 ;select screen output
CALL SELDEV
LD BC,(result) ;load result value
CALL PRINT$NUM ;print it
110 STOP
RET ;return to Basic
```



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Addr Hex	Op	Operands	Addr Hex	Op	Operands
FF58	EQUAL:		FA00	SELDEV:	
FF58 A7	AND	A	FA00	EQU	1601H
FF59 ED52	SBC	HL,DE	FA00	PRINT#NUM:	
FF5B 210000	LD	HL,0	FA00	EQU	1A1BH
FF5E C0	RET	NZ	FA00	AWAIT#KEY:	
FF5F 23	INC	HL	FA00	EQU	15D4H
FF60 C9	RET		FA00	LESS#THAN:	
FF61	NOT#EQUAL:		FA00	EQU	OFF6BH
FF61 A7	AND	A	FA00	GREATER#THAN:	
FF62 ED52	SBC	HL,DE	FA00	EQU	OFF6AH
FF64 210100	LD	HL,1	FA00	MUL16:	
FF67 C0	RET	NZ	FA00	EQU	65000
FF68 2B	DEC	HL	FA00	ORG	64000
FF69 C9	RET		FA00	ENTRY#POINT:	
FF6A	GREATER#THAN:		FA00 210000	LD	HL,0
FF6A EB	EX	DE,HL	FA03*220000	LD	(RESULT),HL
FF6B	LESS#THAN:		FA06	L10:	
FF6B A7	AND	A	FA06 3E01	LD	A,1
FF6C ED52	SBC	HL,DE	FA08 CD0116	CALL	SELDEV
FF6E 7C	LD	A,H	FA0B CDD415	CALL	AWAIT#KEY
FF6F 17	RLA		FA0E 6F	LD	L,A
FF70 210000	LD	HL,0	FA0F 2600	LD	H,0
FF73*E20000	JP	PO,LTB	FA11*220000	LD	(CHAR),HL
FF76 3F	CCF		FA14 113000	LD	DE,48
FF77	LTB:		FA17 CD6BFF	CALL	LESS#THAN
FF77 ED6A	ADC	HL,HL	FA1A 7D	LD	A,L
FF79 C9	RET		FA1B B7	OR	A
FF7A	ZXPEEK:		FA1C*2000	JR	NZ,L100
FF7A 6E	LD	L,(HL)	FA1E*2A0000	LD	HL,(CHAR)
FF7B	PKB:		FA21 113A00	LD	DE,58
FF7B 2600	LD	H,0	FA24 CD6AFF	CALL	GREATER#THAN
FF7D C9	RET		FA27 7D	LD	A,L
FF7E	ZXIN:		FA28 B7	OR	A
FF7E 44	LD	B,H	FA29*2000	JR	NZ,L100
FF7F 4D	LD	C,L	FA2B*2A0000	LD	HL,(RESULT)
FF80 ED68	IN	L,(C)	FA2E 110A00	LD	DE,10
FF82 18F7	JR	PKB	FA31 CDEBFD	CALL	MUL16
FF84	ZXNOT:		FA34 E5	PUSH	HL
FF84 7C	LD	A,H	FA35 AF	XOR	A
FF85 B5	OR	L	FA36*2A0000	LD	HL,(CHAR)
FF86 210000	LD	HL,0	FA39 113000	LD	DE,48
FF89 C0	RET	NZ	FA3C ED52	SBC	HL,DE
FF8A 23	INC	HL	FA3E D1	POP	DE
FF8B C9	RET		FA3F 19	ADD	HL,DE
FF8C	ZXAND:		FA40*220000	LD	(RESULT),HL
FF8C 7C	LD	A,H	FA43 18C1	JR	L10
FF8D A2	AND	D	FA45	L100:	
FF8E 67	LD	H,A	FA45 3E02	LD	A,2
FF8F 7D	LD	A,L	FA47 CD0116	CALL	SELDEV
FF90 A3	AND	E	FA4A*ED4B0000	LD	BC,(RESULT)
FF91 6F	LD	L,A	FA4E CD1B1A	CALL	PRINT#NUM
FF92 C9	RET		FA51 C9	RET	
FF93	ZXOR:		FA52	CHAR:	
FF93 7C	LD	A,H	FA52 0000	DEFW	0
FF94 B2	OR	D	FA54	RESULT:	
FF95 67	LD	H,A	FA54 0000	DEFW	0
FF96 7D	LD	A,L			
FF97 B3	OR	E			
FF98 6F	LD	L,A			
FF99 C9	RET				

Symbols:

EQUAL FF58 NOT#EQ FF61
 GREATER#THAN FF6A LESS#T FF6B
 LTB FF77 ZXPEEK FF7A
 PKB FF7B ZXIN FF7E
 ZXNOT FF84 ZXAND FF8C
 ZXOR FF93
 No error(s)

Symbols:

SELDEV 1601 PRINT# 1A1B
 AWAIT# 15D4 LESS#T FF6B
 GREATER# FF6A MUL16 FDEB
 ENTRY# FA00 L10 FA06
 L100 FA45 CHAR FA52
 RESULT FA54
 No error(s)

Programming by angles

Czes Kosniowski explains the use of trigonometry in programming

Seldom can we directly measure the heights of tall buildings, hills, trees, etc. One way to find the height of a building or tree is to stand away from the object. Now measure the angle between the horizontal and the highest point of the object (using a clinometer, which is just a glorified protractor), then measure the distance between you and the object. By drawing a scale drawing the height of the object can be readily estimated. See Figure 1.

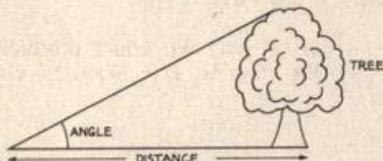


Figure 1

You couldn't use the same technique to measure the height of a mountain peak which is miles away and covered in clouds. The clouds would get in your way, and you couldn't measure the horizontal distance. An instrument such as a tellinometer would help. This uses radar to locate the top of the mountain. It also measures the angle and distance between you and the top. A scale drawing would provide a way of calculating the height of the mountain. (Figure 2).

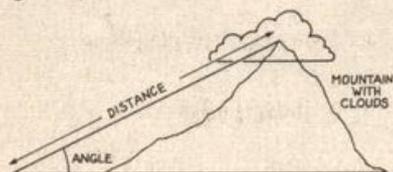


Figure 2

As a further example suppose we wanted to find the width of a large pond or lake (see Figure 3). A scale drawing drawn from the measurements made could be produced and the required distance estimated.

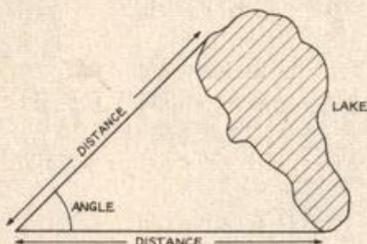


Figure 3

Here is a related example. A navigator is at a certain position A. He is 150 km due west of city B and 188 km from city C. The angle between the two cities is 23 degrees measured from his position. How far apart are the two cities? Again, a scale drawing could provide the answer.

Although scale drawing will provide answers to the problems mentioned above they are rough and ready. And it is not

always practicable or accurate to produce scale drawings. An alternative approach is to do it by trigonometry using your Commodore 64.

The trigonometry functions

The three important trigonometric functions are SIN (sine function), COS (cosine function) and TAN (tangent function). They each represent ratios of the various sides of a right-angled triangle. For example, the triangle in Figure 4 is a right-angled triangle. The angle at the corner of the left is denoted by the symbol X. The three sides of the triangle will be referred to as the side adjacent to X, the side opposite X, and the hypotenuse (the longest side).

$$\text{TAN}(X) = \frac{\text{opposite}}{\text{adjacent}}$$

$$\text{SIN}(X) = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{COS}(X) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

Some useful values to remember are the following:

$$\begin{aligned} \text{SIN}(0^\circ) &= 0 \\ \text{SIN}(30^\circ) &= 0.5 \\ \text{SIN}(45^\circ) &= 1/\text{SQR}(2) \\ \text{SIN}(60^\circ) &= \text{SQR}(3)/2 \\ \text{SIN}(90^\circ) &= 1 \\ \text{COS}(0^\circ) &= 1 \\ \text{COS}(30^\circ) &= \text{SQR}(3)/2 \\ \text{COS}(45^\circ) &= 1/\text{SQR}(2) \\ \text{COS}(60^\circ) &= 1/2 \\ \text{COS}(90^\circ) &= 0 \end{aligned}$$

$$\begin{aligned} \text{TAN}(0^\circ) &= 0 \\ \text{TAN}(30^\circ) &= 1/\text{SQR}(3) \\ \text{TAN}(45^\circ) &= 1 \\ \text{TAN}(60^\circ) &= \text{SQR}(3) \end{aligned}$$

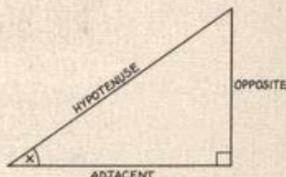


Figure 4

If you know the angle X and one of the three lengths of a right-angled triangle then you can find the other two lengths. For example, if you know the angle X and the length of the adjacent side then the other two lengths are given by the following formulae.

$$\begin{aligned} \text{opposite} &= \text{TAN}(X) * \text{adjacent} \\ \text{hypotenuse} &= \text{adjacent}/\text{COS}(X) \end{aligned}$$

Another way of describing the trigonometric function is by using a circle of radius 1 unit. Measure out the angle required as shown in Figure 5. The values of the various trigonometric functions are indicated.

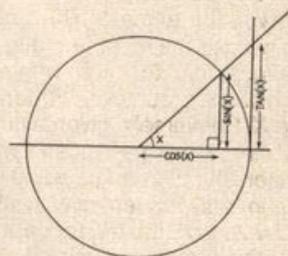


Figure 5

Mathematically distances are measured horizontally from left to right and vertically upwards. This explains why, for instance, in Figure 6 Cos(X) has a negative value.

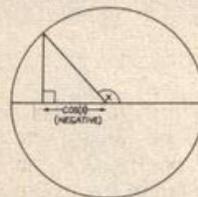


Figure 6

You can obtain SIN, COS and TAN of an angle X by typing *Print Sin(X)*, etc, substituting the appropriate value of X. The only possible problem is that the Commodore 64, like most microcomputers, expects the angles in radians, not degrees. Fortunately, degrees can be turned into radians and vice versa very easily.

First of all, what is a radian? Draw a circle of radius 1 unit. Measure along the circumference of your circle a distance which is equal to the radius of the circle. The angle subtended by this arc is 1 radian. 1 radian is approximately 57°. See Figure 7.

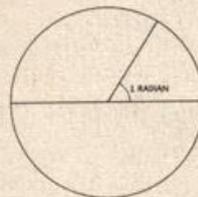


Figure 7

The number π is both remarkable and famous. It is defined to be the ratio of the circumference of a circle to its diameter. The (approximate) value of π is stored in your Commodore 64. Simply type *Print π* to reveal the value stored. In a circle of radius 1 unit the diameter is 2 units. Thus the circumference of this circle is 2*π and so there are 2*π radians in a complete circle. Since there are 360 degrees in a complete circle we see that:

$$\begin{aligned} 360^\circ &= 2 * \pi \text{ radians, and} \\ 180^\circ &= \pi \text{ radians} \end{aligned}$$

We can convert degrees to radians and vice versa quite easily with the following formula:

$$\begin{aligned} X \text{ degrees} &= X * \pi / 180 \text{ radians} \\ Y \text{ radians} &= Y * 180 / \pi \text{ degrees} \end{aligned}$$

The following program can be used to find lengths of right-angled triangles. You need to input an angle and one distance. Program 1 calculates the other two lengths.

Inverse functions

Suppose we know the lengths of the sides of a right-angled triangle, can we determine the various angles? The answer is yes, and we use the inverse trigonometric functions to do this. Given an angle X then $Tan(X)$ gives us a number, the tangent of the angle X . Conversely, given a number N we could find an angle whose tangent is that number. Such an angle could then be called the inverse tangent of N . It is usually denoted by $Atn(N)$, the arc tangent of N .

Look at the triangle in Figure 8.

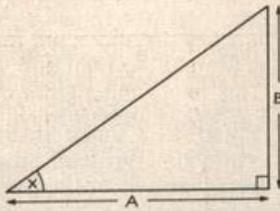


Figure 8

If we know the values of A and B then we could find the value of the angle X . We know that $Tan(X) = B/A$, thus $X = Atn(B/A)$. You can put in the appropriate values in this expression and get your Commodore 64 to print out the answer. Of course, the answer would be in radians. To get an answer in degrees you need to multiply the result by $180/\pi$.

The trigonometric functions SIN and COS also have inverse functions denoted by Asn (arc sine) and Acs (arc cosine)

respectively. $Asn(N)$ is that angle whose sine is N ; similarly $Acs(N)$ is that angle whose cosine is N . Unfortunately the Commodore 64, in common with many other microcomputers, does not contain these functions in its basic. However they can be easily obtained from the Atn function.

To see how we obtain Asn from Atn , look at the right-angled triangle with a hypotenuse of length 1 unit in Figure 9.

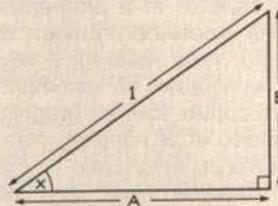


Figure 9

Now suppose that we know the value of B , and we want to find the angle X . We know that $Sin(X) = B$ so that $X = Asn(B)$, but as was mentioned Asn isn't present in the Commodore 64. If we knew the value of A then we could use Atn since $X = Atn(B/A)$ also. To find A we use Pythagoras' theorem.

Recall the theorem of Pythagoras. In words Pythagoras' theorem states that the square of the hypotenuse of a right-angled triangle is equal to the sum of the squares of the other two sides. In symbols we have $C^2 = A^2 + B^2$

where C is the length of the hypotenuse. Since our hypotenuse is of length 1 we have:

$$1 = A^2 + B^2$$

or

$$A^2 = 1 - B^2$$

and so

$$A = \text{SQR}(1 - B^2)$$

Since $X = Atn(B/A)$ we obtain

$$X = \text{ATN}(B/\text{SQR}(1 - B^2))$$

also, $Asn(B) = X$, and so we obtain

$$\text{ASN}(B) = \text{ATN}(B/\text{SQR}(1 - B^2))$$

In a similar way we could produce a formula for $Acs(A)$, one such is given below:

$$\text{ACS}(A) = \pi/2 - \text{ATN}(A/\text{SQR}(1 - A^2))$$

You should notice that $Acs(A) = \pi/2 - Asn(A)$.

Appendix H of the Commodore 64 User Manual contains other examples of mathematical functions which may be useful. ■

This is an extract from *Mathematics on the Commodore 64* by Czes Kosniowski, published by Sunshine Books.

```

10 REM PROGRAM FOR RIGHT-ANGLED
   TRIANGLES
20 PRINT CHR$(147) "    RIGHT-ANGLED
   TRIANGLES" CHR$(17)
30 PRINT "THIS PROGRAM ENABLES
   YOU TO FIND THE"
40 PRINT "SIDES OF A RIGHT ANGLED
   TRIANGLE"
50 PRINT "PROVIDED YOU KNOW ONE
   SIDE AND ANGLE." CHR$(17)
60 PRINT "          N%
          N %"
70 PRINT "          N %
          N %"
80 PRINT " HYPOTENUSE%  %OPPOSITE
          N %"
90 PRINT "          NANGLE %
          ##### "
95 PRINT "          ADJACENT" CHR$(17)
)
100 REM INPUT DETAILS
110 INPUT "ANGLE. IN DEGREES. ":X
120 IF X<=0 OR X>=90 THEN PRINT
   "ERROR - NOT A TRIANGLE":GOTO 110
130 PRINT CHR$(17) "WHICH SIDE DO
   YOU KNOW? 1 (OPPOSITE)"
140 PRINT "2 (ADJACENT) OR 3
   (HYPOTENUSE). "
150 INPUT "TYPE 1, 2 OR 3 ":T
160 IF T<1 OR T>3 OR T<>INT(T)
   THEN 150
170 PRINT CHR$(17) "TYPE IN THE
   LENGTH OF THIS SIDE."
180 INPUT "LENGTH ":L
190 IF L<=0 THEN PRINT "FUNNY -
   TRY AGAIN":GOTO 180
200 REM CONVERT TO RADIANS
210 X=X/180
220 REM THE SPLIT OFF
230 ON T GOSUB 300,350,400
240 PRINT CHR$(17) "    THAT'S IT -
   ANOTHER GO Y OR N?"
250 GET G$:IF G$<>"Y" AND G$<>"N"
   THEN 250
260 IF G$="Y" THEN RUN
270 PRINT CHR$(147) "BYE FOR NOW."
   :END
300 REM OPPOSITE SIDE KNOWN
310 PRINT CHR$(17) "ADJACENT SIDE:"
   L/TAN(X)
320 PRINT "    HYPOTENUSE:" L/SIN(X)
330 RETURN
350 REM ADJACENT SIDE KNOWN
360 PRINT CHR$(17) "OPPOSITE SIDE:"
   TAN(X)*L
370 PRINT "    HYPOTENUSE:" L/COS(X)
380 RETURN
400 REM HYPOTENUSE KNOWN
410 PRINT CHR$(17) "OPPOSITE SIDE:"
   SIN(X)*L
420 PRINT "ADJACENT SIDE:" L*COS(X)
430 RETURN

```

An easy life for some

Keith and Steven Brain take a look at programming aids for the Dragon 32

Moving on from sound and graphics (PCW 24-30 November) here are some programming aids for the Dragon 32 which can make your life much easier.

Toolkit (Premier) is for those who prefer to stick to Basic rather than delve into machine code. It is available on disc or as an Eprom (within Delta or separate) and it adds over 50 new commands to Basic. Although programs incorporating the new commands will only run if *Toolkit* is present, the program also has some first-class editing commands which can be used to edit any program.

The full screen editor is a twin cursor type, which allows you to copy characters from the editing cursor to the normal cursor. You can use the full screen editor in co-operation with the Dragon's standard editing facilities (so that there are not a lot of new commands to remember), or you can recopy a whole line. To save the problem of text scrolling off the top of the screen, you can move text to one of two other text screens, and also swap text screens.

Extensive search and replace facilities are included and *Plan* gives you total control over output to a printer controlling factors such as paging, column length, margin, etc. Extra cassette handling commands are *Cdir* (gives a directory of a tape) and *Cappend* (appends from tape).

Inkey is like *Inkey\$*, but gives the Ascii value of a key pressed, while *Key\$* and *Key* are like *Inkey\$* and *Inkey*, but with built-in auto-repeat. *Inp n,A\$* gives you a controllable length for an *Input*, so that you can prevent an ignorant (or malicious) user entering an illegally long string. *Deek* and *Doke Peek* and *Poke* two bytes at a time with a 16-bit number. *Beep On/Off* controls

a keyboard beep and *Break On/Break Off* enables/disables the break key.

Echo x-y,z copies lines *x* to *y* from *z* downwards and *Prune* removes everything after a *Rem* statement. *Vars* prints the active variable in a program, *Pause* waits for a specified number of milliseconds and *Hang* waits for a key to be pressed. A number of commands are provided to control low-res graphics. The comprehensive error handling commands (*Erl*, *Err*, *Error n*, *Error Goto n*, *Error Off*, *Resume*, *Resume Next*, and *Resume Goto n*) can be used to prevent your program from stopping if there is an error.

The *Resume* commands are important, as they allow you to continue immediately with your program (unlike the error commands in *Dragondos*). *Old* attempts to rescue a crashed program. You are allowed to *Goto* and *Gosub* line numbers specified as variables and you can program the keys *A-H* with up to 23 characters including *Enter*. For example, if you use:

```
PROGA "PAGE" + CHR$(13) + "BEEP" + CHR$(13) + "HANG" + CHR$(13) + "RUN" + CHR$(13)
```

then when you press *Shift* and *A*, it will *Page* your program, *Beep*, *Hang* and then *Run*.

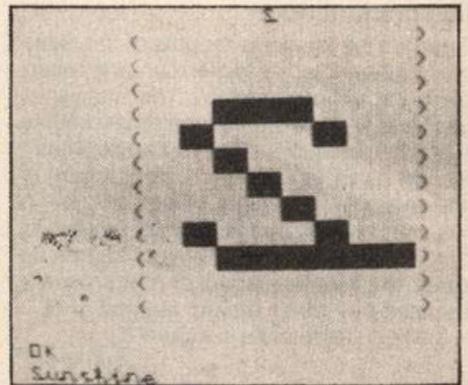
Even after all that description we have still left out some very useful features, so you can probably understand why we believe the Premier *Toolkit* is outstanding value at £29.95.

Encoder 09 (Premier) is a monitor, assembler, and disassembler for the Dragon which comes on cassette, disc (Delta), or Eprom (available as an option on the Delta Dos cartridge). The comprehensive manual is 52 pages long and includes details of the 6809 registers, instruction sets and different types of addressing, as well as the operation of the system.

The program starts up in the monitor mode, where a colon prompt before the cursor informs you that you are using the monitor. Typing *B* moves you to Basic and *&M* returns to the monitor. You can examine and change memory locations and search the memory for a Hex number or an Ascii string.

Block moves are allowed and you can execute machine code routines from the monitor, which will convert or calculate Hexadecimal, Octal, Binary and Decimal values, and also has extensive breakpoint routines. It is fully compatible with Dragon Basic and there is automatic line numbering and tabulation and a full complement of pseudo-opcodes.

You can incorporate assembly language within Basic programs by enclosing the code between square brackets. You can perform a test assemble to check the syntax before moving on to the real thing and assembly can be to memory, cassette,



printer, or disc. There are 19 error messages to help sort out any problems.

Encoder 09 costs £29.95 on tape, £34.95 on Eprom as a Delta addition, and £39.95 on cartridge. We found it easy to use and, if you want to get into machine code programming, then this is a sound investment.

Memory Module (Moray Microsystems) is a low power Cmos static Ram memory module running off Ni-Cads which are trickle charged when the computer is on. It can be used to provide instant memory back-up in case of a system crash or provide a temporary, reusable, "cartridge" facility. The unit is larger than a normal cartridge and, to prevent it flopping about in the expansion port, there are small plastic feet underneath the case. Before turning the Dragon off, you must remember to turn the memory protection switch on and, before you recover or store programs, you must put the memory protection off.

It is easy to store and retrieve a program using a small machine code routine. You could put this routine at the end of a Basic program and instead of *Csaving* the latest copy of your program every half an hour (in case the gremlins get loose in the mains supply), you could dump it into the memory module.

The module is available in a number of Ram configurations (4 to 14K) but, for example, will hold 4K for 83 days using ultra low power Cmos (£42) or 16.6 days using lower power Cmos (£39). This product is rather specialised, but would be of value in program development (especially if you don't have a disc system) or in education where you might want to change the cartridge contents at regular intervals.

The standard Dragon 32 interface is of the parallel Centronics type, although the new Dragon 64 also has a serial RS232 port. Many other machines have RS232 and the addition of this facility allows you to communicate more widely.

RS232C Interface (Cotswold Computers/CP Engineering) is a cartridge which comes with a detailed manual which explains the RS232 standard and how to transmit and receive data. Two demonstration programs are provided, the first being an interface test and the second a program to transmit the graphics screen from one Dragon to another (as we only



had a single interface we could not test the latter). The baud rate is easily controlled by an external, colour-coded, dip switch, and a brief description of the electronic specification is included.

It allows you to use any serial printer on the Dragon, communicate between your Dragon and any other machine with an RS232 interface, and eventually to communicate through a modem (which is currently under development) to the whole world, although of course you still need to write the software to control it! This is another rather specialised product which



will be of interest to the minority, although no doubt invaluable to them. The interface has already been used to connect the Dragon to a number of pieces of specialised scientific equipment.

In addition to serial and parallel ports, it is also useful to have straightforward input and output connections for control applications. *Dragon Interface* (Moray Microsystems) is an input/output module which allows the Dragon cartridge port to be used as a 4 or 8 input port (opto-isolated) with up to 8 relay output ports. Once the module has been configured, inputs are easily ready by *Peeking* location 49152 and relays operated/released by *Poking* appropriate values to 49153.

The module will accept dc inputs from +3 to +15 volts and the output channels will switch up to 220 volts at 0.5 amps. Data at the input channels is indicated by integral leds and connections to the unit are made via clearly marked terminal blocks, once you have managed to persuade four very small hex-head screws to come loose.

Possible applications of this unit are many and varied (we hope to report further on this in the near future), for example, you could easily control your model railway (or robot?). Another obvious application is to build a sophisticated intelligent burglar alarm system which can tell the difference between your cat sitting on the mat or rattling the window and a real threat.

The price depends on the specification, but it is based on a flat charge of £20 for 4 inputs or £28 for 8 inputs and then £3 per relay output (so that a full specification 8 input/8 output module costs £52). An add-on power module is also being made available (at around £40) which will switch 13 amp mains loads so that you can really let your computer control your central heating, greenhouse etc. This unit certainly

extends the power of your Dragon into interesting control applications.

Last, but not least, there are the lightpens which plug directly into the joystick ports of the Dragon and allow you to control the execution of your programs without touching a key. The Trojan Lightpen (Trojan Products) is a relatively simple device supplied with a program on cassette and a combination of instructions printed on the cassette insert and incorporated into the program. The main menu allows you to select options to run through the instructions, draw a simple histogram

of light level, play a game of *Nim*, use the light pen to select which notes to sound, or draw directly on the screen. The drawing routine only uses *Pmode 1*, so the results are rather crude and you still have to

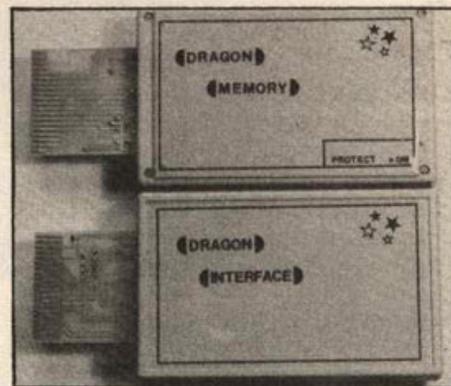
use the keyboard as well, which rather defeats the object of using a lightpen!

Its value seems rather limited, but it's relatively cheap at £10.

The Datapen Lightpen (Datapen Microtechnology) is supplied with comprehensive instructions and a tape with three programs. It differs from all other light pens available for the Dragon in that it is a far more sophisticated (and rather more expensive at £25) beast. Important unusual features are a button mounted on the pen itself, which controls operation, and an led which indicates data capture.

The pen is also easier to use than most, because of its larger size and because the end is flattened and covered with non-slip rubber. It also seemed quite insensitive to changes in ambient light.

The first program provided is an introduction which allows you to work through instructions on how the pen works, produce a low-res flowchart, or find an *X,Y* screen position. The second program is *Sketch* in which you can draw directly on



the screen using any *Pmode*. Four options can be selected with the pen (*Draw*, *Erase line*, *Blank Move* and *Paint*) and, by also using the keyboard, you can save to tape, draw a circle, and change the accuracy factor and measurement bars. This program uses a much faster screen strobe (which can easily be modified) and it clearly demonstrates the superiority of the Datapen.

The *Shape Create* program is very useful, as it allows you to produce designs directly on a screen matrix and then save these in a "library" in memory or on tape and use them later. The *Create more sprites* option allows you to design scaled-up sprites on the screen, while a normal sized version is drawn alongside, with total control by the lightpen. If you select the *Create Drawing* mode, then you can pick a sprite from the library you created and put it at any screen position at any of four 90-degree angles.

Although we have tended to be rather cynical about the value of lightpens in the past, the Datapen has transformed our views and is no doubt the best buy for anyone with a serious use.

Adding on all the facilities of all these products at the same time would certainly produce one hell of a machine, but with all those "bolt-on-goodies" we are sure that you would also need some "go-faster" stripes as well. ■

Firm	Program	Cost
Premier 208 Croydon Road Anerly London SE20 7YX	<i>Toolkit</i> <i>Encoder 09</i>	£29.95 £29.95*
Moray Microsystems 17 Kirkton Place Elgin IV30 3JR	<i>Memory Module</i> <i>Dragon Interface</i>	£42† £52†
Cotswold Computers 6 Middle Row Chipping Norton Oxfordshire	<i>RS232C</i>	
Trojan Products 166 Derlwyn Dunvant Swansea	<i>Lightpen</i>	£10
Datapen Microtechnology Kingsclere Road Overton Hants	<i>Lightpen</i>	£25

*Tape. †Varies according to option.

The REAL Challenge!

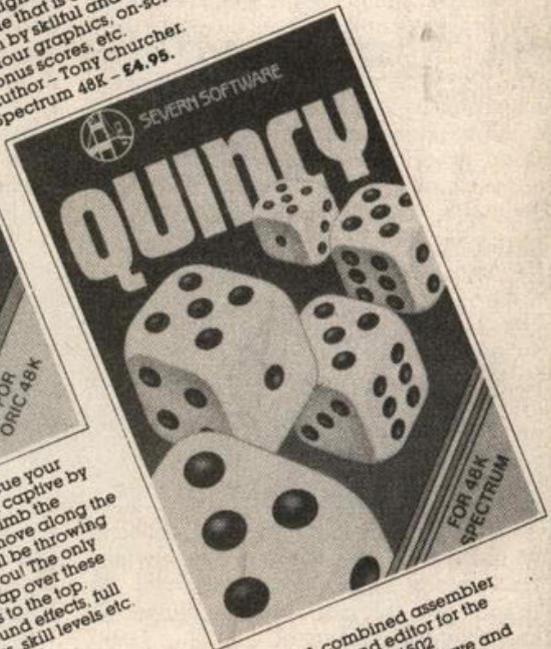
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 Oric Author - Adrian Sheppard.
 Spectrum Author - Mike Howard
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 Author - Tony Churcher.
 Spectrum 48K - £4.95.



Grail You have been chosen to seek and recover the Holy Grail from the Castle Perilous. Throughout the course of your task you will have to use your skill, intelligence and logic (along with a little luck) as you encounter many foes. You will have the opportunity to gather weapons and armour to fight with, but if you are wounded your strength will drain away - many other features such as warp, jewels etc.
 Author - Adrian Sheppard.
 Oric 48K - £6.95.



Orcade A combined assembler Disassembler and editor for the Oric. *Handles full 6502 Mnemonics *Features Save and Reload M/C *Assembles and disassembles at any address. *An essential tool for any serious programmer.
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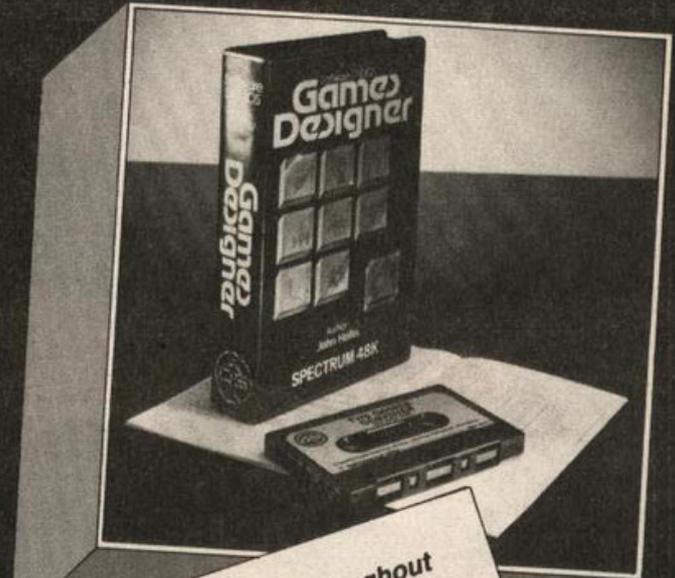
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To the letter

Ian and Damian Inger present Word Search for the 32K BBC

This program is an educational type, for use with a group of pupils rather than one person alone. The teacher has to write a short passage (20 lines of 31 characters)

on the screen which then clears and the pupils are presented with a screen of coloured blocks, one for each letter. All punctuation marks and spaces are put on

to the screen for the pupils.

At random intervals, all occurrences of the guess letter are filled in on the screen. At 15 guess intervals, the pupils are invited to write out a two-line message, saying what they think the passage is about.

The program is designed to encourage group discussion about the positioning of letters and the frequency of certain letters within the passage.

```

10REM Word search
20REM By Ian & Damian Inger
30REM (c) Nov 1983
40REM
50REM
60MODE7
70PROCinit
80PROCteacher_instruction
90PROCcenter
100PROCpupil_instruction
110PROCpunc
120PROCmove
130PROCguess
140PROCcheck
150R=RND(7):IF R=3 AND (A<136 OR
A>139) THEN PROCluck
160GOTO 120
170END
180DEFPROCinit
190T=0
200Q=0
210VDU23:8202:0:0:0:
220DIM A$(31,20)
230DIM B$(31,20)
240DIM T$(30)
250*K.9"! "
260*K.100LD:MRUN:IM
270G$=CHR$(130)
280S$=CHR$(255)
290R$=CHR$(129)
300C$=CHR$(134)
310X1%=0:Y1%=0
320ENDPROC
330DEFPROCteacher_instruction
340CLS
350PRINT"Instructions to the teacher"
360PRINT
370PRINT"You should type the test
passage in CAPITAL LETTERS only."
380PRINT"If you make a mistake,
press the Delete key to erase it."
390PRINT"The program will accept
20 lines of 31 characters."
400PRINT"When you are typing the
test, the ";S$;" will move to the next
line automatically. You may press
'Return' at any time to move to the
start of the next line."
410PRINT"When the last line is
complete, the "
420PRINT"instructions for your pupils
will be displayed."
430REPEAT:PRINTTAB(0,23)"PRESS SPACE
BAR TO CONTINUE":UNTIL GET
440ENDPROC
450DEFPROCpupil_instruction
460CLS
470*FX15.1

```

```

480PRINT"INSTRUCTIONS"
490PRINT
500PRINT"This is similar to Hangman.
All you have to do is fill in the blue
squares with letters."
510PRINT"You will see a 'f' on the
screen. This is where you make your
guess."
520PRINT"The 'f' will always find the
next free space for you, but you may
move the 'f' around the screen with the
arrow keys if you wish."
530PRINT"If your guess is right,
the f will move to the next space."
540PRINT"If your guess is wrong, the
f will stay where it is."
550PRINT"If you are lucky, the
computer will find your guess letter on
every line and fill it in for you."
560REPEAT:PRINTTAB(0,23)"PRESS SPACE
BAR TO CONTINUE":UNTIL GET
570CLS
580PRINT"Sometimes, you will be asked
to write a short message saying what
you think the story is about. At the
end, press red key 9 and all of your
messages will be shown."
590PRINT
600PRINT"The total time taken for
you to complete the puzzle is also
shown."
610PRINT
620PRINT"You may press 'Return'
at any time to see the instructions."
630REPEAT:PRINTTAB(0,23)"PRESS
SPACE BAR TO CONTINUE":UNTIL GET
640TIME=0
650ENDPROC
660DEFPROCcenter
670CLS
680FOR Y=0 TO 20
690PRINTTAB(0,Y):G$:
700PRINTTAB(35,Y):Y+1:
710NEXT
720PRINTTAB(0,21):R$:PRINTTAB
(0,22):R$
730PRINTTAB(1,21)"USE CAPITAL
LETTERS ONLY"
740PRINTTAB(1,22)"PRESS 'DELETE'
IF YOU MAKE A MISTAKE"
750X=0:Y=0
760REPEAT
770PRINTTAB(X+2,Y):S$
780A$(X,Y)=GET$
790AS=ASC(A$(X,Y))
800IF AS=13 AND X<31 THEN REPEAT:
PRINTTAB(X+2,Y):" ":A$(X,Y)=" ":X=X+1:

```

Continued on page 49

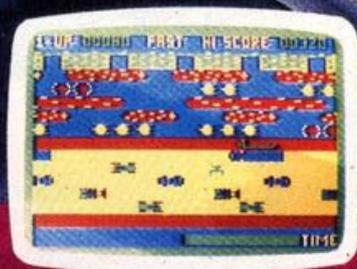
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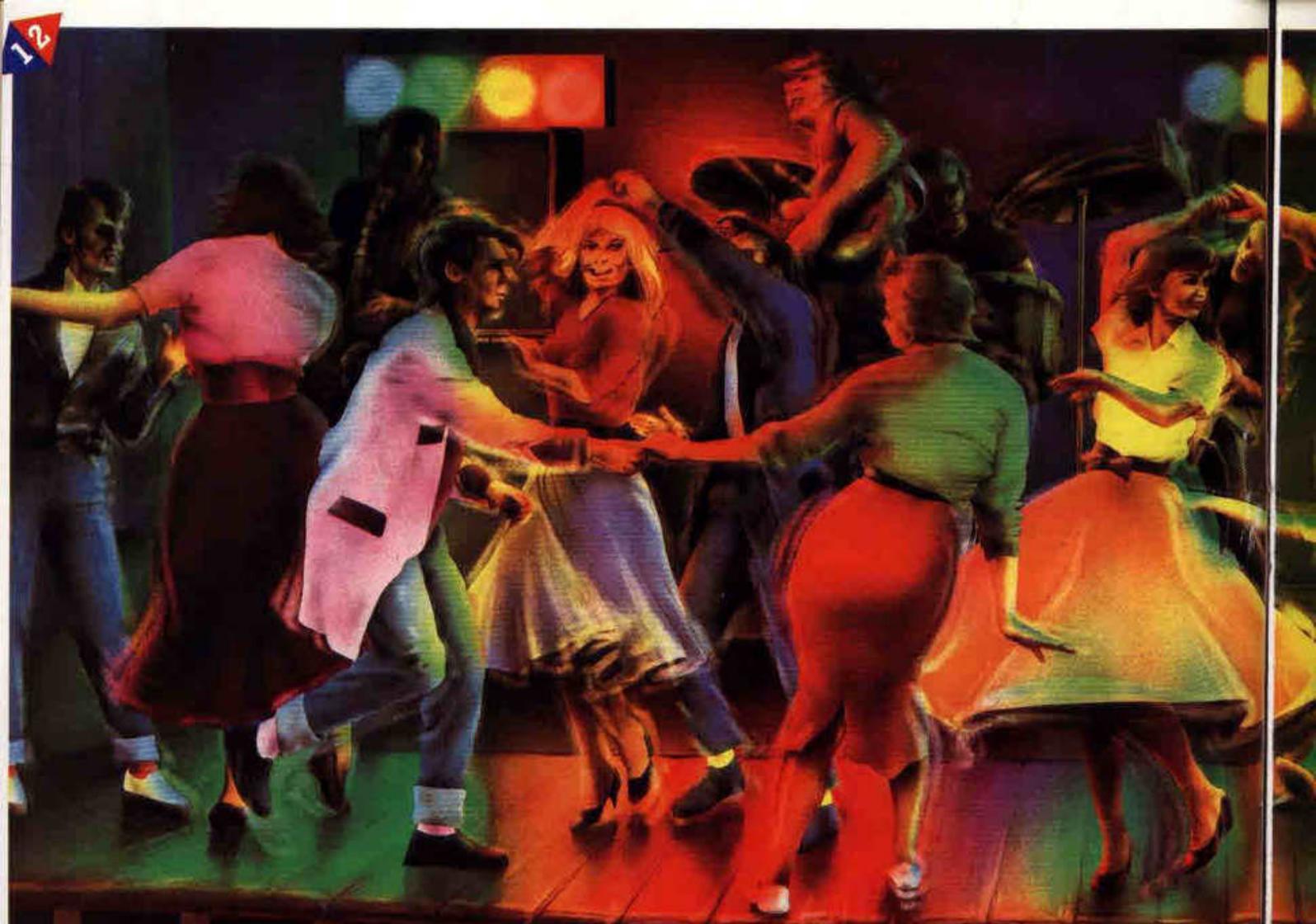
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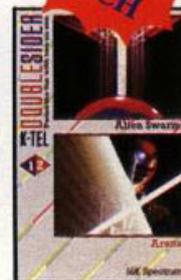
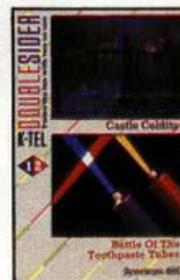
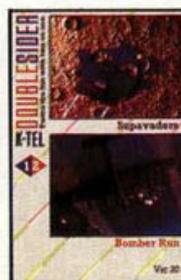
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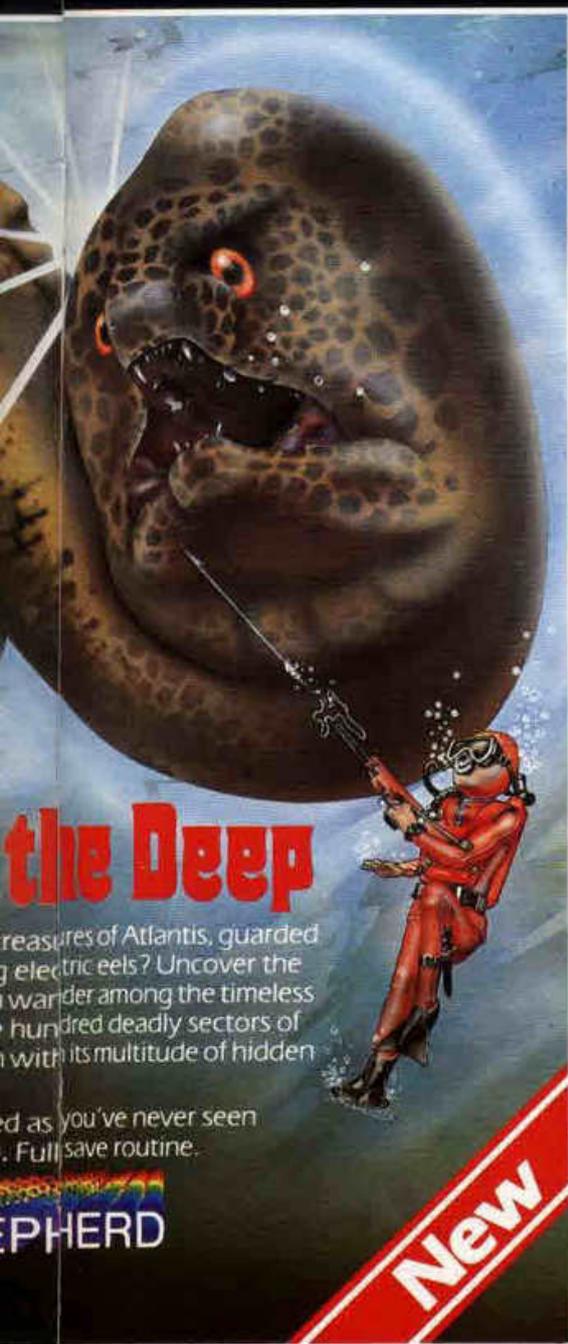


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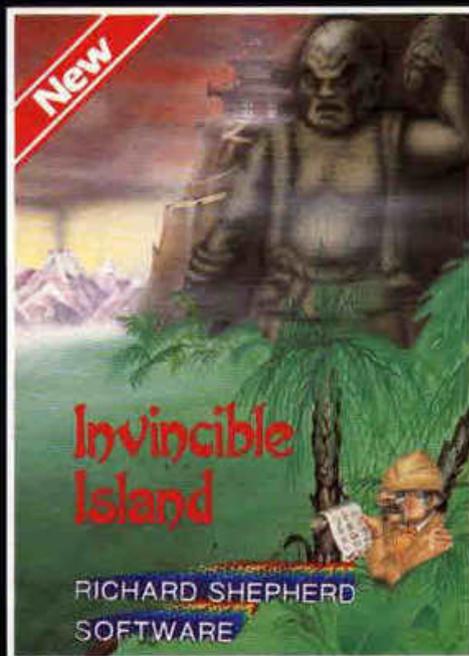
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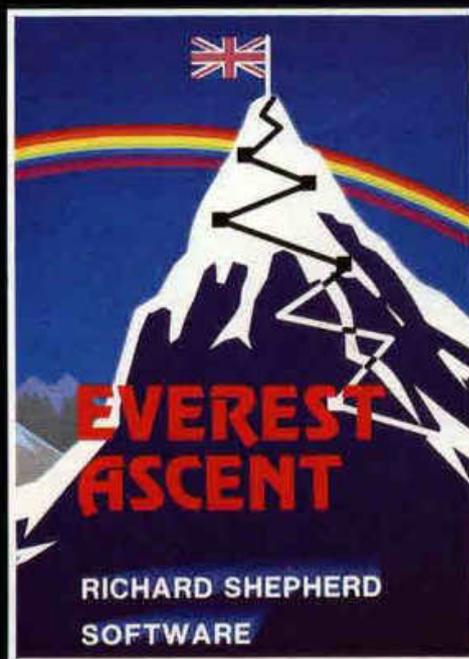
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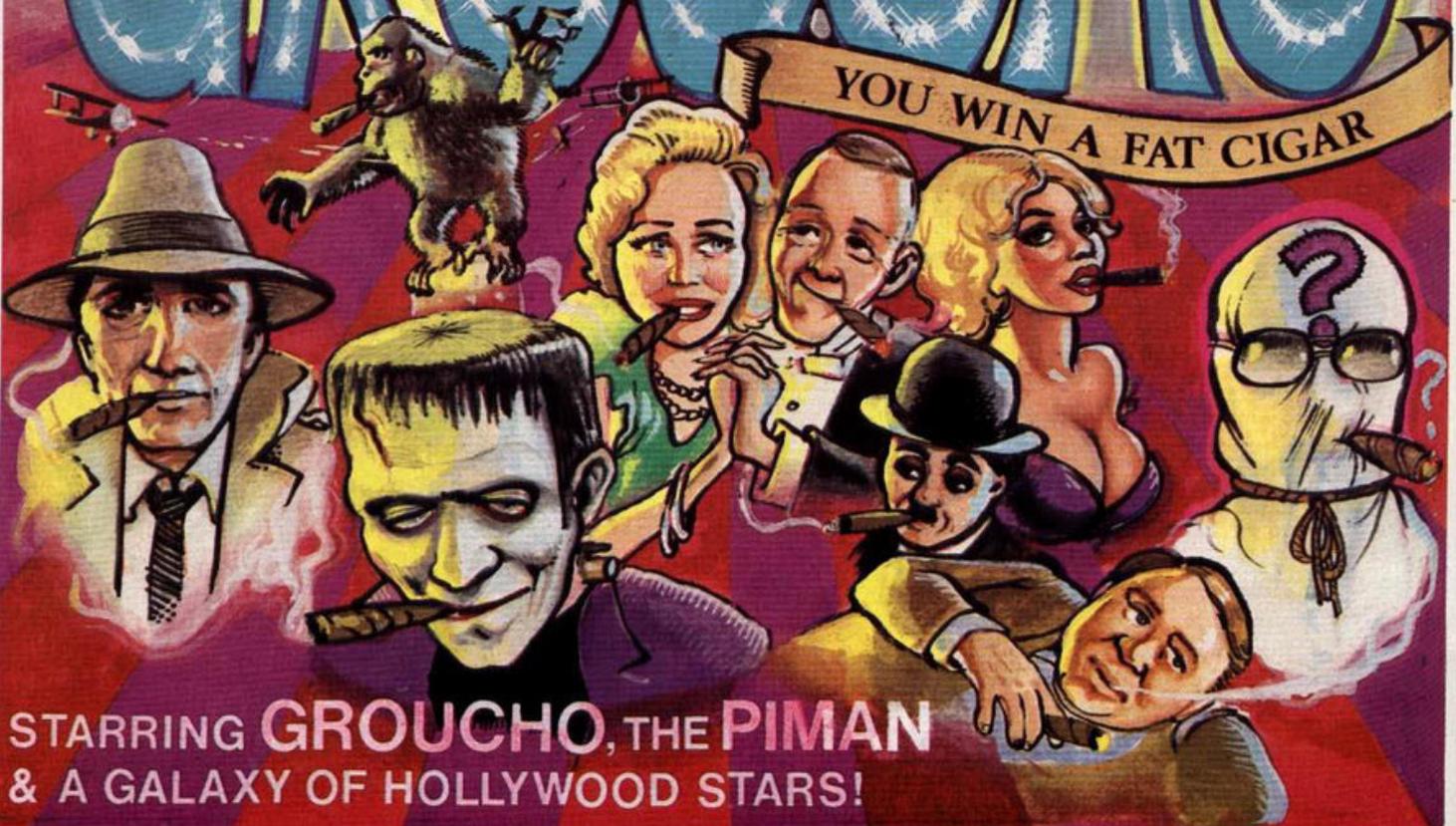
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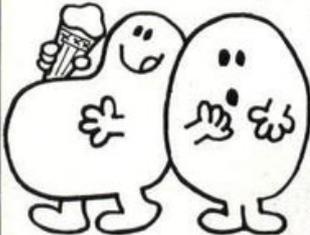
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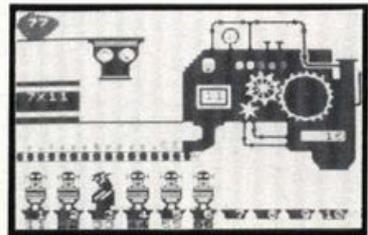
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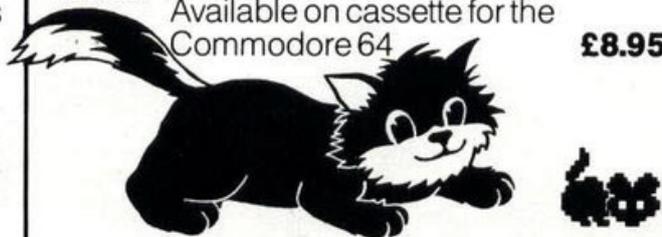
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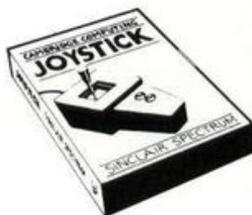
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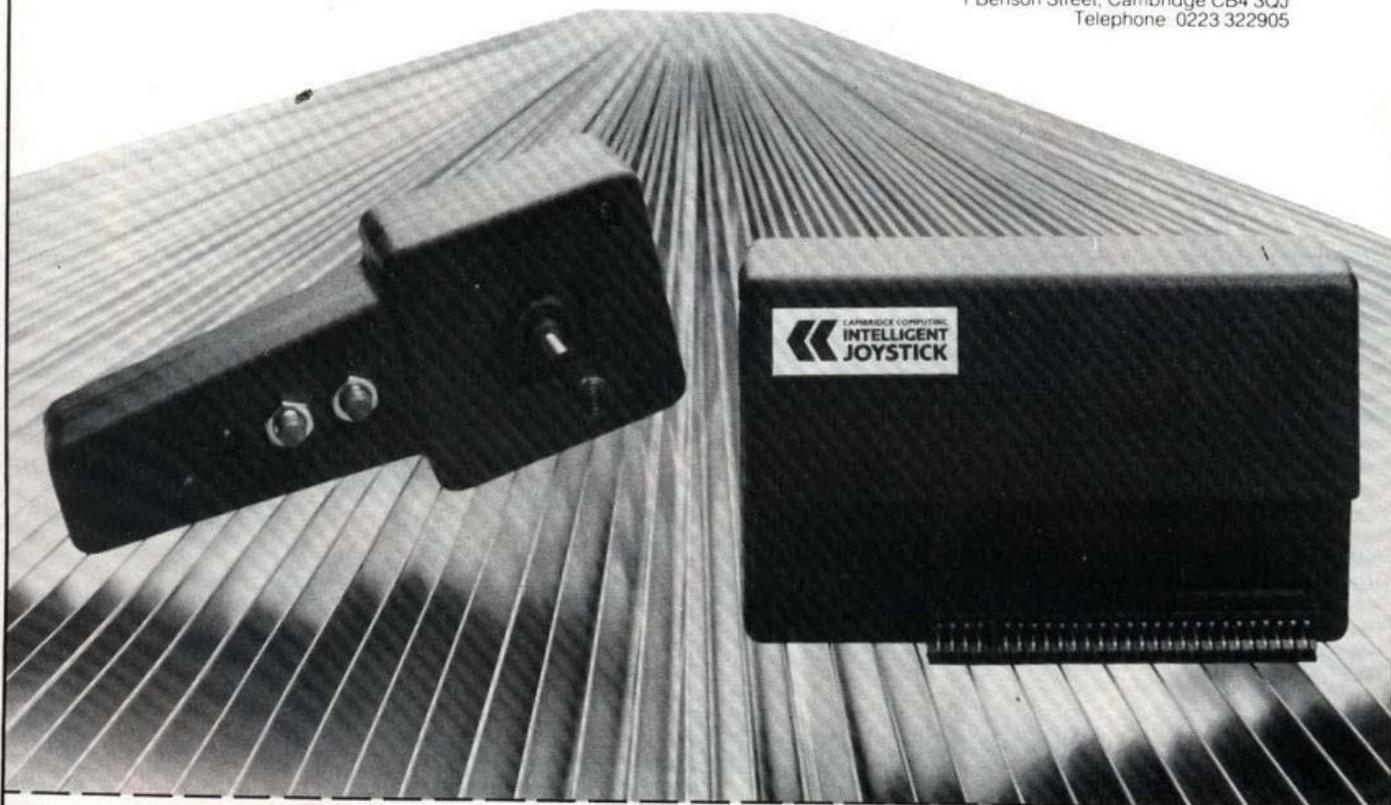
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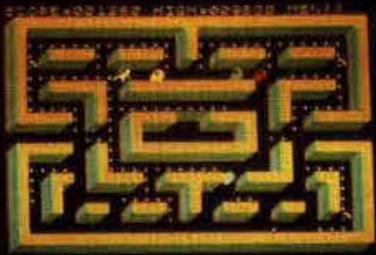
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UNTIL X=32:X=31
810IF AS=127 THEN PRINTTAB(X+2,Y);
":A$(X,Y)="" :X=X-1:IF X<0 THEN
X=31:Y=Y-1
820PRINTTAB(X+2,Y);A$(X,Y)
830IF AS<>127 THEN X=X+1
840IF X=32 THEN PRINTTAB(X+2,Y)"
":X=0:Y=Y+1
850UNTILY=21
860*FX15,1
870ENDPROC
880DEFPROCpunc
890CLS
900FOR Y=0 TO 20
910PRINTTAB(0,Y);C$;
920NEXT
930FOR Y=0 TO 20
940FOR X=0 TO 31
950IF ASC(A$(X,Y))<65 THEN
B$(X,Y)=A$(X,Y)
960IF ASC(A$(X,Y))>=65 THEN B$(X,Y)=S$
970PRINTTAB(X+2,Y);B$(X,Y)
980NEXT
990NEXT
1000ENDPROC
1010DEFPROCmove
1020*FX15,1
1030*FX4,1
1040PRINTTAB(X1%+2,Y1%);"f"
1050A=GET
1060IF A=13 THEN PROCinstructions
1070IF A=33 THEN PROClist
1080PRINTTAB(X1%+2,Y1%);B$(X1%,Y1%)
1090IF A=49 THEN PROClist
1100IF A=136 THEN X1%=X1%-1
1110IF A=137 THEN X1%=X1%+1
1120IF A=138 THEN Y1%=Y1%+1
1130IF A=139 THEN Y1%=Y1%-1
1140IF X1%<0 THEN X1%=31:Y1%=Y1%-1
1150IF X1%>31 THEN X1%=0:Y1%=Y1%+1
1160IF Y1%<0 THEN Y1%=0
1170IF Y1%>20 THEN Y1%=20
1180PRINTTAB(X1%+2,Y1%);B$(X1%,Y1%)
1190ENDPROC
1200DEFPROCguess
1210T=T+1:IF T/15=INT(T/15)
THEN PROCtele
1220G$=CHR$(A)
1230IF A>135 AND A<140 THEN ENDPROC
1240PRINTTAB(X1%+2,Y1%);G$
1250ENDPROC
1260ENDPROC
1270DEFPROCcheck
1280IF A>135 AND A<140 THEN ENDPROC
1290IF A=13 THEN ENDPROC
1300IF G$<>A$(X1%,Y1%) THEN
PRINTTAB(0,23)"WRONG":FOR H=20 TO 0
STEP -1:SOUND 1
.-10,H,1:NEXT:ENDPROC
1310B$(X1%,Y1%)=G$
1320X1%=X1%+1:IF X1%>31 THEN X1%=0:
Y1%=Y1%+1:IF Y1%>20 THEN Y1%=0
1330IF B$(X1%,Y1%)<>S$ THEN 1320
1340ENDPROC
1350DEFPROCluck
1360FOR X%=0 TO 31
1370FOR Y%=0 TO 20
1380IF A$(X%,Y%)=G$ THEN PRINTTAB
(X%+2,Y%);G$:B$(X%,Y%)=A$(X%,Y%)
1390NEXT
1400NEXT
1410ENDPROC
1420DEFPROCtele
1430CLS
1440PRINT"What do you think this
is about?"
1450PRINT"Type your ideas below, but
don't use more than two lines."
1460PRINT"Press Return when you
have finished"
1470PRINT:PRINT:PRINT
1480INPUTT$(Q):Q=Q+1
1490CLS
1500FOR Y=0 TO 20
1510PRINTTAB(0,Y);C$
1520NEXT
1530FOR X%=0 TO 31
1540FOR Y%=0 TO 20
1550PRINTTAB(X%+2,Y%);B$(X%,Y%)
1560NEXT
1570NEXT
1580ENDPROC
1590DEFPROCinstructions
1600CLS
1610PRINTCHR$141+"INSTRUCTIONS"
1620PRINTCHR$141+"INSTRUCTIONS"
1630PRINT:PRINT:PRINT
1640PRINT"The 'f' will move to the
next space on its own"
1650PRINT"If you do not want to make
a guess thereuse the arrow keys to
move the 'f' around the screen"
1660PRINT"When the 'f' is in position,
type in your guess"
1670PRINT"When you have finished the
whole story, press";CHR$(129);"red
key 9"
1680PRINT"This will list your
messages"
1690PRINT:PRINT
1700PRINT"If there is anything
else which you do not understand,
ask your teacher"
1710REPEAT
1720PRINTTAB(0,23)"PRESS SPACE BAR
TO CONTINUE"
1730UNTIL GET
1740CLS
1750*FX15,1
1760FOR X=0 TO 31
1770FOR Y=0 TO 20
1780PRINTTAB(0,Y);C$
1790PRINTTAB(X+2,Y);B$(X,Y)
1800NEXT
1810NEXT
1820ENDPROC
1830DEFPROClist
1840CLS
1850PRINT
1860PRINT"Your guesses were:--"
1870FOR L=0 TO Q
1880PRINTT$(L)
1890NEXT
1900PRINT"Time taken ";(TIME DIV
6000)MOD 60;" minutes"
1910END

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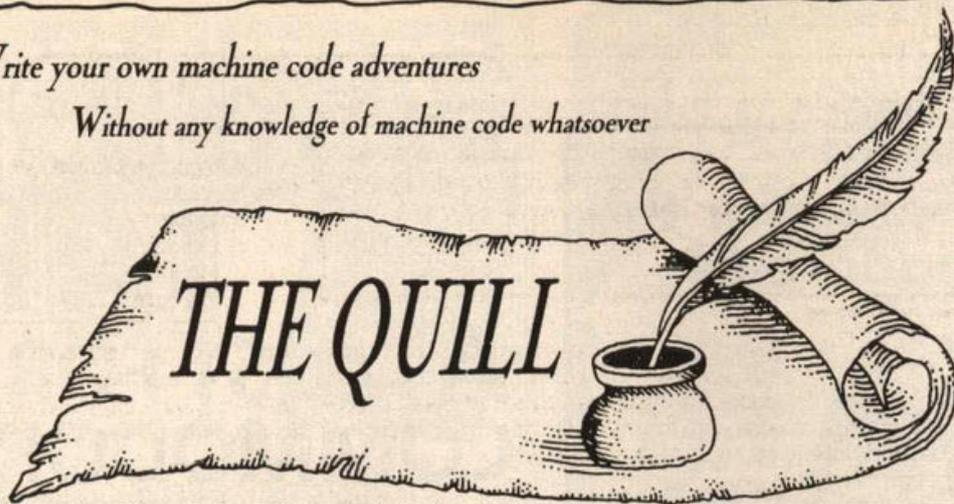
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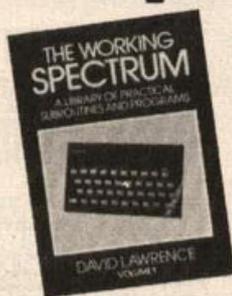


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Bug Fever

on Spectrum

In this game you control a frog on a lily pond surrounded by reeds. The aim of the

game is to catch as many insects with the frog's sticky tongue as possible. You have 60 seconds in which to do this, four additional seconds are taken away if you jump into the pond. Scores vary depending on the type of insect you catch, ie,

dragonflies, butterflies, or flies. Controls are:

- 5 — Skip left
- 8 — Skip right
- 6 — Jump left
- 7 — Jump right

0 — Release the frog's tongue.
When a game finishes the program goes into demo mode and you can press 'r' to re-start a new game. When keying in the listing, first run the user defined character part.

```

1 DATA 14,17,17,35,37,42,116,
50,96,152,8,16,32,132,248,96,1
50,65,46,12,7,5,9,3,4,100,161,203
4,100,4,2,24,32,64,170,65,64,320,
24,0,0,192,62,61,255,62,32,0,127
1,0,1,127,0,0,3,14,255,255,255,
14,3,0
2 DATA 240,0,128,128,128,0,24
0,0,0,0,0,130,130,130,188,188,
254,124,124,56,56,56,56,108,58,6
3,68,68,68,68,68,34,34,34,34,34,34
34,54,28,28,28,28,28,28,127,93,
93,65,65,65,65,0,0,112,216,124
126,255,127,63,255
3 DATA 14,27,62,126,255,254,2
52,255,248,0,128,255,128,0,248,0
10,0,254,128,0,128,254,0,0,192,1
12,255,255,255,112,192,0,15,0,1,
4,1,0,15
4 RESTORE : FOR q=0 TO 167 ST
EP 8: FOR r=0 TO 7: READ a: POKE
USR "2"+q+r,a: NEXT r: NEXT q
10 DATA BIN 1010010,BIN 010101
01,BIN 01010101,BIN 00101011,BIN
001010111,BIN 10010111,BIN 10001
111,BIN 011111111,BIN 01100101,BI
N 01101010,BIN 10101010,BIN 1101
0100,BIN 11010100,BIN 11101001,B
IN 1110001,255
15 DATA BIN 1010010,BIN 010101
01,BIN 01010101,BIN 001010111,BIN
001010111,BIN 10010111,BIN 10001
111,BIN 011111111,BIN 01100101,BI
N 01101010,BIN 10101010,BIN 1101
0100,BIN 11010100,BIN 11101001,B
IN 1110001,255
20 DATA 14,17,17,35,37,42,116,
63,96,152,8,16,32,132,248
900 BORDER 5: PAPER 8: BRIGHT 1
CLS : FOR n=0 TO 10: PRINT AT
n,0: PAPER 5: NEXT n: FOR n=11
TO 21: PRINT AT n,0: PAPER 1,:
NEXT n
901 INK 7: FOR r=0 TO 60 STEP 1
6: FOR q=0+RND*4 TO 255 STEP 16:
PLOT q,r: DRAW 2,2: DRAW 2,-1:
NEXT q: NEXT r
911 LET time=60: LET score=0
912 INK 1: PAPER 4: PRINT AT 17
13:"
913 PRINT AT 16,3:"
914 PRINT AT 19,3:"
915 INK 0: PAPER 4: PLOT 35,26:
DRAW 170,0
916 FOR n=45 TO 190 STEP 8: PLO
T n,26: DRAW 8,8: DRAW -8,-8: DR
AW 8,-6: NEXT n
917 FOR n=0 TO 255: PLOT INK 4:
n,6: DRAW INK 4;0,INT (RND*8): N
EXT n
918 RESTORE 10: FOR n=0 TO 15:
READ a: POKE USR "2"+n,a: NEXT n
919 PRINT AT 19,1: INK 3: PAPER
1:"
920 PRINT AT 16,3: INK 6: PAPER 1:
921 PRINT AT 16,26: INK 7: PAPER 1:
922 PRINT AT 19,26: INK 6: PAPER 1:
923 RESTORE 20: FOR n=0 TO 15:
READ a: POKE USR "2"+n,a: NEXT n
930 FOR q=1 TO 0 STEP -.1: PLOT
INK 6;224,175: DRAW INK 6;31,-q
*4,q: NEXT q
940 OVER 0: FOR r=40 TO 200: FO
R q=1 TO 4: PLOT INK 3;r+q,16: D
RAW INK 3,0,12: NEXT q: LET r=r+
INT (10+RND*20): NEXT r

```

```

1010 PAPER 8: INK 0: REM
1015 PRINT AT 21,0: PAPER 4:
1016 PRINT AT 21,11: INK 7:"BUGF
EVER"
1020 LET x=16: LET y=13
1021 PRINT AT x,y: INK 7:"
1025 LET z=10
1026 GO TO 5360
5010 REM
5020 FOR n=x-3 TO x-z+(3 AND y>=
25 AND z>3) STEP -1: INK 0+(7 AN
D n>10): BRIGHT 1: PRINT AT n,y:
"U":AT n+1,y:"V":AT n+2,y:"W":AT
n+3,y:"": GO SUB 6050
5030 NEXT n
5035 PRINT AT n+1,y:"":AT n+2,y
:"":AT n+3,y:""
5040 FOR p=y TO y+4-(3 AND y>=25
)
5050 PRINT AT n,p:"
5051 IF INKEY$="0" THEN BEEP .01
:0: PRINT AT n,p+3: INK 0:"E"
5052 IF (SCREEN$(n,p+4)(">")) A
ND INKEY$="0" THEN PRINT AT n,p+
3: INK 2:"E": FOR r=5 TO 1 STEP
-1: BEEP .01,-r: NEXT r: PRINT A
T a,b-1:"": LET score=score+
sc1: GO SUB 5310
5053 GO SUB 6050
5060 NEXT p
5061 LET time=time-(4 AND z(<>3) -
(4/10 AND z=3))
5065 PRINT AT n,p-1:""
5070 FOR n=x-z+(3 AND y>=25 AND
z>3) TO x: INK 0+(7 AND n>10): P
RINT AT n-3,y+4:"U":AT n-2,y+4:"
":AT n-1,y+4:"V":AT n-4,y+4:""
: GO SUB 6050
5080 NEXT n
5085 PRINT AT n-4,y+4:"":AT n-3
,y+4:"":AT n-2,y+4:""
5090 LET y=y+4: PRINT AT x,y: IN
K 7:"
5095 BEEP .01,-20: BEEP .01,-10
5096 IF y>=29 THEN LET time=time
-3: PRINT AT x,y: INK 1:"
7: FOR n=1 TO 20: BEEP .003,n:
PLOT 236,32: GO SUB 6050: DRAW I
NT (-10+RND*20),INT (RND*15): NE
XT n: GO SUB 6050: FOR q=16 TO 1
8: PRINT AT q,28: PAPER 1:"
: GO SUB 9120: GO SUB 6050: NEXT
q: LET x=16: LET y=13
5100 RETURN
5110 REM
5120 FOR n=x-3 TO x-z STEP -1: I
NK 0+(7 AND n>10): PRINT AT n,y:
"U":AT n+1,y:"V":AT n+2,y:"W":AT
n+3,y:"": GO SUB 6050
5130 NEXT n
5135 PRINT AT n+1,y:"":AT n+2,y
:"":AT n+3,y:""
5140 FOR p=y TO y-4 STEP -1
5150 PRINT AT n,p:"
5155 IF INKEY$="0" THEN BEEP .01
:0: POKE USR "3"+4,255
5157 IF (SCREEN$(n,p-1)(">")) A
ND INKEY$="0" THEN POKE USR "3"+
4,255: FOR r=5 TO 1 STEP -1: BEE
P .01,-r: NEXT r: PRINT AT a,b-1
:"": LET score=score+sc1: G
O SUB 5310
5160 NEXT p
5161 LET time=time-(4 AND z(<>3) -
(4/10 AND z=3))
5165 PRINT AT n,p+1,""
5170 FOR n=x-z TO x: INK 0+(7 AN

```

```

D n>10): PRINT AT n-3,y-4;"U";AT
n-2,y-4;"A";AT n-1,y-4;"n";AT n
-4,y-4;"": GO SUB 6050
5100 NEXT n
5105 PRINT AT n-4,y-4;" ";AT n-3
y-4;" ";AT n-2,y-4;" "
5190 LET y=y-4: PRINT AT x,y;" "
5195 BEEP .01,-20: BEEP .01,-10
5196 IF y<=3 THEN LET time=time-
3: PRINT AT x,y; INK 1;"": INK
7: FOR n=1 TO 20: BEEP .003,n: P
LOT 11,32: GO SUB 6050: DRAW INT
(-10+RAND*20),INT (RAND*10): NEXT
n: GO SUB 6050: FOR q=16 TO 16:
PRINT AT q,0; PAPER 1;"": GO
SUB 9110: GO SUB 6050: NEXT q:
LET x=16: LET y=13
5200 RETURN
5300 REM FLIES!
5310 LET a=INT (1+RAND*7): LET b1
=INT (1+RAND*3)
5320 IF b1=1 THEN LET a$=" "
LET d=-1: LET d1=0: LET b=29: LE
T sc1=150
5330 IF b1=2 THEN LET a$="ff"
LET d=-1: LET d1=0: LET b=29: LE
T sc1=200
5340 IF b1=3 THEN LET a$=" "
LET d=1: LET d1=29: LET b=0: LET
sc1=50
5350 RETURN
5360 GO SUB 5310
6000 GO SUB 6050
6001 PRINT AT 21,0; INK 7;"TIME:
":INT time AND time>=0;"":AT 21
,22; INK 7;"SCORE:";score
6002 IF time<=0 THEN LET time=0:
PRINT AT 10,9; INK 7; PAPER 4;"
GAME-OVER": GO TO 9000
6005 IF INKEY$="6" THEN LET z=3:
BEEP .01,6: GO SUB 5016:
6010 IF INKEY$="7" THEN LET z=x-
3-1: BEEP .01,7: GO SUB 5016:
6020 IF INKEY$="5" AND y>1 THEN

```

```

LET z=3: BEEP .01,5: GO SUB 5120
6030 IF INKEY$="6" AND y>1 THEN
LET z=x-a-1: BEEP .01,6: GO SUB
5120:
6035 LET time=time-1/10
6040 GO TO 6000
6050 PRINT AT a,b; INK 0;a$
6060 LET b=b+d: IF b=d1 THEN PRI
NT AT a,b-1;"": GO SUB 5310
6065 BEEP .001,b
6070 RETURN
9000 IF INKEY$<>"r" THEN GO TO 6
000
9015 PRINT AT 1,12;"SCORING";AT
2,12;"-----"
9020 PRINT AT 4,3;" DRAGONFLI
ES----- 200"
9040 PRINT AT 6,3;" BUTTERFLI
ES----- 150"
9070 PRINT AT 8,3;" FLIES-----
50"
9080 FOR n=1 TO 50: NEXT n
9090 IF INKEY$<>"r" THEN GO TO 9
090
9100 FOR n=1 TO 10: PRINT AT n,0
; PAPER 5; INK 7;"": NEXT n: PRI
NT AT 21,26; PAPER 4; INK 4;"
": PRINT AT x,y;"": LET score=
0: LET z=10: LET x=16: LET y=13:
LET time=61: PRINT AT x,y; INK
7;"": GO TO 5360
9110 INK 7: FOR n=0 TO 16 STEP 1
0: PLOT n,32: DRAW 2,1: DRAW 2,-
1: NEXT n: PRINT AT 16,13;"": R
ETURN
9120 INK 7: FOR n=0 TO 16 STEP 1
6: PLOT n+230,32: DRAW 2,1: DRAW
2,-1: NEXT n: PRINT AT 16,13;"":
RETURN

```

Bug Fever
by Simon Cox

Double Height on Vic20

The program doubles the height of all the characters on an unexpanded Vic. Although short it can be very useful for display effects.

```

10 FOR I = 1 TO 1024
20 B = PEEK ( Y + 32768 )
30 POKE 5120 + X,B
40 POKE 5121 + X,B
50 X = X + 2 : Y = Y + 1
60 NEXT I
70 PRINT CHR$( 147)
80 POKE 36867,155
90 POKE 36869,253

```

Double Height
by Julian Storer

Elements

on BBC

This program should help to remind you of the main features of the first 20 elements.

Program notes

40 Asks for Element

60-100 Reads and checks Data
110-230 Main section
240-250 Another run?
280-480 Data

Variables

A\$ Element
C Atomic number

D Atomic weight
E\$ Elements symbol
F\$ Electron arrangement
H Number of electrons
I Number of protons
G The atomic group

To return the copy keys back to their copy function type: 245 *FX4.

```

>LIST
10REM ELEMENTS REVISED
20*FX4,4
30MODE 7:VDU23;8202;0;0;0;
40PRINT"ENTER ELEMENT TO BE REVISED"
50
60INPUT B$
70READ A$,C,D,E$,F$,H,I,G
80IF A$="Z" THEN 260
90IF B$=A$ THEN 110
100IF B$<>A$ THEN 70
110PRINT"ELEMENT ";A$
120PRINT"ATOMIC NUMBER ";C
130PRINT"ATOMIC WEIGHT ";D
140PRINT""What is ";A$;"'s symbol ";
150INPUT J$:IF J$<>E$ THEN PRINT"WRONG.ELEMENT ";A$;"'S SYMBOL
    IS ";E$:ELSE PRINT"CORRECT"
160PRINT""What is the electron arrangement(start by ";CHR$(34);"
    and finish with ";CHR$(34);")"
170INPUT J$:IF J$<>F$ THEN PRINT"ELECTRON ARRANGEMENT:";F$:ELSE
    PRINT"CORRECT"
180PRINT"How many neutrons in this element"
190INPUT J:IF J=H THEN PRINT"CORRECT" ELSE PRINT"NO. OF
    neutrons=atomic weight -atomic number.Which is ";H
200PRINT"How many protons in this element "
210INPUT J:IF J=I THEN PRINT"CORRECT" ELSE PRINT"no. of
    protons=atomic number. Which is ";I
220 PRINT"Which group is this element in?";
230 INPUTJ:IF J=G THEN PRINT"CORRECT" ELSE PRINT"GROUP=no.
    of electrons on the outer shell of the atom"
240PRINT"ANOTHER ELEMENT";
250J$=GET$:IF J$="Y" THEN CLS:GOTO 40 ELSE END
260PRINT"ELEMENT IS NOT IN THE FIRST TWENTY ELEMENTS."
270PRINT"PLEASE TRY AGAIN":FORO=1 TO 1000:NEXTO:RUN
280DATAHYDROGEN,1,1,H,"1",0,1,1
290DATAHELIUM,2,4,He,"2",2,2,2
300DATA LITHIUM,3,7,Li,"2,1",4,3,1
310DATA BERYLLIUM,4,9,Be,"2,2",5,4,2
320DATA BORON,5,11,B,"2,3",6,5,3
330DATA CARBON,6,12,C,"2,4",6,6,4
340DATA NITROGEN,7,14,N,"2,5",7,7,5
350DATA OXYGEN,8,16,O,"2,6",8,8,6
360DATA FLUORINE,9,19,F,"2,7",10,9,7
370DATA NEON,10,20,Ne,"2,8",10,10,8
380DATA SODIUM,11,23,Na,"2,8,1",12,11,1
390DATA MAGNESIUM,12,24,Mg,"2,8,2",12,12,2
400DATA ALUMINIUM,13,27,Al,"2,8,3",14,13,3
410DATA SILICON,14,28,Si,"2,8,4",14,14,4
420DATA PHOSPHORUS,15,31,P,"2,8,5",16,15,5
430DATA SULPHUR,16,32,S,"2,8,6",16,16,6
440DATA CHLORINE,17,35.5,Cl,"2,8,7",16.5,17,7
450DATA ARGON,18,36,Ar,"2,8,8",18,18,8
460DATA POTASSIUM,19,39,K,"2,8,8,1",20,19,1
470DATA CALCIUM,20,40,Ca,"2,8,8,2",20,20,2
480DATAZ,0,0,X,"0",0,0,0
    
```

Elements
by Kenneth Adair

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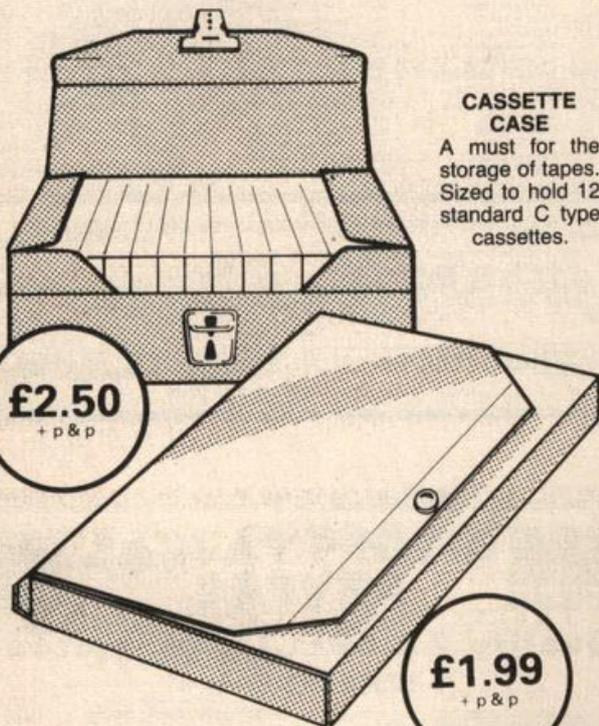
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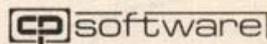
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OPEN FORUM

Pre-defined Sounds

on Dragon

This short machine code routine shows

```

10 '*****
20 '**** Popular Computing ****
30 '**** Weekly ****
40 '****PRE-DEFINED SOUNDS****
50 '****BY N. EDMUNDS 1983. ****
60 '****FOR THE DRAGON 32. ****
70 '*****
80 'USRO(1)=GUNSHOT
90 'USRO(2)=LASER
100 'USRO(3)=EXPLOSION
110 REM CLEAR 200,32000
120 DATA BD,8B,27,5D,27,04,C1,03,23,05,C6,02,7E,83,44,C1,
    01,26,37,34,12,B6,FF,23,8A,08,B7,FF,23,7F,01,47,8E,B7,
    98,A6,80,8D,14
130 '
140 DATA A6,80,8D,10,7A,01,47,26,F3,B6,FF,23,84,F7,B7,FF,
    23,35,12,39,B4,01,47,B7,FF,20,86,41,4A,26,FD,39
150 '
160 DATA 12,12,12,12,12,C1,02,26,37,34,32,B6,FF,23,8A,08,
    B7,FF,23,8E,00,01,86,FD,B7,FF,20,8D,17,7F,FF,20,8D,12,
    30,01,8C,00,98,25,ED
170 '
180 DATA B6,FF,23,84,F7,B7,FF,23,35,32,39,1F,12,31,3F,26,
    FC,39,12,12,12,12
190 '
200 DATA 12,12,12,12,12,34,12,B6,FF,23,8A,08,B7,FF,23,7F,
    01,47,8E,B7,98,A6,80,8D,14,A6,80,8D,10,7A,01,47,26,F3,
    B6,FF,23,84,F7
210 '

```

```

220 DATA B7,FF,23,35,12,39,B4,01,47,B7,FF,20,86,FE,4A,26,
    FD,39
230 'END OF DATA
240 '**BASIC LOADER FOR CODE****
250 DATA "END"
260 READ a$:IF a$="END" THEN 320
270 LET x=VAL("8H"+a$)
280 POKE 32000+c,x
290 c=c+x
300 c=c+1
310 GOTO 260
320 IF c<19623 THEN PRINT"DATA ERROR.":STOP
330 DEF usro=32000
340 PRINT"GUNSHOT=USRO(1)"
350 FOR d=1 TO 300:NEXT d
360 a=usro(1)'1=LASER.
370 PRINT"LASER=USRO(2)'"2=LASER.
380 FOR d=1 TO 300:NEXT d
390 a=usro(2)
400 PRINT"EXPLOSION=USRO(3)"
410 FOR d=1 TO 300:nextd
420 a=usro(3)'3=EXPLOSION.
430 '*****
User functions:-
USRO(1)=Gunshot sound.
USRO(2)=Laser sound.
USRO(3)=Explosion sound.

```

Pre-defined sounds
by N Edmunds

Telephone

on Spectrum

This program is a menu-driven user-friendly telephone directory for either model of Spectrum. The 48K Spectrum will allow for about 600-700 entries. The necessary alterations for 16K are included below. To alter the program for n entries:

Line 200 to: 200 Dim LS (n,32)
Line 2060 to: 2060 For A = 1 to n
Line 2143 to: 2143 For A = 1 to n
Line 3050 to: 3050 For A = 1 to n

Program notes

20 Colours.
30 Poke Caps Lock.
40-90 Print menu.
200-230 Variables.
1000-1100 ADD an entry routine.
2000-2190 DELETE an entry routine.
3000-3080 SEARCH for an entry routine.

4000 EXIT from program.
5000-5030 LOAD a file.
6000-6030 SAVE a file.

Variables

A = Search, delete loops.
L = Entry number.
AS = Menu List.
DS = Entry to be added to list.
ES = Entry to be erased.
LS (n,32) = List of n entries each of 32 characters.
OS = Entry to be searched for.
YS = File to be Saved/Loaded

```

2 REM *****
5 REM * TELEPHONE DIRECTORY *
10 REM * © D. HARRISON 1983 **
12 REM *****
20 BORDER 0: PAPER 0: INK 7: C
LS
30 POKE 23658,8
35 GO SUB 200
40 PRINT TAB 5;"TELEPHONE DIRE
CTORY": RESTORE
50 PRINT: PRINT
60 FOR A=1 TO 6: READ A$
70 PRINT AT A*3,6:A;AT A*3,9:A$
$
80 NEXT A
90 DATA "ADD A NUMBER","DELETE
A NUMBER","SEARCH","EXIT PROGRA
M","LOAD A FILE","SAVE A FILE"
100 LET I$=INKEY$: IF I$="" THE
N GO TO 100
110 IF I$<>"1" AND I$<>"2" AND
I$<>"3" AND I$<>"4" AND I$<>"5"
AND I$<>"6" THEN GO TO 100
120 LET GOTO=CODE I$-48
130 GO TO (GOTO+1000)
140 STOP
200 DIM L$(500,32)
210 LET L=1
220 DIM Z(100)
230 LET ZZ=1
999 RETURN
1000 CLS: PRINT TAB 5;"TELEPHON
E DIRECTORY";AT 2,0;"1. ADD A NU
MBER."
1010 PRINT: PRINT "PLEASE TYPE
IN THE ENTRY YOU WISH TO ADD
TO THE DIRECTORY AND THEN PRESS
ENTER."
1020 INPUT D$
1030 IF LEN D$>32 THEN PRINT AT
9,0; FLASH 1;"SORRY, YOUR ENTRY
IS TOO LONG. MAXIMUM LENGTH ALL
OWED IS 32 CHARACTERS."
: GO TO 1020
1040 PRINT AT 13,0;"IS THIS ALL
O.K. ?";AT 15,0;D$;AT 17,0;"IF N
OT, THEN PRESS 'N' AND YOU WILL
BE TRANSPORTED BACK TO THE MENU!
PRESS 'Y' TO ADD THIS ENTR
Y TO YOUR DIRECTORY."
1050 IF INKEY$="" THEN GO TO 105
0
1060 IF INKEY$<>"Y" AND INKEY$<>
"N" THEN GO TO 1050

```

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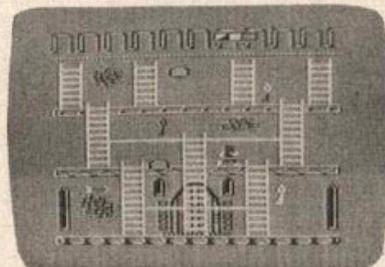
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```

1070 IF INKEY$="N" THEN CLS : GO
TO 40
1080 IF INKEY$="Y" THEN LET L$(L
, TO LEN D$)=D$: LET L=L+1
1090 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY"
1100 PRINT : PRINT : PRINT "ENTR
Y SUCCESSFUL !!!";AT 8,0;"PRESS
ANY KEY TO CONTINUE.": PAUSE 0:
CLS : GO TO 40
2000 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY": PRINT
2010 PRINT "2. DELETE AN ENTRY"
2020 PRINT : PRINT : PRINT "TYPE
IN AS MUCH AS YOU KNOW OF THE
ENTRY WHICH YOU WISH TO ERAS
E."
2030 INPUT E$
2040 IF LEN E$>32 THEN PRINT AT
6,0; FLASH 1;"SORRY THIS IS TOO
LONG FOR THIS PARTICULAR DIRECTO
RY. PLEASE TRY AGAIN."
      GO TO 2030
2050 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY": PRINT : PRINT
2060 FOR A=1 TO 500
2065 LET LEN1=LEN E$
2070 IF L$(A, TO LEN1)=E$ THEN P
RINT L$(A, TO LEN L$(A)): LET Z(
ZZ)=A
2080 NEXT A
2090 PRINT "END OF SCAN."
2100 PRINT : PRINT "DO YOU WISH
TO ERASE THESE ENTRIES?"
2110 PRINT : PRINT "TYPE 'Y' FOR
YES, 'N' FOR NO."
2120 IF INKEY$="" THEN GO TO 212
0
2130 IF INKEY$<>"Y" AND INKEY$<>
"N" THEN GO TO 2120
2140 IF INKEY$="N" THEN CLS : GO
TO 40
2142 PRINT : PRINT "DELETING "
2143 FOR A=1 TO 500
2145 IF L$(A, TO LEN1)=E$ THEN L
ET L$(A)=" "
2150 NEXT A

```

```

2180 PRINT : PRINT "ENTRIES ERAS
ED.": PRINT : PRINT "PRESS 'ENTE
R' TO CONTINUE."
2190 INPUT K$: CLS : GO TO 40
3000 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY": PRINT : PRINT
3010 PRINT "3. SEARCH.": PRINT :
PRINT
3020 PRINT "INPUT THE ITEM YOU W
ISH TO SEARCH FOR."
3030 INPUT 0$: CLS
3040 LET WS=LEN 0$
3050 FOR A=1 TO 500
3055 LET F#=L$(A)
3060 IF F$( TO LEN 0$)=0$ THEN P
RINT L$(A)
3070 NEXT A
3080 PRINT : PRINT "SCAN COMPLET
ED.": PRINT : PRINT "PRESS ANY K
EY TO CONTINUE.": PAUSE 0: CLS :
GO TO 40
4000 CLS : STOP
5000 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY": PRINT : PRINT
5005 PRINT "5. LOAD A FILE.": PR
INT : PRINT
5010 PRINT "PLEASE TYPE IN THE N
AME OF THE FILE WHICH YOU WISH
TO LOAD."
5020 INPUT Y$
5030 PRINT : PRINT : PRINT "STAR
T THE TAPE AND THEN PRESS ANY
KEY": PAUSE 0: LOAD Y$ DATA L$(1)
: CLS : GO TO 40
6000 CLS : PRINT TAB 5;"TELEPHON
E DIRECTORY": PRINT : PRINT "6.
SAVE A FILE.": PRINT : PRINT "PL
EASE TYPE IN THE NAME OF THE FI
LE."
6010 INPUT Y$
6020 SAVE Y$ DATA L$(1)
6030 CLS : GO TO 40

```

Telephone
by David Harrison

Cobwebs

on Dragon

This program will produce a series of

cobweb effects, going through the five graphic modes on the Dragon.

Program notes

10-30 Prints the title.

40-50 Defines the mode and sets up the screen.
60 Starts loop for drawing cobwebs.
70-90 Checks how cobwebs are to be drawn.
100-150 Draws cobwebs.
160-170 Pause in program, clears screen.
180-190 Repeat until the loop is finished.

```

10 CLS:PRINT@203,"cobwebs"
20 FOR XX=1 TO 2000
30 NEXT XX
40 FOR S=0 TO 4
50 PMODES,1:PCLS:SCREEN1,1
60 FOR KK=4 TO 16 STEP 4
70 IF KK=12 OR KK=20 THEN 90 ELSE 80
80 FOR A=0 TO 255 STEP KK:GOTO100
90 FOR A=255 TO 0 STEP -KK
100 Y=FIX(A*191/255)
110 LINE(0,Y)-(A,191),PSET
120 LINE(A,191)-(255,191-Y),PSET
130 LINE(255,191-Y)-(255-A,0),PSET
140 LINE(255-A,0)-(0,Y),PSET
150 NEXT A
160 FOR D=1 TO 2000:NEXTD
170 PCLS
180 NEXT KK
190 NEXT S

```

Cobwebs
by J Blatch

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OPEN FORUM

Dual

on BBC

Dual is a program for two players. It should

work on either A or B. The idea of the game is to destroy your partner ten times as you move left and right.

Program notes

10 — 160 Instructions

170 — 260 Initialise all variables
270 — 360 Defined characters
370 — 510 Print score and cowboys
520 — 600 Input and move cowboys
610 — 640 Prevents move off screen
650 — 920 Moves bullets
930 — 1030 Would you like another game?

```
10 MODE 7
20 CLS
30 PRINT"          DUAL"
40 PRINT"          ****"
50 PRINT" TSCORE=THE TOP MANS SCORE."
60 PRINT" BSCORE=THE BOTTOM MANS SCORE."
70 PRINT
80 PRINT" THE IDEA OF THE GAME IS TO
  DESTROY YOUR OPPONENT BY HITTING HIM
  TEN TIMES."
90 PRINT
100 PRINT"KEYS:"
110 PRINT"TOP MAN= Z=LEFT  X=RIGHT
  A=FIRE"
120 PRINT"BOTTOM MAN= ,=LEFT  .=RIGHT
  ;=FIRE"
130 PRINT
140 PRINT"          (HIT A KEY TO BEGIN)"
150 B$=GET$
160 IF B$="" THEN GOTO 160
170 SC=0: S=0
180 CLS
190 COLOUR 131
200 MODE 2
210 X=5
220 Y=1
230 Z=10
240 C=28
250 COLOUR 131
260 CLS
270 VDU 23,248,0,0,60,60,255,255,255,255
280 VDU 23,249,60,60,60,60,60,60,60,60
290 VDU 23,240,56,254,124,146,238,254,
  198,124
300 VDU 23,241,56,124,186,186,186,84,
  56,56
310 VDU 23,242,40,40,40,40,40,40,108,0
320 VDU 23,243,56,254,124,146,238,
  254,198,124
330 VDU 23,244,56,124,186,186,186,
  84,56,56
340 VDU 23,245,40,40,40,40,40,40,108,0
350 VDU 23,250,24,24,24,219,219,219,
  255,255
360 VDU 23,251,24,24,24,24,60,126,0,0
370 COLOUR 2
380 PRINTTAB(0,0);"TSCORE:";S
390 PRINTTAB(11,0);"BSCORE:";SC
400 COLOUR 1
410 PRINTTAB(X,Y);" ";CHR$240;" "
420 PRINTTAB(X,Y+1);" ";CHR$241;" "
430 PRINTTAB(X,Y+2);" ";CHR$242;" "
440 PRINTTAB(Z,C-2);" ";CHR$243;" "
450 PRINTTAB(Z,C-1);" ";CHR$244;" "
460 PRINTTAB(Z,C);" ";CHR$245;" "
470 COLOUR 2
480 PRINTTAB(3,15);CHR$250
490 PRINTTAB(3,16);CHR$251
500 PRINTTAB(14,17);CHR$250
510 PRINTTAB(14,18);CHR$251
520 A$=GET$
530 PRINTTAB(0,0);"TSCORE:";S
540 PRINTTAB(11,0);"BSCORE:";SC
550 IFA$="Z" THEN X=X-1:GOTO 610
560 IFA$="X" THEN X=X+1:GOTO 610
570 IFA$=";" THEN GOTO 690
580 IFA$="." THEN Z=Z+1:GOTO 650
590 IFA$="," THEN Z=Z-1:GOTO 650
600 IFA$="A" THEN GOTO 760
610 IF X=0 THEN X=X+1
620 IF X=19 THEN X=X-1
630 COLOUR 1
640 GOTO 410
650 IF Z=0 THEN Z=Z+1
660 IF Z=19 THEN Z=Z-1
670 COLOUR 1
680 GOTO 410
690 FORT=26 TO STEP-1
700 PRINTTAB(Z+1,T-2);" ."
710 FOR DELAY=1 TO 10:NEXT DELAY
720 PRINTTAB(Z+1,T-1);" "
730 NEXT T
740 IF X=Z AND A$=";" THEN GOTO 830
750 GOTO 410
760 FOR P=4 TO 27
770 PRINTTAB(X+1,P);" ."
780 FOR DELAY=1 TO 10:NEXT DELAY
790 PRINTTAB(X+1,P);" "
800 NEXT P
810 IF Z=X AND A$="A" THEN GOTO 880
820 GOTO 410
830 PRINTTAB(X+1,Y);CHR$248
840 PRINTTAB(X+1,Y+1);CHR$249
850 SC=SC+1:IF SC=10 THEN GOTO 930
860 FORT=1 TO 2000:NEXT T
870 GOTO 290
880 PRINTTAB(Z+1,C-1);CHR$248
890 PRINTTAB(Z+1,C);CHR$249
900 S=S+1:IF S=10 THEN 930
910 FORT=1 TO 2000:NEXT T
920 GOTO 290
930 CLS
940 MODE 7
950 PRINT"          WELL DONE!"
960 PRINT"          *****"
970 PRINT" YOU SHOT YOUR OPPONENT
  TO PIECES"
980 PRINT" WOULD YOU LIKE ANOTHER
  GAME Y/N?"
990 C$=GET$
1000 IFC$="Y" THEN GOTO 20 ELSE GOTO 1010
1010 CLS
1020 PRINT"BYE-BYE HOT SHOT!"
1030 END
```

Dual
by Martin Rushton



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Averages

on Spectrum

The program is called "averages" and I use it to work out mean and modal averages. It is written for the ZX Spectrum (either model) but should prove easy to convert to run on most other Basics. At the

start of the program you will be asked how many numbers you wish to compare. Next you type in those numbers (entering each number in turn using *Enter*). Finally the computer will print a list of the numbers entered followed by the modal average (if there is one), the number of times it appears and the mean average. The option for a printout is included.

Program notes

100-200	Allows for the inputting of numbers and sets up the variables.
210-250	Compares numbers inputted to see if any are the same.
260-290	Finds mode (greatest value of d).
300-370	Prints numbers, mode and the number of times that the mode appears.
380-420	Works out and prints mean.
425-470	Options available.
500-590	Printout.

```

100 REM AVERAGES BY SIMON SMITH
105
110 BORDER @: PAPER @: INK 7: C
LS
120 INPUT #0: "How many numbers
in calculation (Type number then
press ENTER) ?": a
125 IF a=1 THEN GO TO 120
130 DIM a(a)
140 FOR n=1 TO a
150 INPUT a(n)
160 NEXT n
170 DIM c(a+1)
180 FOR n=1 TO a+1
190 LET c(n)=0
200 NEXT n
210 FOR m=1 TO a
220 FOR n=1 TO a
230 IF a(m)=a(n) THEN LET c(m)=
c(m)+1
240 NEXT n
250 NEXT m
260 LET d=c(1)
270 FOR n=1 TO a
280 IF c(n):d THEN LET d=c(n):
LET #mode=a(n)
281 IF c(n)=d THEN LET a=1
290 NEXT n
300 PRINT "The numbers inputted
were.....": PRINT : PRINT
310 FOR n=1 TO a
320 PRINT a(n)
330 NEXT n
340 PRINT : PRINT
350 IF d=1 THEN PRINT "There is
no single mode": GO TO 360
365 PRINT "The mode is ";mode

```

```

370 PRINT "It appears ";d;" tim
es"
380 LET total=0
390 FOR n=1 TO a
400 LET total=total+a(n)
410 NEXT n
420 PRINT : PRINT : PRINT "The
mean is ";total/a
425 PRINT #0: "HIT ANY KEY TO CO
NTINUE": PAUSE @
430 INPUT "Press y-for a printo
ut of this screen r-to input ne
w numbers a-to exit the progr
am. Then press ENTER ": a$
450 IF a$="y" THEN GO SUB 500:
GO TO 430
460 IF a$="a" THEN STOP
470 IF a$="r" THEN GO TO 100
480 GO TO 430
500 LPRINT "The numbers inputte
d were.....": PRINT : PRINT
510 FOR n=1 TO a
520 LPRINT a(n)
530 NEXT n
540 LPRINT : LPRINT
550 IF d=1 THEN LPRINT "There i
s no single mode": GO TO 560
560 LPRINT "The mode is ";mode
570 LPRINT "It appears ";d;" ti
mes"
580 LPRINT : LPRINT : LPRINT "T
he mean is ";total/a
590 RETURN

```

Averages

by Simon Smith

Microradio

GW6JJN



Broadcasting

This week I would like to mention another kind of radio, the broadcast radio. The BBC and IBA to be exact. Microradio has so far only dealt with the amateur and CB kind radio, but you can't keep a good thing down and the big boys are getting into the act.

Radio West in the Bristol area now has an extremely large audience for their *Data-rama* programme. They transmit a microshow which discusses aspects of computing and then, late at night when only the computer freaks are about, they transmit computer

programmes (the kind you *Load*). This ghastly noise can be heard in the small hours on the FM and medium wave bands for Spectrum and BBC computers. All that is needed is the trusty radio cassette recorder and there are programs to be had for free. I must add that the disc jockeys do not talk over the intro as they do on pop records much to the frustration of some.

The word is spreading and now Radio Victory is at it. They are sending *Screens* over the air with their logo and that of a certain software company not a million miles from Portsmouth; shades of Pimania no less.

As if this was not enough, BBC Radio Wales is the latest candidate vying for the poor micros time. On Fridays at 6.30 pm they have their own computer programme and will be transmitting the *Loading*

kind as well. These will be in Basic for most microcomputers (and, I expect, Welsh for the Dragon). Radio Wales transmits its broadcasts and funny noises on 882Khz in the medium wave.

All of this has been too much for me, I don't get enough sleep as it is. There is a rumour that I have been seen coming and going about the studios of Swansea Sound Radio. I have always had a hankering to be a floppy disc jockey, so who knows, but that's another story.

A quick word for all those lucky people who live in the Duchy of Cornwall. The Cornish Amateur Radio Club now has a computer section devoted to the likes of us. I attended one of these meetings a while ago and was very impressed. Radio computing is becoming very popular down in the southwest where most

people have BBC micros, as I understand. Local listeners who cannot understand conversations on the amateur bands emanating from the Cornwall area can now be told that *The Philosophers Quest* has been solved and the region is back to normal.

One point: please note that information about the Cornish Club can be obtained from Simon Rodda on Penzance 3948. A second point is that when writing to the addresses I give in this column, a stamped addressed envelope will always bring a reply. It is common courtesy, after all.

Ray Berry GW6JJN

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

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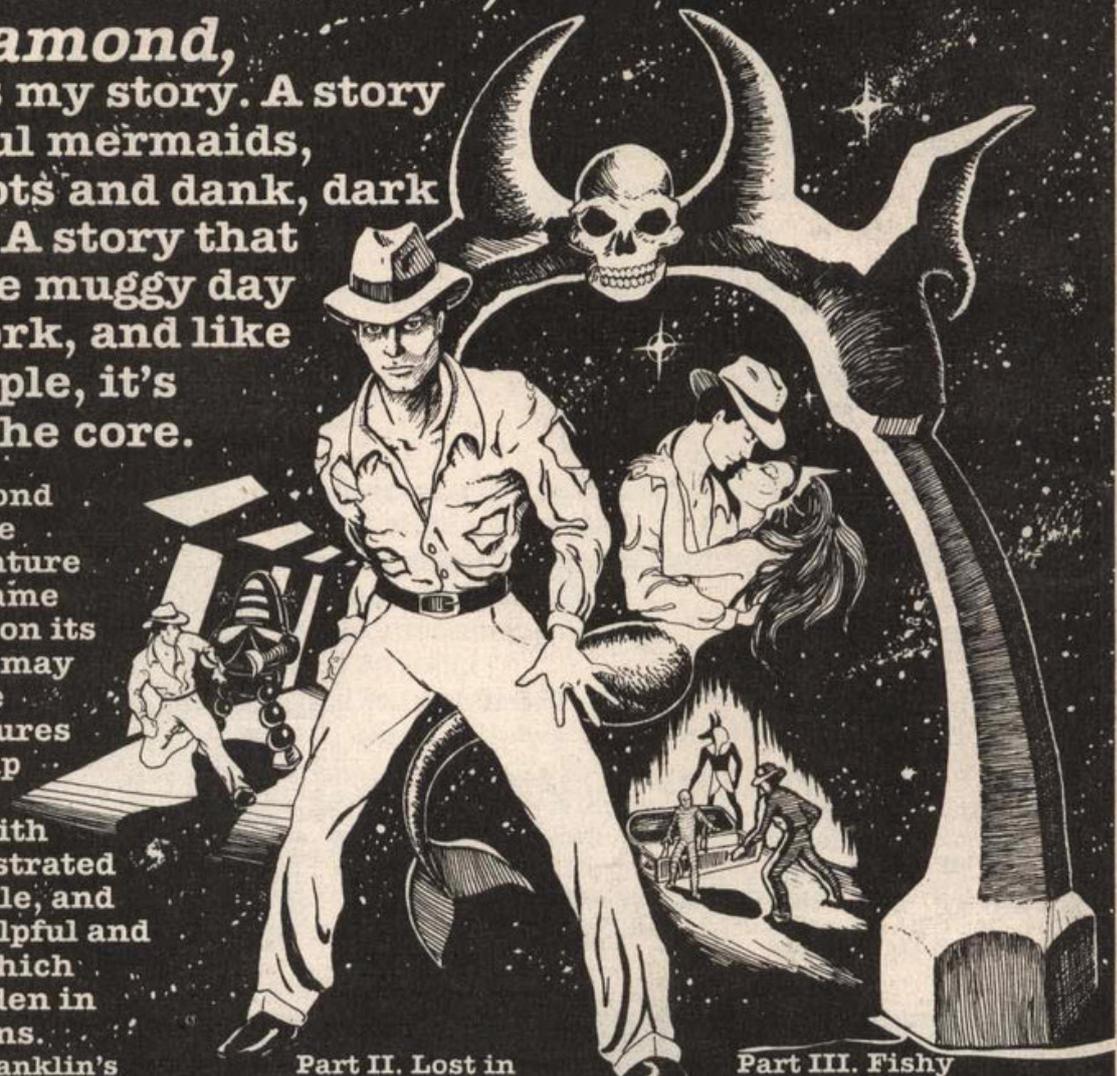
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Look out for Dan Diamond's next Adventure Series "Franklin in Wonderland" Available Spring 1984

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— Computer Choice (Program of the Month) —



Tony Bridge's Adventure Corner



Number one

I have a letter this week from Blair McGlashan of Swanley in Kent. He has a few tips for you to try out while playing *The Hobbit*.

"You may have noticed," he writes, "how the rope may be used for getting the torches in the goblin's cavern, and the elvenking's hall, by tying the torch and then taking the rope. You now carry the rope, with the torch tied to it."

Another anomaly that Blair has noticed is that the barrel can be used to carry objects that would otherwise be too heavy to carry. Now, says Blair, the player is able to use this in order to take any object that is mentioned in the program's description of each location. Thus, should you wish, for some strange reason, to collect the curtain at Beorn's House, go about it this way:

TIE CURTAIN

OPEN BARREL (you will, of course, have to have the Barrel!)

PUP ROPE IN BARREL (ditto the rope!)

EMPTY BARREL

UNTIE ROPE

Now, if you ask the computer for an inventory, you should find that you are carrying the curtain. This can be repeated for any inanimate object present at any of the locations, the only stumbling-block being that only that object may be carried.

Blair also throws some light on the "Barrelbug" that many of us have noticed — the one that causes the program to crash, or freeze, when you try to climb into the barrel. He points out that in order to climb into the barrel, the adventurer will probably have taken it beforehand. And you cannot, logically, be in something if you are also carrying it — so the computer locks up.

Finally, while talking of barrels, Blair says: "We see so much today about graphic adventures — and I would argue that this trend has been largely instigated by *The Hobbit*. Some of the serious adventurers among us wonder whether this is a good thing? When I first bought *The Hobbit*, I was impressed by the very good graphics, but the novelty soon wears off and the pictures begin to spoil the game by ruining one's own conceptions, which can be exceptionally vivid. I remember reading that each picture takes up approximately 500 bytes and there are at least 20

pictures. In this 10K of space, *The Hobbit* could have had many more locations, such as the eagles eyrie, and characters."

I'm in two minds about this subject — I love the pictures of *The Hobbit* and, as they are based on Tolkien's original illustrations, they are from the horse's mouth! However, it does get a bit annoying when, for the thousandth time, the goblin's dungeon is S-L-O-W-L-Y drawn. The Mysterious Adventures from Channel 8 (which I can recommend as good text adventures) contain superb Hobbit-like graphics. But, at a key-press, they can be turned off until called back. In fact, in order to see what objects are at the location, the picture has to be wiped from the screen, which will then reveal the information.

I don't know if *The Hobbit*, beloved though it is of us adventurers in the UK, "largely instigated" the current vogue for graphics in text adventures. After all, the Spectrum, let alone *The Hobbit*, has made little impression in the States so far.

From Southern Lapland, Gunnar Thander writes: "I am glad to say that the first adventure I bought was *The Hobbit*. This definitely made me mad (a micro-adventurer). Have you ever thought about the importance of trying a good, and I mean good, adventure the first time. I think 'old' adventurers really should try to show 'beginners' the good adventures."

We, the Grand Elf and I, try our best in this column, Gunnar, to bring you up to date with new adventures, and also (and very importantly), to retain interest in the old favourites . . . and don't forget to keep an eye on the *New Releases* spot, where Graham Taylor will advise you on the latest programs.

Gunnar continues: "Being non-English, every time I begin a new adventure, I actually face two adventures. The first is the program itself, the second one is the English language!"

Gunnar and his two sons have finally completed *The Hobbit*. If the Thander household is feeling a bit lost and wondering what to try now, there is *Valhalla* awaiting them. As I write, this program is number one in the software best-seller charts and Legend, its authors, claim that the adventure will have done one million pounds worth of business by Christmas, which is very well deserved. I'll be looking in more detail at this program later, but for now, it is gratifying to see that this stunning adventure is getting recognition.

While on this subject, let me move on to a letter I have received from George Wells, of Raynes Park in London. George is 69 (which must make him eligible for a senior adventurer award!). He rescued a Spectrum from his daughter, who was about to throw the thing out of a window. George doesn't say which adventure she was playing, but he has now given it a diet of *Valhalla* which it seems to like very much: "I never cease to admire and wonder at the programmer's skill . . . I also play *The Hobbit*, but, for me, it cannot hold a candle against *Valhalla*. Like the Grand Elf, and

Graham (*New Releases*) Taylor, George has noticed that the program has a unique reaction to the casual swear-word! He finishes: "At 69 I must be in my second childhood. I once started *Valhalla* at 11.30 am and finished at 1 am the following morning." I hope you have many more happy hours with this wonderful adventure, George!

The Hobbit Hall of Fame

Steve Redhead (I do mention *Golden Apple*, Steve, and I agree, it is very good), Wayne Greaves, Kevin Marsh and Peter Bywater, who says that he managed it despite not being one of those unfortunates who can go round *Manic Miner* 20 times before the program has loaded, or thrash the life out of *Orbiter* with the telly off! I know how you feel, Peter — even after reading all the letters in *Popular Computing Weekly* about how to beat *Manic Miner* and the others (what is the point, then, of playing them, I wonder), I still can't get past Eugene!

Incidentally, Peter, your observations about the various objects such as the golden key, the curious map and so on, are a little off target. You'll find the adventure harder to complete without them.

J Pearson with 92.5 percent (and, no you are certainly not the only one to have bought *Valhalla*), Mike Docherty, Alan and Daphne Davis, Daniel Pitcher, Stuart Wedgwood (who has also scored a magnificent 400 points in Crystal's fantastic *Halls of the Things*) and finally Jason Turtle who has completed *The Hobbit* in four moves!

To finish this week, a couple of pleas for help in Acornsoft's *Castle of Riddles*. Mark Richards, with a grand score of four, would like to know how to progress past the wishing well, having met the bear, seen the mirror, and the blood-sucking creature. Also, what does G.L.O.O.P. mean? Are these the letters on the wall of the corridor of doom, Mark? If so, try going *Up* from the courtyard, standing in front of the safe, and *Saying* the word. You could also try getting the bucket from the well (and persevere, it may not come up the first time).

Andrew Goodall is also stuck in *Castle of Riddles*, at the top of the pinnacle after the shooting gallery. Is there a magic word, or does he need a rope? He is also stuck in Digital Fantasia's *Time Machine* — how can he get out of the secret room underneath the desert?

In the near future I hope to be looking at some very interesting adventures that come, like *The Hobbit*, complete with novels. ■

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

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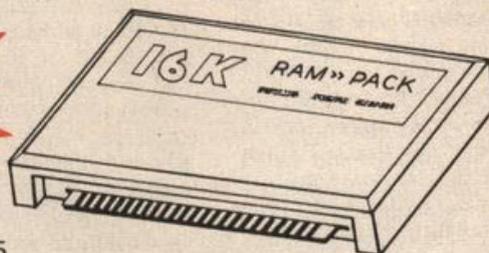
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LIGHT CONTROL

B A Cummins of Clonmacnoise Road, Crumlin, Dublin, writes:

Q I own a Vic20 and would like to control lights, etc, through it. How is this done and is there a book on the subject?

A This can be done, but you will need a relay of some sort. The Vic will not have enough power to drive a mains relay directly, which means that you will have to use a transistor-driven relay to cope with the low voltage. If you want to use a static relay from the mains, then you will have to take care to isolate the extra mains power supply that would be needed.

As far as I know, there are only two books on the subject, *20 Simple Electronic Projects for the ZX81, Spectrum and other Computers* by Stephen Adams, which is heavily orientated to the Sinclair computers, but it carries a lot of useful general information, and *Simple Interfacing Projects* by Owen Bishop, which is more comprehensive and is not tied to a particular computer, but is more difficult to understand.

ASCII AND ANSI

Ian Carleton of St Leonards Hill, Windsor, writes:

Q I am new to computing and am getting my first computer for Christmas (an Acorn Electron). What is the difference between Ascii and Ansi? Does the Electron have them and does it need them?

I do not know if you have answered this before, but I

have seen the words a lot and would like to know because they seem important.

A The Electron has Ascii but not Ansi. Ascii stands for *American Standard Code for Information Interchange*. It is an agreed way of coding the main characters that a computer uses. Thus, a capital letter A has a code of 65 whether it is used on an Electron, Commodore 64, Spectrum, or any of the other common computers.

Although most computers augment the standard by adding their own characters to other code numbers, the main numbers and symbols remain the same. This is very important when it comes to enabling two computers to talk to each other.

Ansi is slightly different. It stands for *American National Standards Institute* and is a dialect of Basic. The Electron does not use this dialect, instead it uses a similar one to the common Microsoft Basic. Microsoft is used on the Commodore, Dragon and Oric, to name but a few.

DEDICATED UNIT

H Jenkins of Salford writes:

Q What is the difference between a monitor and a television?

A Essentially, the difference is that one is a dedicated unit and the other is not. A television was not made specifically to receive a signal from a computer — therefore, it contains a lot of circuitry for the decoding and presenting of pictures that have been transmitted over the air. Thus, any signal going into the set via the aerial socket is processed electronically and decoded before it comes on to the screen. All very necessary for a broadcast signal, but equally unnecessary for the signal produced by a computer.

The modulator has to turn the video output from the computer into UHF, so that it can be sent into the television, via the aerial socket. All this electronic manipulation of the signal, causes interference, resulting in a loss of clarity.

A monitor does not have any of the circuitry for decoding television signals. As long as the computer has the cor-

rect output, usually RGB (Red Green Blue) or composite video, then the monitor will accept this. With less electronic processing, there is a clearer signal.

BLACK AND GREEN

Lee Milset of Paradie Street, Warwick, writes:

Q I have recently purchased a Vic. It suits my needs very well, except when using the colour black in large blocks or as a screen border colour. In the case of large blocks, the screen distorts in the middle. When using black as a screen colour, the tv flickers uncontrollably and even fiddling with the tuning does not help. I have to turn off the computer to restore the picture.

Could you tell me if this is a computer fault? It works perfectly with a mono set.

B P Knox of Garden Way, Littleborough, Lancs, also writes:

I own a Vic20, unexpanded, and it is faulty (I used another Vic to check). When using a black border I lose all green characters, which turn white, while cyan and yellow go pale. Can you tell me what is causing this?

I have been on to Commodore and they say they have not heard of the problem before.

A I have met this problem before, though I have never tackled it. I am surprised that Commodore have never met it at all. I have not got a definite answer, but one possible solution was offered to me by Stephen Adams.

Most probably, the problem lies in the Vic (Video Interface Chip), or the associated discreet circuitry. The phasing for the colour green is also the reference phasing for the other colours, so while a different phase means a different colour, it is green from which they take their standard. In addition, black is in fact off — no signal. Therefore, if you

are using black and green, you are in effect just switching the colour on and off.

If you have tried retuning your television and failed, then it is probable that there is a small problem in the video circuitry. Usually this would cause no trouble, but when black and green, which are constantly switching the screen display on and off, are used together, then this might well serve to exacerbate any faults.

In Lee's case it would seem as if the problem is that the Vic chip needs to action the Restart because it is going off phase. This happens when you power up. I am afraid that I can offer little help in fault finding, particularly if the problem comes from within the Vic chip itself.

I am afraid that all I can say is return your computer if it is still under guarantee.

WHAT IS A RADIAN?

David Grennel of Banbury, Oxfordshire, writes:

Q I have a Spectrum, but the question I want to ask is not about the Spectrum in particular. I would like to know what a radian is. Never a whizz at maths, I do, however, know a little bit about geometry, but I am sure I never met radians.

Could you explain — is it a set number of degrees or is it a fraction of pi?

A Radians can be expressed in terms of pi, but this is not the way a radian is established. There is a clue in the name, radian and the source, radius. In formal terms, a radian is 'the angle subtended at the middle of the circle, by an arc the length of a radius of that circle'.

Imagine a circle of two centimetres, draw the radius. From where it reaches the edge of the circle draw an arc the length of the radius, in this case 2cm. From there draw a second radius. The angle made by these two is one radian.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem Peek it to Ian Beardsmore and every week he will Poke back as many answers as he can. The address is Peek & Poke, PCW, 12-13 Little Newport Street, London WC2R 3LD.

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ATARI VCS with Pit Fall, Combat, Space Invaders, Asteroids, Phi Onx, two joysticks, pair of paddles, all boxed, very good condition, hardly used, cost £180, will sell for £95. Tel: Mrs E Riley, 500 7735.

VIC20 + 8K Ram + cassette deck + £40 games + books and magazines + 10 blank tapes, £130 in total. Tel: Gary, Cookstown (06487) 63712, after 4 pm.

VCS ATARI CARTRIDGES, between £8 and £10 each, titles include Space Invaders, Empire Strikes Back, Pac-Man, 65 titles in all, Tel: Bicester 242408, between 5 pm and 6 pm.

TI99/4a COMPUTER plus Extended Basic and Tombstone City. Over ten cassettes and cassette cable. Very good condition, ideal for Christmas. Tel: Edward on 570 3131 after 4 pm.

TEXAS TI99/4a, joysticks, three cartridges: Parsec, Connect Four and Invaders. Eight cassette games, beginners Basic tutor, dual cassette lead. All still guaranteed, in good condition, £150 ono. Tel: Egham 35853.

TELETYPE KSR 33. Ideal cheap printer. Manual and stand, £50. Could deliver London/Oxford area. Tel: Malvern 68865.

SHARP PC1211 pocket computer and CE 122 printer/cassette interface. Three manuals, mains P.S.U. and printer paper, £60. Tel: 031-343 3725, Colin.

WANTED COMMODORE 64 preferably with cassette unit, swap for TI994a with Parsec, Munchman, Invaders, Household Budget, Management (command modules) plus 21 cassette games and cassette lead. Tel: Cyrus after 6.30 pm.

SWAP DRAGON hi-res or Ghost Attack cartridge for Chess of swap both for J.C.B. sound of speech module. Tel: 01-821 1710 after 9 pm.

SPECTRUM SOFTWARE, swap Richard Shepherd's Ship of the Line and Trans Tower for Black Crystal, Valhalla or any one for Psst, Super Spy, any adventure. Tel: Jeff, (Birmingham) 779 3026.

LOADS OF SPECTRUM SOFTWARE to swap, sell two-thirds new price such as Scrabble, Conflict, Zues etc., swap for software or hardware. Call or write Austen, Kettering Court, Thornton Heath, Surrey.

BI-DIRECTIONAL 80-column dot-matrix printer, CBN Tronics OC serial 1/6 W manual, £220, unused MZ80K I/O box £75, serial board £60. Wanted twin floppies for MZ80K W. post board. Tel: Ray Pearce, Southampton 788278.

INTELLIVISION plus 14 cartridges including: Astromash, Frog Bog, Microsurgeon and more, worth £375, yours for only £150. Great value from P. Bevin, 62 St Denis Road, Selly Oak, Birmingham B29 1LR. Tel: (021) 476-6880 after 6 pm.

TRS-80 model 1, level 2, including manuals, books, all leads, PSU and much software, will sell for £150 or swap for Commodore 64 including PSU and leads. Tel: (0442) 52444.

TI99 CASSETTES, leads and Munch Man cartridge, £50. Tel: 485 8393 after 5 pm.

DOLPHIN 80P PRINTER compatible with BBC but needs interface, can have 80 or 136 characters per line over 4000 sheets, 9in paper, £200 ono. Tel: 0268 412549 after 6 pm.

SHARP MZ 80K, 50K Ram Quantum, hi-res, 4-Basics Forth, two assemblers, disassembler, machine code, utilities and many games, manuals, monitor plus basic, listings, magazines, books, user notes. Excellent condition, dust cover, cost £800+, accept £450 ono. Tel: 01-889 1090.

UK101 SK, cased. Wemon monitor, ETI 2000 baud tape loader, £130. Tel: 085 682 200.

FOR SALE or swap. Sharp MZ80-A, excellent condition, hardly used, with 100+ programs and four languages, £300 or swap for BBC micro model A (or B). Other offers considered. Tel: (Bottwell) 853460.

ORIC 1 48K, never used. Bargain at £90. Tel: Kim, 01-673 6735 after 6.30 pm.

FOR SALE. Salamander, Franklin's Tomb, Star Jammer, Microdeal, Space War, Shuttle; Dragon Data Dr. Mountain. The lot £20 ono. Will separate. Tel: (Cornwall) Mawgan 500.

ORIC 1 48K computer, including bought software: Dig-Dog, Night Cycles, Oric Trek and Hopper plus leads and manual, £99. Tel: Sheffield (0742) 51235.

SHARP MZ80K 48K Ram, monitor and cassette, three Basics an assembler and Z80 manual and tapes, £150. Tel: 66322 Ext 2802 Burton on Trent (daytime) Mr Bolton.

HEWLETT PACKARD 85A desk top computer, 16K expanded to 32K, screen printer and micro cassette, print rolls and cassettes. Good condition, £1,145. Tel: Tadworth 3675.

TI99/4A with extended Basic, Chess, Parsec, Munchman, Tombstone City, Speech Synthesis, cassette leads, Basic and games books, cost over £400, will sell for £200. David Hobbs (0442) 47661.

INTELLIVISION + 9 cartridges including Lock 'n' Chase, Dungeons and Dragons, Star Strike, Tennis, Triple Action, ideal Xmas present, cost £290, sell for £125 ono. Tel: 01-529 4357.

TEXAS TI99/4A hardly used, still boxed, few tapes, 1 cartridge, 2 joysticks, beginners Basic cassette + many magazines and programs, bargain £100. Tel: Way 43916.

SHARP MZ-80K, 48K, built-in monitor and cassette, includes software, £200, buyer collects. Mr J. Jones, 94 Queensway, Didcot, Oxon.

LYNX 48K, all leads and manuals + PSU, introductory cassette + users group magazines, boxed, under guarantee, £175. Tel: 021-443 5361 (evenings or weekends).

MICROLINE 82A, dot matrix printer with graphic option, boxed, £200. Acornsoft view word-processor, £30. Tel: (0344) 886 178.

LYNX 48K + 8 games cassettes, manual + introduction tape, 2 books, user club news letters, guaranteed, £160. Tel: (0634) 402694 (after 6 pm).

SHARP MZ80K, 48K, Basic extension tape, data base cassette, 100 games and assorted programs, Sharp soft users notes, price £240. Tel: 054-3256138.

TI99/4A, complete with cassette leads, Beginners Basic cassettes, and manuals, boxed, as new, offers invited, or would consider swap. Tel: (0252) 511248 (anytime).

FOR SALE, 1K ZX81 + keyboard + 4 books containing over 100 programs + manual and all leads, £25, very good condition, the ideal Xmas gift, buyer must collect or pay postage. Phone 021-772 3873, soon!

BBC MODEL B, Acornsoft, swap Rocket Raid, Arcadians, Killer, Cowboy Shoot Out, Dragon Chess. Tel: Derby 700088.

FULLER KEYBOARD, brand new, never used, worth £30, sell for £15. Tel: 01-698 5971.

HP41C + 3 memory modules + stats pack + maths pack + printer, £250 ono. Tel: 01-735 3681 (evenings).

SHARP MZ80A for sale, includes some software, £250 ono. Tel: Burnley (0282) 36327.

CENSORY G chess computers for sale, offers. Tel: 01-854 7913 rm 423.

TI99/5, extension Basic, Attack cartridge, other software for £100. Tel: 074-488 2430 (anytime).

AGF, joystick, interface 2 for Spectrum, user's Atari joystick — works with many games like Manic Miner + Lunar Jetman, £12. Tel: Bristol (0272) 685504.

SCRABBLE, brand new in box, half price, £8, Write: 15 Frome, East Tilbury, Essex RM18 8TD.

PRINTER, TELETYPE MODEL 33, complete with papertape punch, reader and floorstand, can be seen working, ideal for conversion to computer printer, £40. Tel: Hemel Hempstead (0442) 67918 (after 6 pm).

FOR SALE, Bug-Bytes, Vic Panic original cassette, hardly ever used, accept £5, or swap for Another Vic in the Wall. Tel: Kildgrove (07816) 3716 or 2640.

LYNK 96K upgraded machine including software, printer cable and books. Quick sale, offers over £200. Tel: 01-658 0645.

IKON HOBBIT floppy tape system for BBC, hardly used, including six data cassettes, zero memory Rom. Cost £195, accept first offer over £150. Tel: 01-658 0645.

FOR SALE: Dragon 32K in mint condition, includes over £160-worth of software, joysticks, manual and books. Will sell for £200 ono. Tel: (St Helens) 051-430 0741.

ORIC 16K plus one tape, worth £103. Unwanted gift, sell for £80 or swap for 48K Spectrum. Tel: Crawley 518460.

16K ZX81 and software, £45. Tel: 0505 842828.

ZX81s for sale

ZX81 plus 16K RamPack, printer, cassette recorder, £25 software, ZX81 executive case. Worth £155, sell for £115 or swap for Vic20 plus cassette. Tel: Wakefield 259767.

ZX81 16K, manual, leads etc, Sinclair belt, software: Pimania, Avenger etc. Best offer secures. Tel: Thorham Common 6421.

ZX81 16K Ram, leads, manual, machine code book, two games books, £60 of software including: Flight Simulation, Galaxians, Labyrinth, Space Raiders, £60 ono. Tel: Glossop 3516.

ZX81 SOFTWARE. Includes Brick-Stop, QS Scramble, QS Defenda and QS Asteroids. All tapes in original condition. Tel: 0984 23783 for details and prices. No offers ignored. No time wasters.

ZX81 16K, software — Trader, £6; Flight Simulation, £4; Orwell cassette four, £4, 3D Defender, £4, QS Scramble, £3; Space Raiders, £3. Mr A. B. S. Wheeler, 38 Bede Road, Barnard Castle, Durham.

ZX81 plus 16K Ram pack, with manual, including power supply, etc, software worth £16 and print 'n' plotter pad, well cared for, ideal for beginner, £50 ono. Tel: 01-960 0094 evenings.

ZX81 16K, leads, manual, PSU, books, £200-worth of software — all current, superb condition, would make a nice Christmas present, make me an offer, I might accept. Tel: 042 879 3813.

16K ZX81 plus leads and manuals + software including Pimania, Flight Simulation, Catacombs, Sorcerers Island, etc + Mastering Machine Code book by Toni Baker, £50 ono. Tel: 0787 (Essex) 475022.

ZX81, 16K memory pack, Kempson keyboard, case, box and £40 of software, selling it for £75. Tel: 01-670 3817.

ZX81, 16K Ram, including books, programs and consul. Price £60. Mr Cruse, 3 Dorset Way, Twickenham TW2 6NB.

ZX81 16K Fuller keyboard, joystick and interface, software, book and magazines, cost £160, very good condition, £65 ono. Tel: Bourne End 24201 after 5 pm.

16K ZX81 plus £25 of software, immaculate condition, still boxed with manual, £40; also Sinclair 16K Ram pack, as new, £15. Romford 61557.

ZX81 16K, Maplin keyboard, DK'Tronics graphic board, 4K + 2K chip, aluminium case 14 1/2" x 14 1/2", cassette recorder, leads, manuals, b/w TV, software, etc, swap for Vic20 expanded, games, recorder, manuals, or £120.

ZX81, 16K Ram pack, QS Scramble, selling it for £55, offers considered. 01-575 3885, ask for Levine.

16K ZX81 + Fuller keyboard, excellent condition, with £50 of software and loads of magazines, will sell separately or the lot for £70 ono. Tel: 01-698 5971.

ZX81 16K, keyboard, sound pack, graphic Rom board, all in a consol case, £50 of magazines + books, lots of software + Tron, 14-inch b/w portable TV, offers over £160. Call evenings Anosh, 01-998 8117.

ZX81 16K QUALITY KEYBOARD, 20 games, manual and leads, £65 ono. Tel: 0952 811399.

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VIC20 with cassette unit, 3 months old, 2 games including Fly Snatcher, Blitz and Alien Blitz, Asteroids, Food Machine, sell for £120. Tel: (Hastings) 431198.

VIC20, C2N cassette deck, starter pack with Introduction to Part I, 27 games, boxed, as new, 6 months old, 6 months guarantee left, sell for £150. Tel: Crawley 22141.

ORIGINAL VIC20 3.5 ARCADE GAMES, including Asteroids, Pucky, Astro-Land, Treasure Maze, Target Shoot, all on one great cassette and only for £3.95. Phone Northwich 782475 after 5 pm.

VIC20, plus 16K Ram, 6 months old, plus software, £125. Phone 01-989 1679 after 6.30 pm.

16K VIC20, cassette unit, super expander, Omega Race, hi-res graphics, book, joystick, many other games, worth £300, selling for £150. Tel: 0883 48554 (evenings).

VIC20 + cassette unit + 3K super expander + Star Battle cartridge + software, cost £265, sell for £120. Tel: 01-204 4596 (after 4 pm).

VIC20 + C2N cassette recorder + 8K, 14 games cartridges + Programmers Aid + Mission Impossible, £400 of software, Vic Revealed + compiler, Forth + Chess, worth £700, sell for £160 — will not separate. Tel: 01-579 2129 after 4.30 pm.

VIC MEN, original tape for Vic20, offers? Tel: Stevenage (0438) 811634 after 7 pm.

VIC20 SOFTWARE, over 25 Vic20 tapes (originals only) at £2-£3 each, e.g. Micropoly, Battle of Britain, Snooker, etc. Tel: 0438 811634 after 7 pm.

COMMODORE VIC20 FOR SALE, including games cartridge, £70 ono. Tel: Chorley (02572) 75035.

21K VIC20 + C2N + Introduction to Basic I + 4 cartridges + Point Master + £300 of software, cost £700, sell for £230 ono. Tel: Reading 883238.

VIC20 SOFTWARE to swap or sell. Tel: 05212 3503.

25 UNEXPANDED VIC20 GAMES (yes 25), including Ski-Run, Pontoon, Slot Machine, 5 adventures, hi/low, etc. only £5 !!! Phone Lye 3057 after 6 pm (ask for Adrian).

VIC20 SPEECH SYNTHESISER CARTRIDGE, cost £65, unwanted gift, with full instructions and demo cassette, £40 ono. Mr D. Oldfield, 50 Albion Terrace, Lynemouth, Northumberland NE61 5TA.

VIC 1540 SINGLE FLOPPY DISK to swap for Commodore 64 with cassette recorder or will sell for £220 ono. Tel: 0622 813794.

VIC20 + C2N + 3K + 8K + 16K + joystick + programme reference guide, etc. swap 48K Spectrum. Phone 01-858 2261 (daytime).

VIC20 + 16K (8K 3 slot motherboard + 8K cartridge) cassette unit, good condition, loads of software, joystick, 3 good books, only £130 ono. Paul Johnston, 7 Dunedin Road, Corby NN18 9JX.

VIC20, C2N + 16K + 8K, revision programs, Dr Watson's Assembly + over 45 original games, including Arcadia, Skyhawk, plus much more. Also manuals, reference guide, will sell separate or all for £250. Call Ketan at 788-0630 (evenings).

VIC20, £75 ono, innovative computing £00, Getting Acquainted with your Vic £2, Bug-Byte Asteroids £5, Backgammon £5, Audiogenic Amok £4, programmer's reference guide £8, Quicksilver Skyhawk £7, dustcover £1, Starbattle £7. Christchurch (0202) 483807.

COMMODORE 64 with cassette unit plus handbook and £30 worth of software, £200. Tel: 43636 (daytime), 371638 (evenings), Derby.

VIC20 with tape recorder, 20K expansion, joystick, £200 of software + books + magazines, sell for £150 or swap for 48K Spectrum. Tel: High Wycombe (0494) 716520.

VIC20 Adventureland cartridge, will swap for any other in Scott Adams series or sell for £8. Tel: Rochdale 0706 358419.

VIC20 lightpen + games, cost £34.50, bargain at £22. Ring 0743 60890 (after 6 pm) ask for Michael.

VIC20, 1 month old, Introduction to Basic Part I, C2N tape recorder, Personal Computing for the Vic20, £20 software, sell for £100. Tel: 359 1151.

VIC20 + 16K Ram switchable + 2 games cartridges + programmer's reference guide + 20 games etc on tape + magazines, £99. Phone Walton (0932) 229646.

VIC20 16K RAM PACK, £300 of software, joystick, books, six months old, excellent condition, many cartridge games. All for £225. Tel: 881-1758 evenings.

VIC20 plus C2N cassette unit plus joystick, all leads and software, £110. Tel: (Southend) 0702 713755.

VIC20 plus C2N cassette, 8K, super expander, Buti, plus, motherboard, light pen, joystick, literature and many games, worth £370, sell for £250. Tel: Boldon 363680 after 5 pm.

VIC20 cassette, joystick, £20 worth of software, manual, programmer's reference guide and magazines, £100 ono. Tel: 01-943 0856.

VIC20 DATACASSETTE BOOKS, 3K Ram, 16K Ram, Super Expander, 30-40 plus tapes, three games cartridges, machine code, monitor, good condition, boxed. Tel: 0203 (Coventry) 76831.

VIC20 CARTRIDGES for sale or swap for BBC B software, Avenger, Ratrace, Jelly Monsters, Alien, Star Battle, Road Race, Adventure Land, £12 ono each. Tel: Chelmsford (0245) 468954 after 6 pm or weekends.

VIC20 plus cassette unit, with dust cover and quick shot joystick, five books, lots of magazines and lots of software, i.e., games, music, educational, etc. Offers please. Tel: 061-339 3227.

COMMODORE-64 plus Commodore cassette player and games plus program book and magazines etc. Purchased last month. Mint condition. Offers realistically of £250. Tel: 01-568 7325.

VIC20, still under guarantee, C2N cassette player, joystick plus two cartridges, eight machine code, games, Vic programmer's reference guide, £110 ono. Tel: Radlett 7506.

VIC20 plus cassette deck, Introduction to Basic Part I, joystick and 16K switchable Ram Pack plus £80 of software and magazines and books, sell for £200. Tel: 6563824.

VIC20 BOOKS, software, £75; 16K Ram, Programmers Aid, Hesmon, £20 each. All boxed, as new. Tel: 654 4899 after 6 pm.

VIC20 Choplifter cartridge for sale, £20, cost £25 (needs a joystick). Tel: (0222) 842649 after 5 pm.

VIC20, 16K, C2N cassette deck, super expander, joystick, Jelly Monsters, Avenger Road Race, Adventure Land, Pirate Cove, Physics Revision, Cassettes. Excellent condition, sell for £150. Contact John Mudge on Uxbridge 38397.

COMMODORE VIC20 cassette deck, super expander, point master joystick, games including Avenger, Sargon, Chess cartridges, 10 months old, £150. Tel: (0565) 4712

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VIC20 EITO/SOSTELL, under guarantee, CN2 unit, plus expansion, all £130. Tel: Farnborough, Kent 54609.

VIC20, plus C2N plus 16K Ram and Introduction to Basic plus £75 of software, £168. Tel: 041-772 2055.

VIC20 C2N TAPE DECK, 32K Ram Pack, switchable to standard plus 3K plus 16K plus 24K plus 32K. One hand, quick shot, joystick, books, manuals and magazines. Cassette software. Under guarantee. Offers. Tel: 0981 250420 after 5.30 pm.

COMMODORE VIC-20 C2N. Lots of programs and books. All leads, 10 months guarantee. Boxed, for £100. Tel: 0506 414432.

VIC20 C2N super expander, Introduction to Basic Part I and many other books, software including seven cartridges and 15 cassettes over £500 when bought, will accept £350. Tel: Blackburn (0254) 662385 between 5 pm and 7 pm.

COMMODORE VIC20 with 16K Ram pack, C2N cassette deck, £165 of software, two educational cassettes, English and physics, one road race cartridge, one dust cover, Arcade software including: Martian Raiders and Paratroopers, £195. Mr. S. R. Kelshiker, 22 Woodgrange Avenue, Kenton, Harrow.

VIC 15-15 PRINTER, including word pro. cassette and new ribbon, £130. Tel: Evesley (0734) 732268.

COMMODORE VIC20 3/8K, joystick, tape cassette unit, over 25 cassettes and three games cartridge, £200. Tel: Fareham 230956 or write to: 14 Drysles Close, Bridgeway, Gosport PO13 0SL.

VIC20 16K CASSETTE UNIT, £200 of software, £30 of books, one joystick, five cartridges, £220 ono or possibly swap 48K Spectrum with cassette and printer. Tel: Leeds (0532) 772818.

VIC20 SOFT SWITCH, never used, £18. Tel: Aldridge 51923.

COMMODORE 64 1541 disc drive, disc daylight pen, reference guide. All for £50. Tel: 01-603 2931.

VIC20 plus cassette deck and three joysticks. Many books, including Programmer's Reference Guide, loads of software, £150. Tel: Deneham 860 293 after 5 pm.

16K FOR VIC20 with five 16K games, £30. Tel: 01-387 8751 evenings.

VIC20 plus C2N 3K expansion cartridge, two games cartridges, 15 commercial software games, including adventures, and tape, copier and joystick, magazines and books, as new, worth £350, will sell for £150. Tel: Blackpool 692323.

VIC20, with 16K cassette deck, joystick, paddles, many magazines, cassette games, £170 ono. Tel: Romford 67307.

16K VIC20 plus cassette deck, joystick and paddles, magazines, cassette games, £165 ono. Tel: Upminster 50552.

VIC20, 16K, C2N cassette, joystick, £150 worth of software, books, magazines, cost over £350, sell for £200 ono. Tel: Lindfield 2677 evenings.

VIC20 Adventureland cartridge, swap for Rat Race or other adventure cartridge except Count. Tel: Nottingham 204058.

COMMODORE PET 2001, built-in green screen plus cassette recorder, 64K, £200. Tel: Reading 666211.

VIC20, C2N 16K, 3K super expander, four games cartridges, Gorf, Sargon, Choplifter, The Count Adventure, £160. Cassette software, joystick, will not separate, £170 ono. Tel: Bexhill (0424) 221298

VIC20 ALIEN cartridge, will swap for any Commodore adventure cartridge except Mission Impossible. Tel: Newton Abbot (0626) 3005 after 4 pm.

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TANDY TRS80, still boxed, 16K colour with 2 manuals, £190. Tel: 873370 (Birmingham).

16K VIDEO GENIE, some software available, all leads + manual, £150. Tel: Lewington 2596.

32K GENIE, 2 weeks old, £120 or swap for Vic20. Mike, 01-701 4115.

VIDEO GENIE 16K, built-in cassette, 14" TV included, lots of extras, fully expandable, excellent condition, £230. Tel: Nottingham 384961 for more details.

COLOUR GENIE 16K, software, books, manuals, all leads, brand new in original packing, £180. Tel: (051) 678 9237.

Dragons for sale

DRAGON 32, guaranteed, boxed, new, plus leads, manuals, £15 of magazines, £6 of books, £113 of original software, ideal Christmas present, total £338 plus joysticks, offers. Ring 772 3939 after 5-7 pm, ask for Murtha Piggott.

DRAGON 32, almost new, £100 joysticks, cassette recorder, plenty of software, arcade games, adventures, etc. all very good condition, all for £200. Tel: Bedford 57407 after 5 pm.

DRAGON 32, 2 joysticks, cassette recorder, 3 cassette games, 2 cartridge games, nearest offer to £150. Tel: 01-888 7060.

DRAGON 32, cassette recorder, 30 tapes including Dragon King, Caterpillar Attack and Planet Invasion, two joysticks, books + magazines, £180. Tel: 01-703 7985.

DRAGON 32 plus 20-inch colour TV, over £100 of software, plus joysticks, 6809 machine code manual, etc, just £290. Tel: 0792 68894 after 6 pm.

DRAGON 32K computer games plus two games programming book. Worth £84, will sell for half price or £4 each, or swap for knitting machine in working order. Tel: (St Helens) 051-430 0741.

DRAGON 32, joysticks, cassette recorder, plus £20-worth books, £80-worth software including Cosmic Invaders cartridge, Donkey King, Frogger etc. and Dragon User magazines. A bargain at £195. Tel: West Lothian 0506 37745.

DRAGON 32, nine cassette games, 10 books and two joysticks. Sell for £250 ono. Tel: Rugby 3655 after 4 pm.

DRAGON 32, three joysticks, three books, £230-worth of software. Offers around £170 considered. Tel: Bishop's Stortford 815623 after 5 pm.

DRAGON 32, £200 of software including £50 word processor. Sony cassette recorder, two joysticks and instruction manual. Cost £375, sell for £215 ono. Excellent condition, boxed. Tel: 01-440 2227.

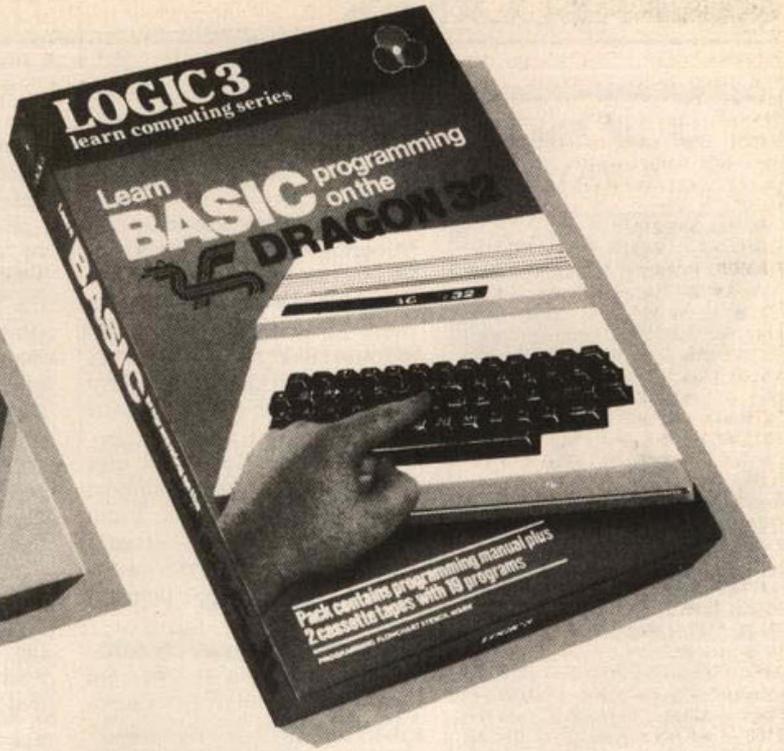
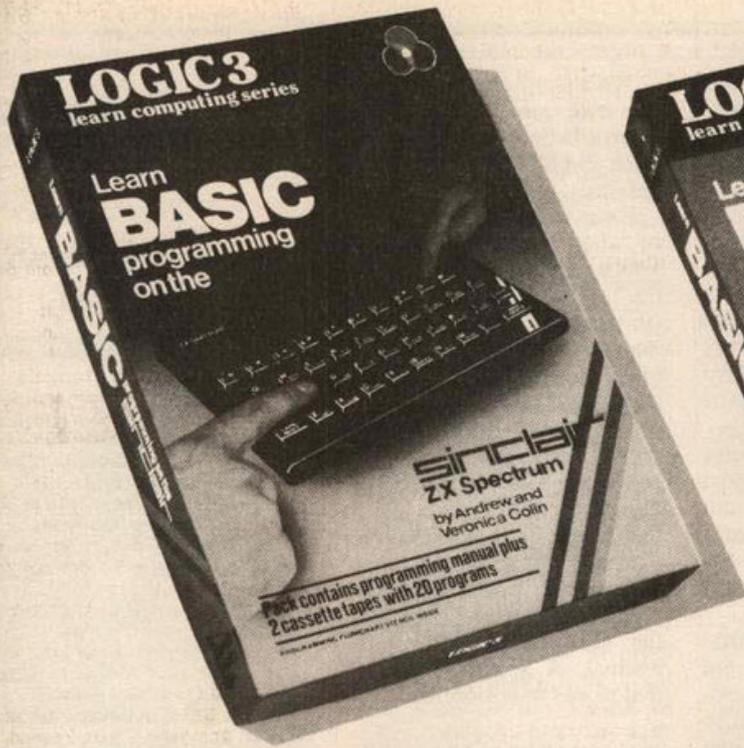
DRAGON 32K, together with joysticks, light pen, telewriter, word processor and games, £210 ono. Oric 1, 48K plus Oricbase, Zodiac and Flight, £110 ono. Phone Nigel 01-485 1383.

DRAGON 32, software, 2 joysticks, £430. Tel: 0744 27768.

DRAGON 32, boxed, joystick, 5 games, book + manual + 4 Dragon User magazines + all leads, £140. Tel: High Wycombe 715789.

DRAGON 32, tape recorder, joysticks, light pen, books, magazines and £41 worth of software, Dragon Trek, Pimania, Crede, Quest, Defence, will sell for £200 ono or swap for CBM 64 + C2N cassette unit. Northampton (0604) 28319.

DRAGON 32, boxed as new with manuals, boxed dual Dragon data, joysticks, Calixto Island and program books, £170 ono. Ring 061-998 8694 after 7.30 pm (not Wednesday).



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PCW 8/12

NEW RELEASES

UP UP AND AWAY



At last a genuinely interesting educational package for the Spectrum — *Ballooning* from Heinemann Educational Books.

The program itself involves piloting a balloon over various hills and mountains, using vents to lower you and the burner to raise you up. At various points in your trip you will be given different tasks to complete like getting and delivering medical supplies.

The manual/booklet not only describes the operation of the game, but is full of puzzles and information about the history of ballooning — all illustrated with photographs and colour drawings.

Other programs in the same series involve driving and being a special agent — your children might actually enjoy this series, maybe even learn something.

Program *Ballooning*
Price £9.95
Micro Spectrum 48K
Supplier Heinemann Educational Books
 22 Bedford Square
 London WC1R 3HH

DREADED BUGS

Lothlorien is well known for its excellent war-gaming simulations, so its latest move is slightly surprising — the company has released a series of arcade games for the Spectrum and Oric 1.

Micro Mouse is the Spectrum game and is superb. It

introduces an idea so obvious you wonder why nobody ever thought of it before. The program is about making a program.

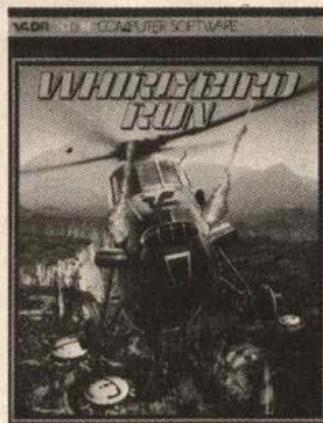
On screen are the lines of a program that won't run because some bugs have stolen some of the letters and numbers in the program. *Micro Mouse* has to retrieve the stolen letters and replace them in their correct positions in the program.

He is hampered in his task by the dreaded bugs whom he must avoid at all costs. From time to time Micro is given a chance at revenge via a can of Datakill which wipes them all out for a while.

Once a program is completed it will run and you are treated to another, more complex, program to debug. The game is graphically excellent with smooth-moving sprites.

Program *Micro Mouse*
Price £5.95
Micro Spectrum 16/48K
Supplier M C Lothlorien
 56A Park Lane
 Poynton
 Stockport
 Cheshire SK12 1AE

PRICE PROBLEM



One of the things that led to a falling off in the numbers of Dragon 32s being sold was almost certainly the lack of quality software.

Now that the Dragon has been given a new lease of life by various injections of cash, Dragon Data are obviously keen to ensure that history does not repeat itself. To this end, it has just issued 11 new games — all professionally packaged in what look like large video cases.

Whirlybird Run is a *Scramble* style game in which you pilot a helicopter over mountains and hills and past missile defences.

Later levels include swarms of alien fighters trying to knock you out of the sky. Like the original, you must replenish your fuel supply by bombing the enemy fuel dumps (why this should work is a mystery to me).

The game is graphically good, with the helicopter's rotors seeming to turn, and is also fast and addictive. Up to this point, then, I would recommend the game. The problem is the price — £12.95 really isn't justified even with the big box and two page manual. A Spectrum equivalent would cost more like £6.

Program *Whirlybird Run*
Price £12.95
Micro Dragon 32
Supplier Dragon Data
 Kenfig Industrial Estate
 Margam
 Port Talbot
 West Glamorgan

HELPFUL CLUES

Twin Kingdom Valley is an illustrated adventure game for the Acorn machines and the Commodore 64.

Like the *Hobbit*, it is basically a text style adventure, but with every scene illustrated. In this case there are 175 different illustrations — some of which may contain helpful clues so they are more than just dressing.

Judging by the screen shots the graphics are well up to *Hobbit* standard and in other ways the games are comparable — both, for example, feature the passage of time as an important ingredient. Both can manage quite complicated instructions and, more generally, their worlds are similar — full of dragons and caves, treasures and forests.

Bug-Byte doesn't seem worried by its illustrious competition (now that *Hobbit* is on BBC and 64) though. At the bottom of the advertisements is the legend 'Eat your heart out Bilbo!' — whether he will remain to be seen.

Program *Twin Kingdom Valley*

Price £9.50
Micro BBC/Electron/CMB 64
Supplier Bug-Byte
 Mulberry House
 Canning Place
 Liverpool

FILM SET



Zodiac was the first of the Oric adventures to achieve anything like the cult status of the Artic adventures. So, there will be quite a lot of interest in the follow-up *House of Death*.

Although basically a text adventure in the classic mould, there are various puzzles and intelligence tests built into it.

The setting is a disused film set, the location for such classic horror films as *An American Werewolf in Guernsey*. The task is to find five treasures and return them to the starting place.

Aside from logical puzzles, problems can also take the form of monsters from the movies like werewolves, Dracula, etc.

Program *Oric House of Death*
Price £9.99
Micro Oric 1
Supplier Tansoft
 Units 1 and 2
 Techo Park
 Newmarket Road
 Cambridge

PURE FANTASY

For those of you who, like me, had their imagination fired by the sequence in *2001* when the space ship slowly docks with the space station to the music of the Blue Danube, a new program may help you live out your fantasy to the full.

2002 is a sophisticated simulation of the famous docking sequence, with you at the controls of the Orion spacecraft.

The high resolution of the BBC, coupled with superb 3D gives a spellbinding effect. There are six skill levels for everyone from the complete novice to the experienced astro pilot.

Program 2002
Price £7.95
Micro BBC B
Supplier Superior Software
 Dept C
 69 Leeds Road
 Bramhope
 Leeds

SLIDER TOY



Jumbly is here. Quite a few people wondered what those teasing adverts saying 'Jumbly is coming' were all about. Now we know.

Jumbly is a computer version of those slider toys in which you have to move around various plastic tiles to make a picture.

However, what used to be a couple of hours entertainment has been extended to a couple of months worth, by a number of special features. Most importantly, there are a series of pictures — what number has not been given away.

Some of the pictures scroll in different directions, making it much harder to see what you are doing. Each picture also has a target number of moves in which it must be solved — only if you equal or beat this will you be allowed to go to the next one.

It is absolutely infuriating and my reaction was to throw something at the tv — others

will doubtless get days of masochistic pleasure.

Program Jumbly
Price £6.95
Micro Spectrum 48K
Supplier DK²Tronics
 Unit 2
 Shire Hill Industrial Est
 Saffron Walden
 Essex CB11 3AX

ARCADE HIT

Every so often, seemingly by some sort of Jungian telepathy, all the software houses decide to bring out home micro versions of an arcade hit at exactly the same time.

This month it is the bizarre game *Qbert*. This involves bouncing a funny little creature up and down a stack of cubes trying to land on each one. This is made more difficult by the presence of various similarly bouncing missiles that tumble down the stack.

There are any number of versions of the game for any number of machines (although I have not yet seen one for Spectrum).

One of the best is *Humphrey* which is true to the arcade original in every way except that the layout of the cubes changes with each screen of action. It runs on the Commodore 64 and is graphically excellent.

Program Humphrey
Price £6.90
Micro Commodore 64
Supplier Mr Micro
 69 Partington Lane
 Swinton
 Manchester M27 3AL

ABOVE STANDARD

If only it had the software back up the Texas T199/4A would look excellent value for £90. Doubtless it's now far too late for this situation to change dramatically, but there are some interesting new programs around.

Adventuremania is a graphics adventure which uses all 16K and all colour sets. It's set in London — your first location is Trafalgar Square. The sleeve notes contain the dark warning 'beware the ungodly are everywhere', pre-

sumably this means the tourists.

The game is supposed to be fiendishly difficult — you don't even find out where you are going and what you are supposed to do until you find the hidden instructions half way through the adventure. The game looks above the usual Texas standard without being the usual high Texas price.

Program Adventuremania
Price £5.95
Micro Texas Instruments
 99/4A
Supplier Intrigue Software
 Cranbrook Road
 Tenterden
 Kent TN30 6UJ

VISUAL MENU



There's no doubt about it. The Commodore 64 has great sound — if there's a single reason to switch from a Spectrum, that's it.

The problem is the effects are not very easy to get at — around five Pokes per noise. If only someone could make it simpler.

They have (aren't market forces wonderful) and *Ultisynth 64* is the result. The program enables you to use your Commodore 64 as a synthesiser, record your creations and play them back.

What the program does, essentially, is enable you to control the various parameters of each sound using a visual menu — for the note values you can use the keyboard, playing it like a piano.

What the program proves once again is that the Commodore 64 is a wonderful machine (some of the sounds are really impressive) but one

that Commodore have documented very badly indeed — hence the place for programs like this. The manual that comes with the program is excellent.

Program Ultisynth 64
Price £14.95
Micro Commodore 64
Supplier Quicksilva
 Palmerston Park House
 13 Palmerston Road
 Southampton
 Hampshire
 SO1 1LL

LOST TOMB



Aztec Tomb is a graphic adventure for the Commodore 64 from Alligata Software. It's vast, taking 15 minutes to load, so it should see you all through Christmas.

Your task is to locate a lost Aztec tomb, hidden deep within the Amazon rain forest. Each location in the jungle is illustrated by a picture like the *Hobbit*.

The cover blurb warns you that this is no ordinary jungle, strange things can and will happen. The scope of the program and quality of the graphics should ensure that this one does well.

Program Aztec Tomb
Price £7.95
Micro Commodore 64
Supplier Alligata Software
 178 West Street
 Sheffield S1 4ET

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

This Week

Program	Type	Micro	Price	Supplier
Advertiser	Ut	Spectrum	£17.95	Brane
Alien Swoop	Arc	Spectrum	£4.50	Space Age
Allens	Arc	Aquarius	£5.95	Add On
Battlezone	S	BBC	£6.95	Lothlorien
Beyond Basic	Ut	Spectrum	£9.95	Sinclair
Bubble Trouble	Arc	Spectrum	£5.50	Arcade
Bugged	Arc	Dragon	£6.95	Dungeon
Business Pack No. 1	Arc	BBC	£159.95	Gemini
Business Pack No. 2	Ut	BBC	£79.95	Gemini
Business Pack No. 3	Ut	Electron	£79.95	Gemini
Chuckman	Arc	Aquarius	£5.95	Add On
Cosmic Split	Arc	Commodore 64	£7.95	PSS
Creator's Eye	Arc	Commodore 64	£7.95	Mogul
Data Genie	Ut	Spectrum	£9.95	Audiogenic
Diabetes	Ut	Spectrum	£9.95	Martin Dunitz
Dietician	Ut	Spectrum	£6.95	Keysoft
Ed On	Arc	Aquarius	£5.95	Add On
Evolution	S	Spectrum	£6.95	Microsphere
Family Pack	Arc	Spectrum	£8.50	Keysoft
Family Tree	S	Spectrum	£6.50	Keysoft
Fig Forth	Ut	Commodore 64	£19.99	Romik
Fire Hawks	Arc	Spectrum	£6.95	Postern
Five Treasures	Ad	Spectrum	£6.95	Space Age
Floyd's Bank	Arc	Lynx	£9.99	Romik
Freez' Bees	Arc	Spectrum	£5.95	Silversoft
Galaxy	Arc	Commodore 64	£7.95	Anirog
Games Pack 1	Arc	Lynx	£7.95	Gem
Happy Letters	Ed	BBC	£8.97	Bourne
Home Pack No. 1	Ut	BBC/Electron	£79.95	Gemini
Home Pack No. 2	Ut	Spectrum	£59.95	Gemini
House of the Living Dead	Arc	Spectrum	£5.90	Phipps
Keyfile	Ut	Spectrum	£7.95	Keysoft
Kick Off	Arc	Commodore 64	£6.99	Bubble Bus
Killer Knight	Arc	Spectrum	£5.90	Phipps
Krystals of Zong	Arc	Commodore 64	£7.95	PSS
Laser Shaker	Arc	Spectrum	£5.95	Poppy
Light Cycles	Arc	BBC B	£7.50	Paeon
Loony Zoo	Arc	Spectrum	£5.90	Phipps
Magic Meanies	Arc	Spectrum	£5.95	CDS
Metamorphosis	Arc	Commodore 64	£7.95	Mogul
Micro Drive In	Arc	Spectrum	£6.95	Softel
Military Quiz	S	BBC	£5.00	Logic Soft
Moby Dick	Arc	Commodore 64	£7.95	PSS
Mr Wimpy	Arc	Spectrum	£5.90	Ocean
Music Master	Ut	Spectrum	£9.95	Sinclair
Music Monitor	Ut	Spectrum	£4.50	Space Age
N Vaders	Arc	Aquarius	£5.95	Add On
Neoclyps	Arc	Commodore 64	£7.95	PSS
Oh Mummy	Arc	Lynx/Spectrum	£7.95	Gem
Orion	Ut	Oric 1	£12.95	Lothlorien
Robot Riot	Arc	Spectrum	£5.95	Silversoft
Roman Empire	S	Lynx	£7.95	Lothlorien
Sam Spade	Arc	Spectrum	£5.95	Silversoft
Scan	S	BBC B	£7.50	Paeon
Scroller	Ut	Spectrum	£7.95	Brane
Spanner Man	Arc	Lynx	£7.95	Gem
Sub Chase	Arc	Spectrum	£4.95	Gem
Tank Attack	Arc	BBC B	£7.95	Gem
Three Dee Space Wars	Arc	Spectrum	£5.95	Spectrum
Timeman Two	Ed	BBC	£8.97	Bourne
Turbo Grid	Arc	Vic20	£5.50	Microdeal
Urban Upstart	Ad	Spectrum	£6.50	Richard Shepherd

Book Ends



PROPER BASIC

An excellent book for those who believe in doing things properly even if that means paying more is *Proper Basic* by Brian C Walsh.

Although clearly written and full of diagrams, the book looks as though it is primarily intended for schools and colleges. It contains more or less everything you could ever need to know about Basic in all its forms.

The book would be a good reference work for questions about the theoretical nature of Basic, but make sure it's really what you need — it costs £12.50.

Book *Proper Basic*

Price £12.50

Micro *General*

Supplier *John Wiley
Baffins Lane
Chichester
West Sussex
England PO19 1UD*

Not, I should stress, that there is anything very gory or nail-biting about any of the stories. They're all about solving science projects and finding out how many marbles are in a jar.

Book *Bytes Brothers Input an Investigation*

Price £1.25

Micro *General*

Supplier *Fontana Paperbacks
8 Grafton Street
London W1X 3LA*

EDUCATION

More than anything else the BBC computer is associated with education — both of children and adults.

BBC Micro in Education is a book aimed squarely at this market and is intended to be used by teachers within class-work as well as in homes.

The book is a mixture of general information about the history and development of computers as well as specific instruction on BBC Basic.

Book *BBC Micro in Education*

Price £6.50

Micro *BBC*

Supplier *Shiva Publishing
4 Church Lane
Nantwich
Cheshire CW5 5RQ*

MYSTERY

A nice idea for the younger computer owner. *The Bytes Brothers Input an Investigation* is a book in which fiction is interlaced with computer programs. The Bytes Brothers use the programs to help solve their mysteries.

Util 1	Ut	BBC B	£9.95	Gem
Wheelle	Arc	Spectrum	£5.95	Microsphere

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.

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

Top 10

Rank	Program	Micro
1	(5) Planetoids	(Acornsoft)
2	(2) Hopper	(Acornsoft)
3	(1) Rocket Raid	(Acornsoft)
4	(—) Chess	(Acornsoft)
5	(4) Alien Swirl	(Program Power)
6	(7) White Knight Mk 2	(BBC)
7	(3) Swoop	(Program Power)
8	(8) Castle of Riddles	(Acornsoft)
9	(6) Monsters	(Acornsoft)
10	(—) Dr Who — The First Adventure	(BBC)

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

Top 10

Rank	Program	Micro
1	(—) Miner 2049er	(Big Five)*
2	(—) Shadow World	(Synapse)†‡
3	(5) Zaxxon	(Datsoft)
4	(—) Ultima II	(Sierra On-Line)§
5	(—) Marawder	(Sierra On-Line)‡
6	(—) Savage Island Part 1	(Adventure International)†
7	(—) GFS Sorceress	(Avalon-Hill)¶
8	(—) Lords of Karma	(Avalon Hill)¶
9	(—) Escape for Pulsar 7	(Channel 8)
10	(10) Preppie	(Adventure International)

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

Top 10

Rank	Program	Micro
1	(3) Wacky Waiters	(Imagine)
2	(1) Arcadia	(Imagine)
3	(—) Jetpac	(Ultimate)
4	(—) Catcha Snatcha	(Imagine)
5	(—) Flight-Zero-One-Five	(AUS)
6	(—) Tombs of Domb	(Audiogenic)
7	(7) Skyhawk	(Quicksilva)
8	(6) Gridrunner	(Ligamsoft)
9	(2) Wizard and the Princess	(Melbourne House)
10	(—) Paratroopers	(Rabbit)

(Figures compiled by Boots & Co/Websters)

Top 10

Rank	Program	Micro
1	(—) Flight Simulation	(Psion)
2	(—) Football Manager	(Addictive Games)
3	(—) 1K Games	(Artic)†
4	(1) Defender	(Quicksilva)
5	(2) QS Scramble	(Quicksilva)
6	(—) Planet of Death	(Artic)
7	(—) Invaders	(Quicksilva)
8	(—) Mothership	(Softsync)
9	(4) 1K Chess	(Artic)†
10	(3) Asteroids	(Quicksilva)

*All run in 16K. †1K only.
(Figures compiled by Boots & Co/Websters)

Spectrum

Rank	Program	Micro
1	(4) Chequered Flag	(Psion)*
2	(7) Atic Atac	(Ultimate)*
3	(—) The Pyramid	(Fantasy)**
4	(3) 3d Ant Attack	(Quicksilva)*
5	(2) Kong	(Ocean)*
6	(1) Lunar Jetman	(Ultimate)*
7	(5) Manic Miner	(Bug-Byte)*
8	(10) Split!	(Incentive)*
9	(8) Flight Simulation	(Psion)*
10	(—) Scramble	(Psion)

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

Books

Rank	Program	Micro
1	(5) BBC Micro Disk Companion	(Latham)
2	(4) Spectrum Microdrive Book	(Logan)
3	(9) Spectrum Interfacing and Projects	(Bishop)
4	(8) Advanced Graphics for the ZX Spectrum	(Angell and Jones)
5	(2) 30 Hour Basic	(Prigmore)
6	(6) Using the 64	(Gerrard)
7	(—) CP/M — The Software Bus	(Clarke)
8	(—) Advanced Programming Techniques for the BBC Micro	(McGregor and Watt)
9	(10) Commodore 64 Programmer's Reference Guide	(Commodore)
10	(—) Master Your ZX Microdrive	(Pennell)

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

Dragon 32

Rank	Program	Micro
1	(2) Pettigrew's Diary	(Shards)
2	(1) Mined Out	(Quicksilva)
3	(5) Dragonfly 2	(Hewson)
4	(—) Transylvanian Tower	(Richard Shepherd)
5	(—) Cuthbert Goes Walkabout	(Microdeal)
6	(—) SAS	(Peakssoft)
7	(4) Ring of Darkness	(Wintersoft)
8	(—) Tiger Grand Prix	(Tiger)
9	(—) Dragon Trek	(Salamander)
10	(7) Champions	(Peakssoft)

(Figures compiled by Boots & Co/Websters)



Structured Pascal

Last week I examined some of the features of **L**Forth, picking out those I think should appear in our ideal language. This week, I'll look at Pascal in the same way.

The most notable feature of Pascal is that it is structured. Effectively, this means that it discourages you from using *Goto* statements by providing *Repeat*, *While* and *Case* statements. Some beginners feel that structured programming is not beneficial, but I must stick my neck out and say that faster, better programs will be written if you use structured techniques.

Amateur programmers or beginners find *Goto* easier to use, but our ideal language is not aimed at either group. Beginners are well served by Basic, Pascal and Logo, whilst amateur programmers who persist in ignoring structured programming are doing themselves a disservice.

Thus, our ideal language will use the three basic structures of Pascal. Other elements of the structured nature of Pascal are the procedures and functions. I covered these in my last column, drawing the conclusion that not only should one be able to define procedures and functions, but also operators.

In addition, Pascal offers user defined data types. These are a great idea on the whole, but they lead to the odd Pascal situation where types cannot be mixed — eg. 'A := 2+2.0' causes a crash on most systems. I suggest user defined types should be implemented, with automatic type conversion where feasible.

One of the most important features of Pascal, and its siblings such as Algol and BCPL, is the block structure. This allows you to treat a group of statements as a single statement, if they are bracketed by special words or symbols. This is

admirable, since it makes the language easy to compile and interpret, but is difficult for beginners to learn. However, one has to draw the distinction between easy to learn and easy to use. Block structuring is a tricky concept for some people, but once grasped, it is elegant and simple to use.

The feature of Pascal that seems to annoy people most is the use of the ':=' symbol to indicate an assignment statement. I am inclined to make the colon optional, on the understanding that many people do not find it necessary, especially those reared on Basic.

A major disadvantage of Pascal is that it is rarely interpreted. As I said before, our language must be both interpreted and compiled, to allow easy program development and both speed and security from the compiler.

This leads to several problems. For example, BBC Basic provides the *Eval* function to evaluate an expression. This is very useful in graph plotting applications, but it is impossible to compile. For example, consider the fragment:

```
D=23
D=AS"D*2"
PRINT EVAL(AS)
```

When this is compiled, the computer will no longer know the variables *D* and *AS* by name, only by their address. Thus, it will not be able to compile the previous routine.

The name of each variable could be stored in the compiled program, but it would add considerably to the space it takes up. A more pertinent objection is that the compiled code will need access to a complete expression evaluator, which forms a substantial part of the interpreter itself. Thus, the compiled code would swell to enormous proportions if *Eval* was used.

So, I maintain that certain functions are impossible to compile. This leads to an interesting question — should we provide these functions in the interpreter, but not in the compiler? If we do, there will be incompatibilities between the two, which is ugly. So, do you attach more value to compatibility or to features? Personally, I am tempted not to provide such functions at all, but there is room for debate on the subject.

Finally, some people have asked whether this series is building up to naming a specific language as the mythical ideal. I shall not divulge the answer yet — but it would be nice to find our ideal language existed.

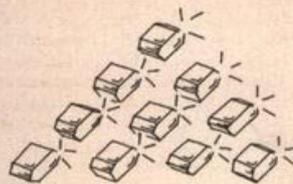
Jeremy Ruston

Forty thieves

Puzzle No 86

Once upon a time, many years ago, not far from old Baghdad, lived Ali Baba and his 40 thieves.

In their secret cave they examined the spoils of their latest robbery — a fortune in emeralds. The precious stones were laid out on the cave floor in the form of a triangular pattern similar to the one shown here:



As there were more jewels than is shown, the triangle was much larger than this, but its general arrangement was as illustrated, with every row being complete.

The next day, when Ali Baba awoke, he found to his horror that the 40 thieves had departed taking with them all but one of the jewels. They had divided up the jewels equally amongst them and, as they had one left over, they left it for poor Ali Baba.

What was the smallest number of gems that could have been present?

Solution to Puzzle No 81

The program generates integer squares, *Z*, and tests to see if each is made up of two integer squares, *A*×*A* and *B*×*B*.

```
10 LET X = 720 LET P = 130 LET Q = 140 LET Z =
X*X 50 FOR A = 1 TO X - 1 60 IF A*A >= P*10
THEN LET P = P*10 70 FOR B = 1 TO X - 1 80 IF
B*B >= Q*10 THEN LET Q = Q*10 90 IF (Z -
B*B)/Q = A*A*10 OR (Z - A*A)/P = B*B*10
THEN PRINT "A*A =";A*A, "B*B =";B*B, "Z =";
Z 100 NEXT B 110 NEXT A 120 LET X = X + 1 130
GOTO 20
```

This gives an answer of 3249 (57²) made up of 324 (18²) and 9 (3²).

Winner of Puzzle No 81

The winner is: G Murray, Honeyborough, Neyland, Dyfed, who receives £10.



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