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POPULAR Computing WEEKLY

6-12 December 1984

It's the best selling weekly

Vol 3 No 49

Atari 800XL price slashed



ATARI has further slashed the price of the Atari 800XL (see *Popular Computing Weekly*, November 22).

The retail price is now down to £129, a reduction of almost 25% from its previous price of £169.

The new price follows the announcement three weeks ago in the States that the 800XL would sell for just \$120 (about £100) over there.

The aggressive price cutting of the 800XL — Atari's only home computer in the Christmas market now that the 600XL model has been dropped — reflects Atari boss Jack Tramiel's policy of "marketing

for the masses".

"Manufacturing advances in high technology products mean that prices should be tumbling," commented Tramiel.

"Technology is what this decade is about. I've given this notion to my factories out in the Far East. They're going to produce it at the price the man next door can afford."

Atari factories worldwide are currently producing about ten million machines per year. A large proportion of these are targeted for the European market for 1985. Atari has recently appointed a European marketing manager, M. Rosi.

Further bargains for the Atari 800XL are available if you shop around. Laskey's, for instance, has an Atari Starter pack consisting of the computer, a joystick, data recorder, Introduction to Basic manual and one piece of software — which can be chosen from a selection — all for £170.

Prestel breached

PRESTEL, the British Telecom database, has suffered a second serious breach of its security.

On Sunday night a group of 'hackers' broke into Micronet only days after Prestel installed new security codes claimed to be unbreakable.

The 'hackers' took action after Prestel removed its second biggest information provider — Timeframe — from the system. Timeframe was asked by Prestel to withdraw a claim

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Minter lights up

JEFF MINTER, author of Llama-soft Commodore classics including *Sheep in Space* and *Attack of the Mutant Camels* is soon to release his first non-games title for the C64 — to be called *Psychedelia*.

The program is best described as a light synthesiser, where the user can create moving patterns of ever changing colour on screen (best done listening to a favourite LP) using a joystick.

The program operates much like a sound synthesiser — only with light — and it is



continued on page 5



Oric's new IQ164 computer — details inside.

INSIDE > MIDI KEYBOARD > ADVENTURE COMPETITION >

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If I was thinking of buying a micro this Christmas I would be looking pretty closely at the Atari 800XL.

Atari last week slashed its price once again so that it now costs only £129 — the same price as the 48K Spectrum.

Yet the Atari has 64K Ram and offers a number of features found only on more expensive machines — it has a better keyboard than the Spectrum Plus which costs £179. It has four sound channels, one more than the Commodore 64 which costs £199. The Spectrum models have only a one-voice squeak. The 800XL has a cartridge port and twin joystick ports, unlike the Spectrum models. It even has a monitor socket, sprite graphics and a display with up to 256 colours on screen at any one time.

In the words of Atari's latest ad the 800XL has now well and truly "socked the competition".

It's a big gamble. Before Jack Tramiel — Commodore's founder — split away and bought Atari in June the company had been losing \$800m a year.

He has worked quickly. We now have a considerably slimmed down Atari that is proving to be very aggressive in the market. He has just borrowed a further \$150m from his US investors push Atari back into the limelight. "Too many people have got too fat out of this business", he says.

The only problem with the Atari 800XL is software. The best programs are still unquestionably to be found on the Spectrum and Commodore 64 machines. Still, that should come if Tramiel's plan works.

The Atari 800X is now a very attractive purchase at £129. It makes Sinclair's Spectrum Plus — without either ZX Interface 1 or 2 built-in — look a bit mean, and the Commodore 64 look very overpriced.

It makes the £275-plus MSX micros look like no-hopers.

POPULAR Computing WEEKLY

Vol 3 No 49

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Competition > Adventure competition to win *The Sandman Cometh*

Star Game > Ashley Watson challenges your piloting skills with Lunar Module on the Dragon 32

Software Review > McGraw Hill's QL Assembler reviewed by Andy Pennell > Psion's Matchpoint on the C64

Streetlife > Christina Erskine views robots in action at Ford Motors on the Sierra line

Hardware Reviews > Disc interface for Spectrum > Siel MK900 music keyboard

Spectrum > Reverse your Polish on any Spectrum thanks to Richard Armstrong

Commodore 64 > A parallel printing routine from Adrian Warman

BBC & Electron > How to print out user defined graphics on your Epson

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>Futures...

Which MSX? We spot the differences... And a machine-code taster of Jeff Minter's new *Psychedelia* to type in



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ABC

56,052 copies sold every week
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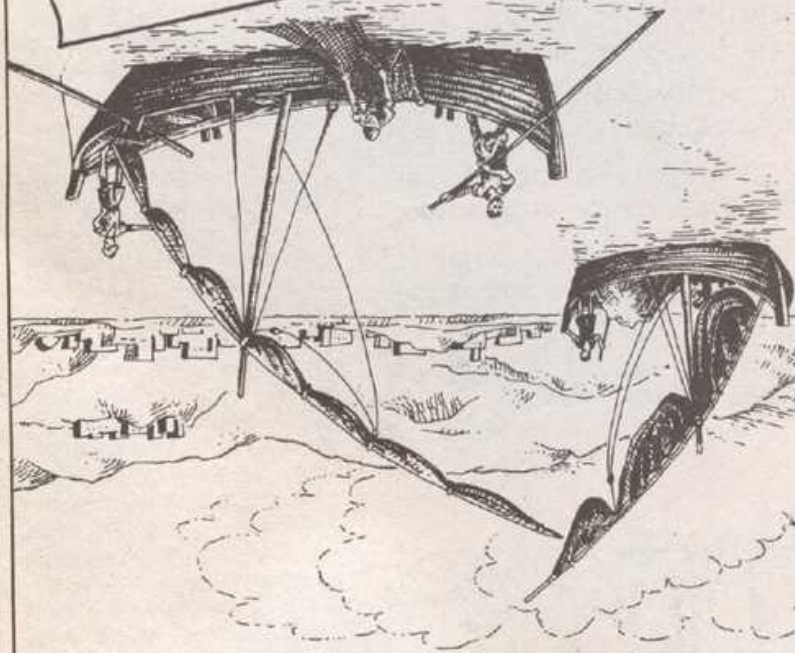
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for SPECTRUM 48k

SHARDS SOFTWARE PRESENTS ...

Psychedelia

continued from page one

possible to produce pre-programmed sequencing, and pre-set shapes. You can define the starting shape from which the program constructs its patterns and you can control the colour rotation sequence.

A number of built-in 'planes of symmetry' can be switched in or out to produce multiple images on-screen.

Further variation can be achieved by altering the bandwidth and the pulse length of the shape 'trail' which changes how the joystick effects the patterns. Finally, it is possible to record pattern sequences and then play them back.

"I enjoy writing games but I wanted to write something totally non-competitive but at the same time great fun to play and experiment with," explained Jeff Minter.

Psychedelia is being released in mid-December for the Commodore 64, C16 (which has a 128-colour display) and Vic20, priced at £7.95.

QL releases

IN THE same week as Psion's QL chess program is to be released Sinclair has announced a number of other new QL titles, which will become available before January.

An assembler package has been produced by GST which will be priced at £39.95.

QL Toolkit written by Tony Tebby and Sinclair adds 60 new commands to SuperBasic including full multi-tasking. *QL Toolkit* will sell for £24.95.

QL Cash Trader written by Accounting Software giving a dynamic profit/loss accounting system will sell for £39.95.

Finally, *QL Linker* from GST is a relocating linker for programs written in compiled languages of M68000 assembler.

CPC464 Forth

NEW hardware and software products have been announced for the Amstrad CPC464 by Skywave.

The company has produced an RS232 communications interface priced at £71.30, and also a Forth (Forth standard) language package on cassette, priced at £20.70, for the machine.

Details from Skywave, 73 Curzon Road, Boscombe, Bournemouth.

New IQ164 details

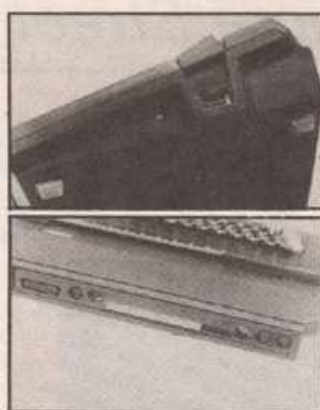
THE new IQ164 Oric machine, due for launch in January on the continent (as the Stratos) and in the UK shortly afterward, will be priced around £250.

The machine looks remarkably similar to the Atmos, using the same keyboard and black and red colouring on the casing.

The two cartridge slots on the upper left-hand side will offer a total of 112K Rom space for languages and applications programs. The machine contains no internal Rom — Basic is provided on a plug-in cartridge.

When Basic is used the function key can be used simultaneously with the other keys to give a single Basic keyword entry.

The machine also offers a Centronics printer interface,



two modem ports — one RS232, one V23, two Atari-style joystick ports, a cassette socket and both UHF and RGB/Peritel TV connections. It has a built-in disc controller and a Shugart 34-pin interface — giving the option to use 5inch discs as well as Oric's 3inch Hitachi-based discs.

Spectrum+ hits snag

SINCLAIR's Spectrum+ computer has run into reliability problems and the number of faulty machines has resulted in a severe shortage of the micro in the shops.

"The shortage of Spectrum+ machines is having a devastating effect on the Christmas market," said John Flatman, of Boots' computer buying department. "People are waiting until the machine finally arrives rather than buying an ordinary Spectrum, and it seems there are severe quality problems with the machine."

At W H Smith, a spokeswoman confirmed that the shops were not getting as many machines as they needed.

"We have been having problems with the keyboard in that many of the keys seem to be loose. Consequently, we have been looking at them and tes-

The Net spreads

MICRONET 800 is expanding abroad. A franchise to run Micronet has been given to the Hong Kong telephone company and Swedish PTT.

The Swedish franchise will make Micronet available to users in Sweden, Norway and Denmark.

Micronet's managing director, Tim Schoonmaker, says this is just the beginning. "Our next target is to take Micronet 800 to micro users in Australia and the United States."

ting them as they come out of the boxes.

"Recently the problems haven't been quite so bad as they were to begin with, and we are beginning to get replacements, though not enough."

"I am not aware that the situation is at all difficult at the moment," said Sinclair spokesman. "My impression is that things are a lot more positive this year than they were twelve months ago."



Prestel

continued from page one

that Prestel's security had been broken and when they failed to comply Prestel removed them from the system.

Angry hackers then succeeded in breaking into Micromouse on Micronet leaving the message "Bring back Timeframe — hack of the century".

The same group is also apparently attempting to break into BT's prestige information service BT Gold.

Elite bugged

THE Electron version of *Elite*, Acornsoft's top selling game has run into problems.

A bug has been found that means Hyperdrive between galaxies is impossible in the cut-down Electron version, making the playing area an eighth the size of its BBC counterpart.

An Acornsoft spokesperson commented "the single galaxy restriction does not affect the actual playing of the game. It is still possible to achieve Elite status."

Acornsoft Managing Director, David Johnson-Davies explained further:

"There is a bug in the program that means the game is played in one galaxy, but this does not affect the playing of the game — Elite status can still be attained."

"We regret the bug is present but, given the complexity of the game, it is difficult to guarantee the lack of bugs."

"However, if customers feel strongly about the matter, we will refund their money."

Acornsoft says that it is currently working to cure the problem and is looking at the possibility — if an eight-galaxy version can be produced — of replacing one-galaxy copies already sold with the corrected version.

Until it is known whether or not the problem can be solved, Acornsoft have no plans to alter the documentation supplied with the game, despite the fact that it clearly states that Hyperdrive is possible.

Micronet

Following last week's News Desk item headed *QL network by Prism*, we would like to make clear that Prism no longer has any connection with Micronet which is run jointly by EMAP and British Telecom.

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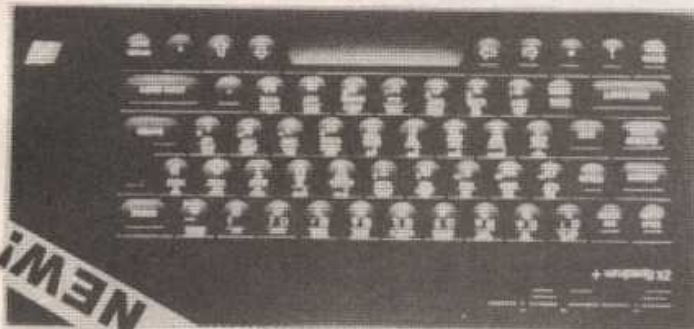
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AIRWOLF is the latest game from Elite Systems based on the ITV series of the same name.

The player must guide his helicopter through 12 playing

screens to rescue, one by one, six kidnapped scientists.

The program will be available this month for the Spectrum priced at £6.95, and the Commodore 64 at £7.95.

● Following the Elite launch, advertisements for a forthcoming Ocean game, also entitled *Airwolf* have been withdrawn.



Sir Clive goes on show

A WAXWORK model of Sir Clive Sinclair will be on show in Madame Tussauds from next April.

Work on 'Sir Clive' himself has now been completed, but he will not be put on display until a model of Selina Scott is finished, as the two will appear in a tableau together.

"Sir Clive will be shown holding one of the Sinclair pocket TVs," explained a spokeswoman for Madame Tussauds. "Selina Scott will be looking over his shoulder, looking at the TV screen, on which there will be a picture of herself."

Free bundles

TOSHIBA is currently offering three software packs bundled free with its new Toshiba HX-10 MSX computer.

The three packs are CDS Micro Systems *French is Fun*, Ocean's *Hunchback* and *Manic Miner* from Bug Byte.

"These three were chosen largely because we wanted chart-topping products, such as *Manic Miner*," said a Toshiba spokesman. "But we are keen to emphasise that MSX does not just mean games machines, so *French is Fun* was added to the list."

Learn to read ...

SINCLAIR has released a further 13 educational titles for the Spectrum and Spectrum+.

Two — *Estimator Racer* and *Number Painter* — are ASK titles produced in association with Psion and priced at £4.95.

The remaining 11 at £7.95 are Sinclair Macmillan programs. Four of these are science simulations written by Five Ways and five are additions to the Learn to Read series from Fisher Marriot.

Tickets still to be claimed

A NUMBER of winning raffle tickets from the 14th ZX Micro-fair held on November 17 to 18 are still unclaimed.

The prize winning ticket numbers are as follows:

Green — 570, 582, 559, 834, 768, 879, 474,

993, 615, 871, 949, 625, 472, 309, 736,

697, 496, 684, 454, 817, 347, 303, 862,

900, 564, 478, 392, 271, 557, 275, 295,

420, 632, 347, 679, 711, 520, 349, 303.

Red — 770, 396, 568, 454, 645, 812, 515,

458, 960, 628, 752, 763, 402, 461, 475,

413, 436, 503, 493, 473, 372, 389, 413,

606, 411, 824, 506, 436, 611.

White — 230,344, 201, 140, 503, 664, 498,

393, 689, 339, 502, 650, 120, 693, 474,

284, 89, 110, 148, 422, 200, 264, 148, 64,

187, 422.

Blue — 34, 111, 73.

The raffle, in aid of Capital Radio's 'Help a London Child' raised over £700 for London children in need.

The first prize was won by Mr M Slatford of S Croydon, Surrey.

If your ticket number appears above write to: ZX Raffle, 71 Park Lane, Tottenham, London N17 0HG, enclosing the ticket and a label with your name and address.

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POPULAR COMPUTING WEEKLY

8

QLUB fights back

In answer to the several points raised in R. Haigh's letter in the November 15 issue, Sinclair Research should like to point out that:

1) The second *QLUB News* was distributed on November 12 and our records confirm that R Haigh was part of that mailing.

2) The new-version Psion update will be offered free of charge to QLUB members as part of their membership entitlement. We may subsequently offer these up-dated versions to non-QLUB members but there would be a charge.

3) While R Haigh may feel that he does not need Psion software assistance, experience to date suggests that a large number of QLUB members do very much value this service — so far some 8,000 enquiries have been handled.

QLUB Editor
Sinclair Research
Cambridge

Ultimate news 1

I am writing this letter to put Mr N Brailsford who asked about Ultimate games on the 64, out of his misery. Ultimate have already produced a version of *Jet Pac* on disc — although I must admit that my *Jet Pac* is a pirate copy of a pre-release version.

PS Ultimate have released a game called *The Staff of Karnath* for the 64.

PS Sorry about the pirate version, Ultimate!

D Page
2 Park Approach
Welling
Kent

Ultimate news 2

I wish to stake my claim to be the first person to complete Ultimate's new Megagame/Movie/Classic program *Knight Lore*. After two weeks of solid playing I stirred in the last charm and was cured. This historic event (!) took place on Friday the 23rd of November at 6.19pm for those who wish to challenge my

claim. I won't say exactly what happens as it will spoil the aim of the game for other people. Seeing as the cassette inlay is so vague, as are reviews, here are a few playing tips:

- 1) You need two of each of the seven charms.
- 2) You must drop them in the cauldron in the correct order.
- 3) This is indicated by the cauldron steam.
- 4) You can't have three or more objects in a room.
- 5) You can drop and pick up, objects simultaneously.
- 6) Keep track of what you have collected.
- 7) Make a map!

Andrew Wappat
15 Darngate
Longthorpe
Peterborough

Misleading review

Your *Book Ends* review of Adrian Dickens' *The QL Advanced User Guide* (*Popular Computing Weekly*, November 15) is extremely misleading in its references to the 'Sinclair QDOS manual'.

This manual was in fact a preliminary draft of the QDOS documentation — a working piece of documentation which has never been published in any official form. It has been supplied by Sinclair Research Limited *only* to software houses who have applied for it.

Anyone subsequently seeking permission to quote from the manual has been warned of possible errors, and permit-



"What do you suppose Jack Tramiel's trying to do?"

ted to proceed only and entirely at their own risk, on condition that Sinclair's copyright in the material is acknowledged.

Sinclair expects to publish shortly its own comprehensive official Software Developers Guide.

Software Department
Sinclair Research
Cambridge

Imagine a micro

Even in the advanced digital microcomputer world we still have an electro-mechanical problem — the mass storage devices called disc drives.

A low-priced home micro costs around £150 — the disc drive which goes with it still costs up to £230. For the non-professional user a disk drive therefore seems rather expensive for what it does — storing and retrieving data — in comparison with the multitude of basic functions of the micro-keyboard, video-control, music, programming.

To be complete a drive has also secondary functions: the organisation of the data (*Copy, Delete, Merge, Directory*). It is these functions which make the drive so expensive.

Supposing it was possible to execute these secondary functions inside the computer without intervention of the mass storage device after the data is loaded.

I imagine a micro with 512K Ram and a fast tape or streamer as a mass storage device. Loading and saving memory would only be possible in sequential blocks of a fixed length: say, 192K Ram. This would make the tape operation very simple — a computer controlled start at the beginning and a stop at the end of the block. Without making the streamer too expensive it still must be possible to *Load* or *Save* a block in less than 15 second. Organising the data before saving would also be very easy, it would only be a matter of changing the data locations in the memory. Random accessing would no longer be a time consuming operation. With 512K Ram as memory it would be possible to

have two of the memory blocks present in the computer for merging and copying files. Moreover the DOS could be replaced by a simple, short menu-driven program.

It must be possible to build and sell a micro like this with a built-in fast tape unit for less than the cost of a micro plus disc drive — £400.

Cormon Eddy
Hof Van Tichelen 26
B2020 Antwerp
Belgium

Is the QL the kind of machine you had in mind?

Dragon still fiery

I was very disappointed to read in last week's *Popular Computer Weekly* that you were surprised at the large turn-out at the 6809 show.

The Dragon is alive, well and kicking like mad with a lot of support from a lot of not so small companies — not to mention a lot of owners who obviously don't think the Dragons are dead.

So many reviewers in the computer press obviously never switched on their review samples of the Dragon. If the number of non-existent Rom-bugs they all found is anything to go by it amazes me that it sold at all.

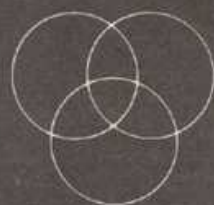
The Dragon is without a doubt far superior to the BBC, Spectrum and QL (I nearly forgot the Spectrum Plus with its drop-off keys which allow one to completely redesign the keyboard layout) etc, which is all most magazines (including yourselves) seem to class as computers.

If only the reviewers had bothered to admit that all they did was read the manual and base their review on that we might still have Dragon Data. If I appear to be upset it is because I am very disappointed to see the computer press are still kicking the Dragon when it is (a little) down.

Long live the Dragon.

J E Slad
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LOGIC 3



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To Celebrate the Christmas season Logic 3 are running a grand Christmas Competition with a ZX Microdrive and Currah µSpeech Synthesizer as first and second prizes. Microdrive, complete with...

The ZX Microdrive, complete with Interface 1, is undoubtedly the ultimate Spectrum add-on allowing programs and data to be quickly saved and recalled. The Currah μ Speech is both powerful, featuring an infinite vocabulary, and easy to use.

To enter the competition carefully read the reviews in this catalogue then answer the questions in the Quiz 3. All entries received before 31st January will be eligible for the competition. Prizes will be awarded to the first 12 correct answers drawn.

Here's your chance to win these desirable Spectrum add-ons, but don't leave it too late, make sure your entry reaches Logic 3 before the closing date!



CLUB SUCCESS
in 3 Spectra

CLUB SUCCESS The Logic 3 Spectrum Club was launched in July, 1984 and has been an outstanding success. Already more than half-way to its first 10,000 members in twelve months, the continuous demand for the club has kept Logic 3's staff working seven days a week.

The Logic 3 Spectrum has been an outstanding success. A target of 10,000 members in twelve months has been achieved. Logic 3's staff working week just to keep up with demand. Tony Toller, Logic 3's managing director and coordinator of the Club, explains its success as follows: "With other clubs once a person has joined there is no more reason for the club to try to support its members who each month have to purchase a certain number of products from a short list. Our Club is different. Members have no obligation to purchase any products from the club so to choose only the best quality products at the best possible price. It is a lot of pride."

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INSIDE

★ **EDUCATION**

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GAMES
The best games for the Spectrum selected by our own review panel and rated according to: graphics, sound, colour, originality and interest.

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HARDWARE
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and peripherals.

**LOGIC 3's
SOFTWARE
PANEL**

PANEL
Neil Atkinson, pupil of Sir William Borlase School, spends his weekends in a shop selling home computer software; intends to be a journalist.

Andrew Goltz, director of Logic 3, spent 6 years with Commodore's UK and International Division, instigated Commodore's 'Approved Product' scheme for third party software.

Bliss Healey, graduate of London School of Economics, has translated business software into French, currently working on the design of graphics for educational software.

Tony Toller, director of Logic 3, former journalist, specialist in business applications on Micros and co-ordinator of Logic 3's software club.

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Yes, please rush me a copy of your Software Club catalogue

I have a ☐ ZX Spectrum ☐ Commodore 64
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Name

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Perchance to dream

This week we offer you the chance to enter an intriguing adventure puzzle based on the new epic adventure, *The Sandman Cometh* by Star Dreams

The Prize

The Sandman Cometh is an adventure through the dark side of the mind, where logic is twisted and opposites meet. The objects of material reality are seen in strange new guises, the substance of the mental world holds sway.

To solve *The Sandman Cometh* you will need to learn the significance of dreams from Freud, symbols of reason from the world's greatest philosophers and jokes from the backs of matchboxes.

The Sandman Cometh is divided into two 48K Spectrum adventures. You are the dreamer searching for clues in a maelstrom of mental turmoil — seeking only the means to wake up. There are quality graphics illustrating most of the stuff that dreams are made of, and a rich vocabulary.

The Bait

The Popular Computing Weekly school of hack psychology and fringe religion invites you to win five copies of the *The Sandman Cometh*. First prize will consist not only of the game itself but also a bottle of vintage champagne!

Venture into 1985 with sparkling tastebuds and a contented expression. Ten runners-up will receive a useful Spectrum toolkit utility program and to win it you'll

What to do

The Sandman Cometh is no ordinary program and to win it you'll have to complete no ordinary competition. In each of the next two weeks' issues (December 13 and 20) we will be publishing a

rhyming couplet somewhere in *Adventure Helpline*. In the third week — the January 3 issue — we will print a listing for a game that combines a quiz with an adventure. Complete the

clues, explore the adventure make use of the enigmatic advice offered in the two rhyming couplets and you'll hear a tune.

entries get the prizes and the editor's decision (as usual) is final.

How to enter

If you think you know the tune, name it, with a brief explanation of what you did to discover it (you can't get it just by looking at the listing incidentally) and send the details to Sandman Competition, *Popular Computing Weekly*, 12-13 Little Newport Street, London WCH7PP by 1 February 1985. The first 15 senders of correct



★ A CRASH SMASH ★

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► I FOUND IT EXCITING AND COMPELLING AND KEPT WANTING TO HAVE JUST ONE MORE GO ■



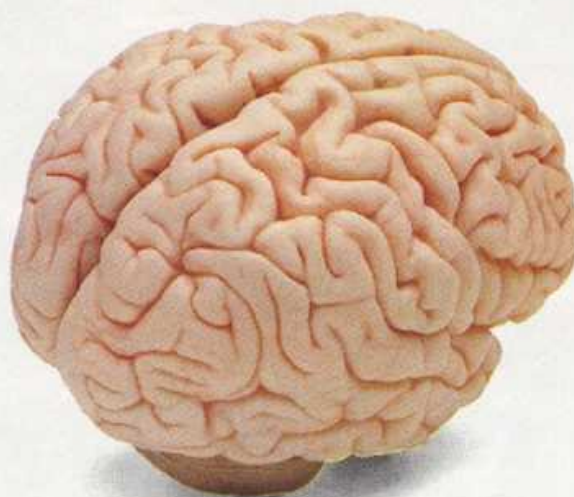
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computer is like asking Albert Einstein to work out

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software programs. For example, record keeping,

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or word processing.

And for those you need peripherals.

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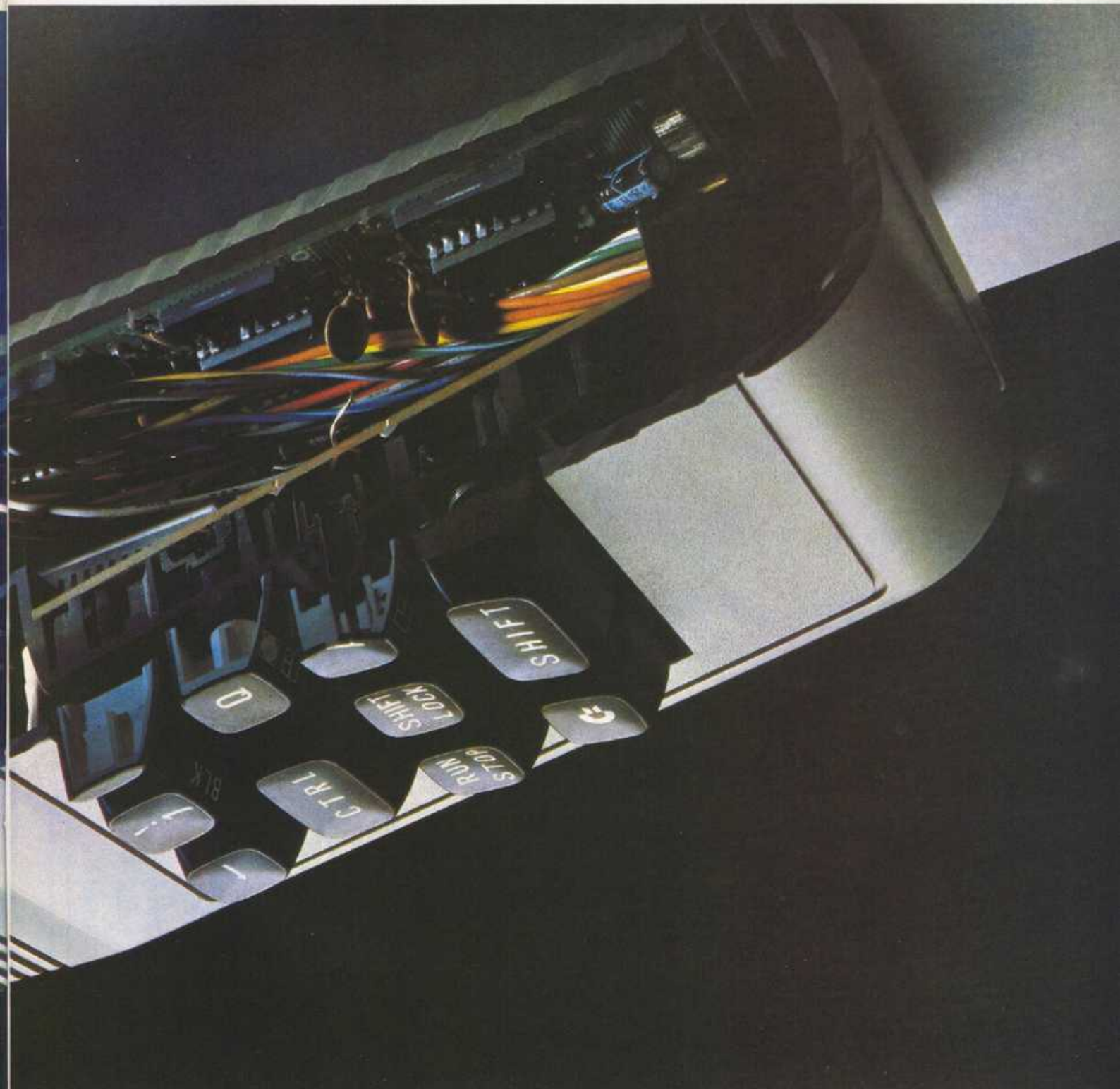
Or a Commodore cassette unit, the

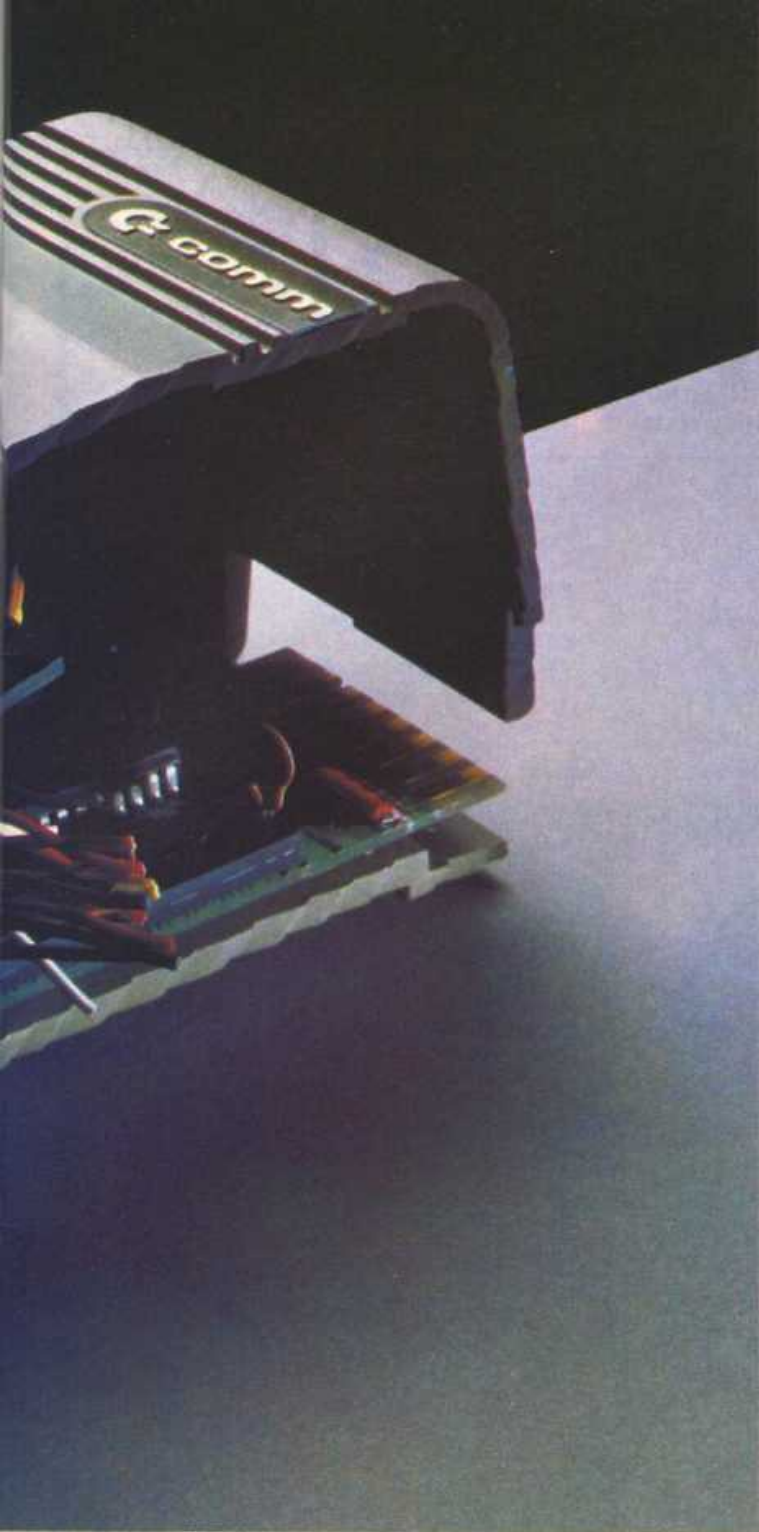
inexpensive way of loading and storing programs.

For those who like the idea of text and graphics

being more alive and having greater clarity than

on a TV, there's the Commodore colour monitor.





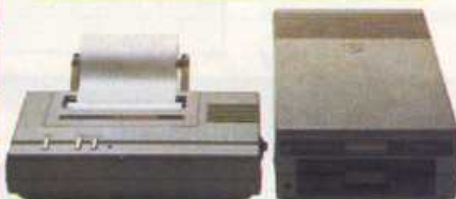
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AND MORE! (SEE JOURNAL COVER)

Lunar Module

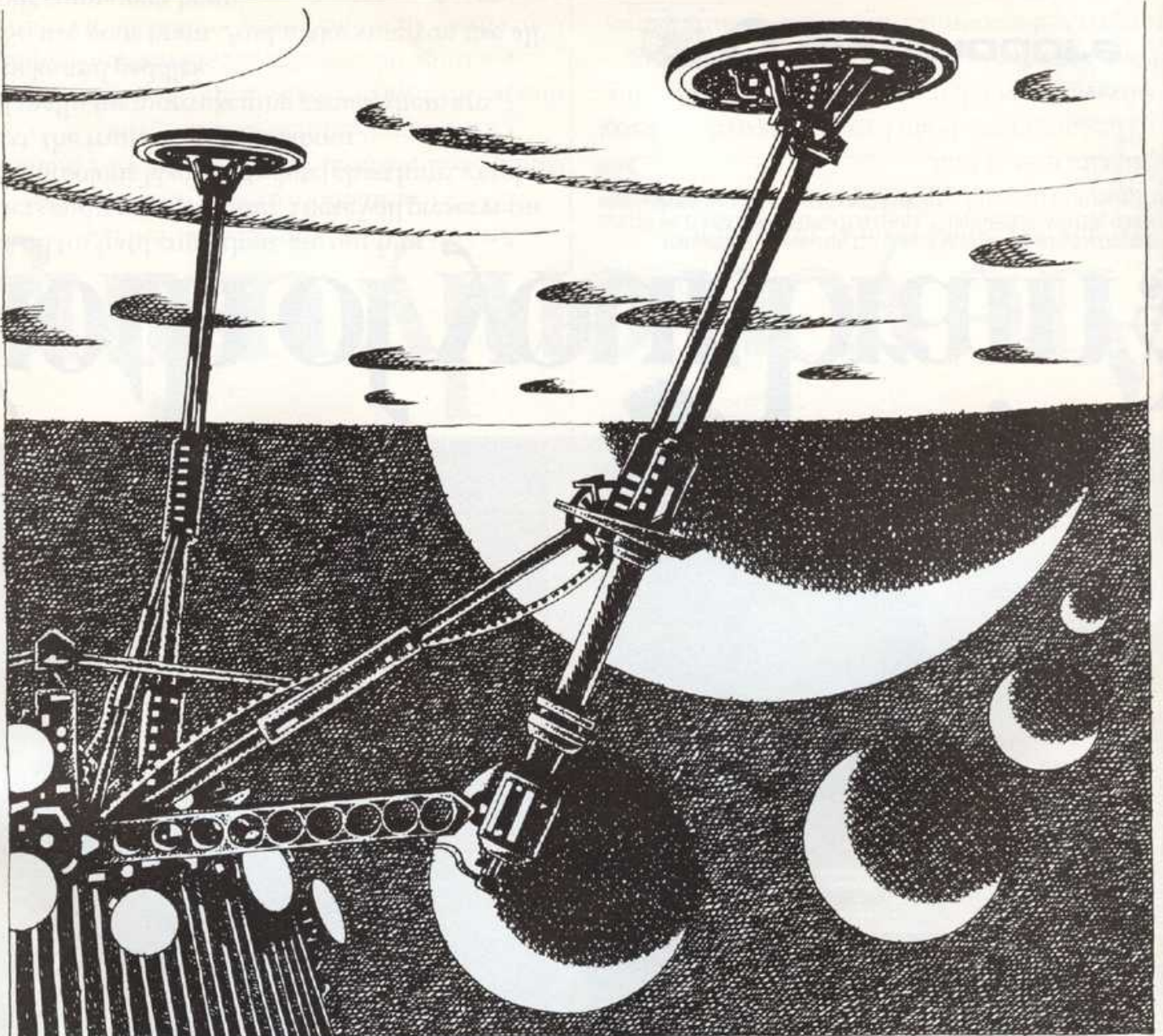
Your chance to make that giant leap for mankind on the Dragon 32 by Ashley Watson

This program simulates the landing of a lunar module on the surface of a planet. The speed at which the craft falls, etc, is quite accurate because a number of equations are used—Lines 3030 to 3090—which calculate fuel used, fuel left, mass of module, velocity and height above the planet's surface. On a successful landing, the speed at which the landing took place will be shown. Full instructions are shown within the Dragon

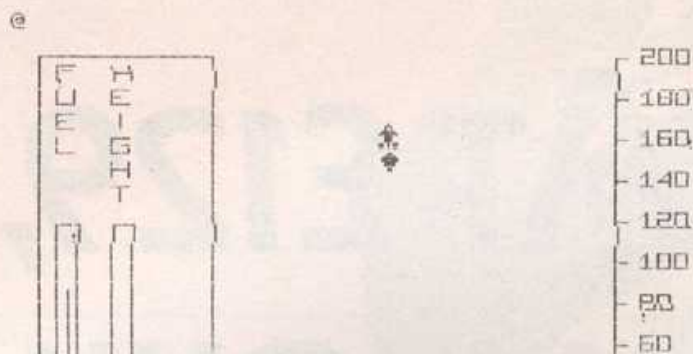
Program Notes

Lines
10-210 Initialise
1000-1120 Main loop
Check keyboard
2000-2090 Calculate
3000-3100 Delay
4000-4050 Crash/land routines
5000-5140

6000-6150 Display instruments
6160-6250 Print space ship
7000-7040 Draw landscape
Instructions
8000-8130 Another go?
8500-8560 Used to set up display
9000-9300 Data for letters, numbers and machine code
9310-9390



THE FOLLOWING IS A SCREEN DUMP OF THE PROGRAM



```

10 REM
20 REM initialise
30 REM
40 CLEAR 100,32700
50 DIMW$(26),NU$(10),R(10),R1(10),R2(10),R3(10)
60 FORA=1 TO 26:READW$(A):NEXT
70 FORA=1 TO 10:READNU$(A):NEXT
80 PCLS:FORA=0 TO 10:READ DA:POKE1536+(A*32),DA:NEXT
90 FORA=0 TO 7:READ DA:POKE1538+(A*32),DA:NEXT
100 FORA=32701 TO 32738:READB:POKEA,B:NEXT
110 GET(16,0)-(24,8),R2,6
120 GET(0,0)-(8,10),R,6
130 GET(100,100)-(108,110),R1,6
140 GET(100,100)-(108,108),R3,6
150 GOSUB 8000:GOSUB9000
160 V1=100
170 H1=1000:H=H1
180 F1=500
190 M1=2500
200 MU$="L80T80V31AV25BV20CV15D"
210 CR$="01T255L255BAG"
1000 REM
1010 REM main loop
1020 REM
1030 GOSUB 6000
1040 GOSUB 2000
1050 IF H1<1 THEN 5000
1060 GOSUB 3000
1065 IF H1>1000 THEN CLS:PRINT" THE
PLANET IS NOW OUT OF RANGE
DUE TO OVER THRUSTING.
MISSION FAILED":GOTO8500
1070 GOSUB 4000
1080 IF H>=200 AND H1<200 THEN F4=1
ELSE F4=0
1090 IF H<=200 AND H1>200 THEN F5=1
ELSE F5=0
1100 IF F5=1 THEN C=1000:GOSUB 9210
1110 IF F4=1 THEN C=200:GOSUB 9210:GOSUB70
1120 GOTO 1030
2000 REM
2010 REM check keyboard
2020 REM
2030 A$=INKEY$:IFA$="" THEN 2070
2040 J=ASC(A$)
2050 IF J<48 OR J>53 THEN 2070
2060 K=J-48:GOTO2080
2070 K=0
2080 IF F2>0 THEN F=K*10000 ELSE F=0:K=0
2090 RETURN
3000 REM
3010 REM calculate
3020 REM
3030 V=V1:H=H1:F2=F1:M=M1
3040 A=(F/M)-2
3050 V1=V-A
3060 H1=H-V
3070 U=(F/50000)*50
3080 F1=F2-U
3090 M1=M-U
3100 RETURN
4000 REM
4010 REM delay / print thruster
4020 REM
4030 IFK(>0 THEN PLAY MU$:FL=E6+2:FM=
E6+10:PUT(128,FL)-(136,FM),R2,PSET
ELSE FL=
0:FM=0
4040 FORB=1 TO 300:NEXT B
4050 RETURN
5000 REM
5010 REM crash or land
5020 REM
5030 IF V1<5 THEN 5100
5040 REM
5050 REM crash routine
5060 REM
5070 FORQ1=1 TO 13:CIRCLE(130,175),Q1:
PLAY CR$:NEXT Q1
5080 FORQ3=13 TO 1 STEP-1:CIRCLE(130,
175),Q3,0:PLAY CR$:NEXT Q3
5085 CLS:PRINT"YOU CRASHED AT A SPEEDOF";Z

```

continued on page 20

At £129, LOOK HOW THE ATARI 800XL LICKS THE COMPETITION.

At last, serious home computers are up against serious competition. The ATARI 800XL offers everything other competitors in their price range offer. And, as you can see above, a great deal more. No other computer makes your tongue hang out further.

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PROGRAMMABLE JOY STICK PORTS			✦	✦
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CARTRIDGE SLOT			✦	✦
MONITOR SOCKET		✦	✦	✦
BUILT-IN "BASIC"	✦	✦	✦	✦
COMMUNICATIONS CAPABILITIES	✦	✦	✦	✦
REAL KEYBOARD	✦	✦	✦	✦
	SINCLAIR SPECTRUM PLUS	ACORN ELECTRON	COMMODORE 64	ATARI 800XL


```

5086 PRINT "METRES PER SECOND"
5090 GOTO 8500
5100 REM
5110 REM land routine
5120 REM
5130 CLS:PRINT "YOU LANDED AT
A SPEED OF";Z
5132 IF Z<0 THEN Z=.1
5135 PRINT "METRES PER SECOND"
5140 GOTO 8500
6000 REM
6010 REM display instruments
6020 REM
6030 X=INT(F1+.5):Y=INT(H1+.5)
Z=INT(V1+.5)
6040 IF Y<0 THEN Y=0
6050 GOSUB 6150:GOSUB 6070
6060 RETURN
6070 REM
6080 REM update fuel/height level
6090 REM
6100 X=X/5.6:Y=Y/12
6110 LINE(39,170)-(39,81),PSET
6120 LINE(20,170)-(20,81),PSET
6130 LINE(20,170)-(20,170-X),PSET
6140 LINE(39,170)-(39,170-Y),PSET
6150 RETURN
6160 REM
6170 REM update space ship
6180 REM
6190 EB=E6:E7=E7
6200 IF H1<200 THEN YB=Y/1.18 ELSE
YB=Y/5.9
6210 E6=180-YB:E7=170-YB
6220 PUT(128,FL)-(136,FM),R3,PSET
6230 PUT(128,EB)-(136,E9),R1,PSET
6240 PUT(128,E6)-(136,E7),R,PSET
6250 RETURN
7000 REM
7010 REM draw landscape
7020 REM
7030 DRAW "BM80,190M+20,-23M+15,+12M+31,
+0M+5,-13M+4,+5M+7,-3M+9,+20M+5,+2M+12,
-7M+20,+21"
7040 RETURN
8000 REM
8010 REM instructions
8020 REM
8030 CLS
8040 PRINTAB(10); "LUNAR MODULE"
8050 PRINTAB(10); "-----"
8060 PRINT(C) 2/3/84 BY ASHLEY WATSON"
8070 PRINT
8080 PRINT "YOU ARE IN CONTROL OF ONE OF
THE NEW X-ASH-X ROCKETS AND YOU MUST
LAND YOUR ROCKET ON THE
SURFACE OF THE PLANET ASHTRON."
8090 PRINT "TO SLOW THE ROCKET DOWN USE
THE THRUSTERS (KEYS 1 TO 5 -1 ISWEAKE
ST) BEFORE THE FUEL RUNS OUT.
TO LAND SUCCESSFULLY THE SPEED MUST
BE BELOW 5 METRES PERSECOND."
8100 PRINT "HEIGHT IS SHOWN ON
THE RIGHT"
8110 PRINTAB(8) "PRESS ANY KEY";
8120 A$=INKEY$:IFA$="" THEN 8120
8130 RETURN
8500 REM
8510 REM another go ?
8520 REM
8530 PRINTAB(8);
"ANOTHER GO (Y/N)"
8540 A$=INKEY$:IFA$<>"Y"AND A$<>
"N" THEN 8540
8550 IF A$="Y" THEN RUN
8560 END
9000 REM
9010 REM set up display
9020 REM
9030 PMODE4:SCREEN1,1:CLS
9040 DRAW "BM10,10D170R60U170L60"
9050 DRAW "BM16,B0R/D90L/U90BM35
*B0R/D90L/U90"
9060 Z$="FUEL":Y=16:Z=20:GOSUB 9110
9070 Z$="HEIGHT":Y=35:Z=20:GOSUB 9110
9090 C=1000:GOSUB 9210
9100 RETURN
9110 REM
9120 REM draw letters
9130 REM
9140 FOR T=1 TO LEN(Z$)
9150 G=ASC(MID$(Z$,T,1))-64
9160 IF G<0 THEN T$=NU$(G+17)
ELSE T$=W$(G)
9170 DRAW "BM"+STR$(Y)+"",+STR$(Z)+T$
9180 IF G<0 THEN Y=Y+6 ELSE Z=Z+10
9190 NEXT
9200 RETURN
9210 REM
9220 REM draw numbers
9230 REM
9240 EXEC 32707
9250 DRAW "BM210,10D170":C1=C/10:F0R
B=10 TO 187 STEP 17
9260 DRAW "BM210,"+STR$(B)+"R4"
9270 Z$=STR$(C):Z$=MID$(Z$,2)
9280 Y=219:Z=B+2:GOSUB 9110
9290 C=C-1:NEXT
9300 RETURN
9310 DATA "Z","Z","Z","Z","Z",
"U6D3R6B3D6","BM+3,+0U6","NR6B6
"U6D3R6B3D6","BM+3,+0U6","Z","NR6B6
"Z","Z","Z","Z","Z","R6B3L6U
"Z","Z","Z","Z","Z","NR6B6U6
9320 DATA "R4U6L4D6","R4L2U6G2"
9330 DATA "NR4U3R4U3L4","R4U3L4U3R4
9340 DATA "BM+4,+0U6M-4,+4R4","R4U3L4U3R4
9350 DATA "R4U3L4D3U6R4","BM+4,+0U6L4"
9360 DATA "U6R4D6L4U3R4","BM+4,+0U6L4D3R4
9370 DATA 16,56,40,124,254,56,56,214,
214,214
9380 DATA 24,60,126,126,60,24,24
9390 DATA 22,6,9,29,223,0,166,140,252,
16,174,140,244,31,33,95,167,132,92,225,
140,234,34,4,48,1,32,244,49,168,32,16,
172,140,224,37,232,57

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Bombs out

Program QL Machine-Code Editor/Assembler Micro QL
Price £29.95 Supplier McGraw Hill Book Company, Maidenhead, Berkshire.

entered a program and saved it, it would be useful to have an option in the editor to load the

assembler.

The assembler is thankfully written in machine-code and runs as a proper job, so would

run concurrently with the editor if it didn't insist on Aewing

itself. It asks for three file names, for the source, the object code, and the listing, then

gets on with it. It is fast, with none of the overlaying problems I experienced for

example on the Metacomco assembler.

The assembler itself is also most of Motorola standard — it doesn't need the *Quick* or *Ad-*

dress operands in its instructions, and adds them itself, but

strangely rejects any instructions that actually specify them.

It also has a non-standard way of defining data, using 28000

mnemonics instead of 68000, and always requires colons

after its symbols for some strange reason.

The problem occurs when you

still faster than Piston's *Quill*

noticeably slow — in fact, it is

tioned speed, as it is not really

ing. Note that I have not men-

complete lack of crashproof-

but the disadvantage is the

it is easy to write and debug,

tages. The advantages are that

advantages and disadvantages

in SuperBasic, which has its

The editor is actually written

and the 68008 assembler.

programs — a screen editor,

It consists of two separate

code book.

along with their QL machine-

Hill, and is advertised

software arm of McGraw

This is a product from the

after its symbols for some

and always requires colons

of defining data, using 28000

It also has a non-standard way

of defining data, using 28000

mnemonics instead of 68000,

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It consists of two separate

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along with their QL machine-

Hill, and is advertised

software arm of McGraw

This is a product from the

from other assemblies. Having

rather necessary if using files

of its non-standard syntax, is

replace option which, because

does not have a search and

has a (slow) search facility, it

rest of features, and though it

The editor itself has the ba-

would re-start it.

me with a Goto command that

the authors, they came back to

quite often. After contacting

it crashes out — which it did

didn't mention what to do after

My preliminary instructions

sage.

bombs out with an error mes-

ding the file, the program

error occurs, such as not fin-

Save or Load a file — if any

The editor is OK, but, it was

converted to machine-code

with error trapping it would be

vastly improved.

The assembler is non-

standard, as is Metacomco's,

but works quickly. Compared

with Metacomco's, it's a case of

you pays your money, you

takes your choice, but the QL

assembler market is about to

get very crowded — I have just

got the official Sinclair one, and

two others are also imminent.

With all these assemblers

available for the QL, why

doesn't some other software

come out for it?

Andrew Pennell

Insight

Program Henry IV Part I Micro
Price £7.95
Supplier Penguin Books, Harmondsworth, Middx

tion of the behaviour of a real
How accurate a representa-
put in on *Fighter Pilot* ever will.
boat than the hours of practice
put to practical use in a real
chance that such games will be
honest there's a much greater
lacking and gybbling and to be
easy familiarity with terms like
med landlubber like me, it's a
stretch the mind' and it is in the
their range the title 'Games that
Hill MacGibbon have given
ning out of programs.

certainly strikes a note of origi-
nality amongst the usual chur-
where do you go next? How
about a yacht simulator? It

greater sophistication
reaching greater and
with light simulators

Program Yacht Race Price
£9.95 Micro Spectrum 48K
Supplier Hill MacGibbon, 92
Fleet St, London EC4Y 1DH.

Landlubber

the program gives you only the
references which link all the
names or concepts selected.
Each reference gives you the
Act, Scene and Line in the play
so that you can refer to the
original text, and it also pro-
vides a paragraph of comment,
which points out the particular
significance in the play of this
reference. The comments not

than limited appeal.

But I found it a bit too pedes-
trian and pricey to have more
must be much more exciting,
to give it a real race the game

cheats. For those good enough
help wondering whether it
into the horizon that you can't

which disappears so rapidly
is the computer controlled boat
interesting. The only exception

there seems to be nothing
happening at all — more detail
is needed to keep the display

the yacht but a lot of the time
accurately reflect the speed of
the graphics. Doubtless they

grammed by Five Ways Soft-
ware, but is let down slightly by
The game itself is well pro-

microdrive' option.
thoughtfully provided a 'save to
side price tag. They have also
compared by a pretty exces-

maps. Unfortunately, this is ac-
supporting documentation and
publishing company, excellent
as would be expected from a
presentation is flawless with,

qualified to say, however, the
yacht this is, I am truly not

needs to be treated with
some caution. I often
have the feeling that you would
be better off spending your
money on a good textbook,
rather than a computer pro-

gram of debatable benefit. How-
ever, the Penguin Study Soft-
ware Series of study aids for
Shakespeare's plays over-

comes my reservations. From
the evidence of the program
for *Henry IV Part One*, anyway.

The program works like a
small database system contain-
ing references to a number of
key characters and topics rele-

vant to the play, eg Falstaff, Hal,
Henry, loyalty, kingship.
You select the character or
the program will then present
to you with a series of references
select more than one subject,

easy-to-use search menu, and
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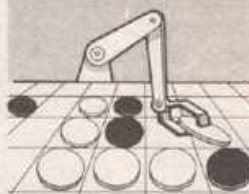
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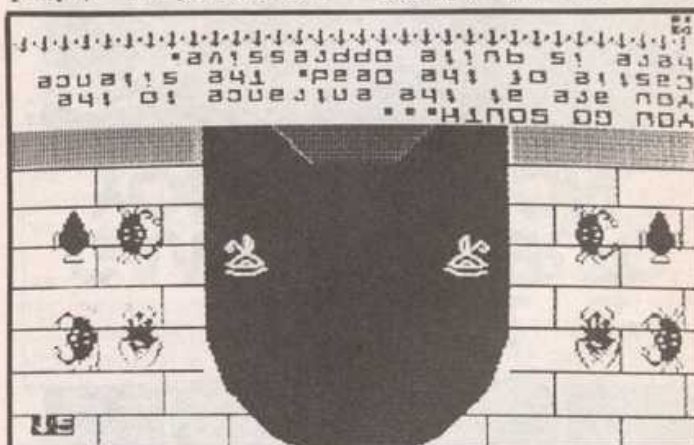


Sounds good

Program Se-Kaa of Assiah
Price £2.99 Micro Spectrum
48K Supplier Master Vision,
Park Lorne, 111 Park Road,
London NW8 7JL

There's also far better use of sound than in most adventures (fall off a path and see what I mean).

What is lacking is content. With a good number of rooms, all made up of the same elements, a sense of repetition soon sets in. There are too,



MasterVision is Master-Se-Kaa came in a video case label, and my copy of the first is to find various sacred objects in the Castle of the Dead, which is haunted by the Dark Hordes. These objects then have to be returned to their rightful places. In a week which has produced many good new adventures this one is in some ways, a disappointment. The illustrations are rather good, with animated flames on the torches and a useful compass indicator at the top of every scene.

Program Smash and Grab Micro Electron Price £7.95 Supplier Superior Software, Regent House, Skinner Lane, Leeds.
Ever fancied robbing a bank with the knowledge you have three chances of getting away with millions of pounds? Well, here is your chance. You may have three chances and there may only be one policeman chasing you, but there are also floating dustbins and flying police-cones to contend with.
To explain: first you kick a

Get your kicks

Many empty places — in fact I was left wondering whether I'd missed something, but didn't have the incentive to go back and find out what. As for the Dark Hordes, I kept getting warnings that they were following me but never met them. Sad, because a good bit of the tedious slaughter would have relieved the tedious. There's undoubted programming talent behind this game, but it's all rather like a picture book without a story. Obviously for the price it's no rip off and is certainly worth a look if you're an absolute addict.

John Minson

Program Smash and Grab Micro Electron Price £7.95 Supplier Superior Software, Regent House, Skinner Lane, Leeds.
Ever fancied robbing a bank with the knowledge you have three chances of getting away with millions of pounds? Well, here is your chance. You may have three chances and there may only be one policeman chasing you, but there are also floating dustbins and flying police-cones to contend with.
To explain: first you kick a little game — I liked it.
In short, a reprehensible little game — I liked it.
Fred Short

Cat-napping

Program Show Crazy Price £3.95 Micro Spectrum 48K Supplier Ssoft, 298 Manchester Road, West Timperley, Altrincham, Cheshire WA 14 5NB.

Lost — Ginger Cat — Answers to the name of Purrrfect Pest — Reward. I can't think of any other quests to find lost moggies, but that's the theme of this adventure and it makes a pleasant change that the worst that can happen to you are fractures. Obviously, to add a sense of urgency to the cat hunting, calls for an incentive — in this case it's the impending show.

Harping on

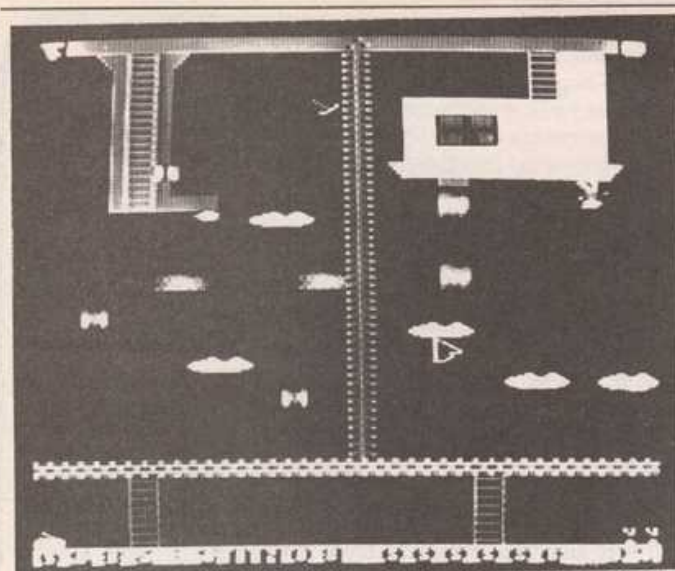
Program Jack and the Beans Supplier Superior Software, Dept C, Regent House, Skinner Lane, Leeds

The fairytale of Jack and his adventures with a magic beanstalk is the basis for Andrew Harley's latest game from Superior Software. To be cruelly analytical it is a ladders and platforms game — but a first-rate variation on the theme. You control (from the keyboard only) Jack's movements which are fast and well animated. Climbing the beanstalk is not as easy as it looks — grabbing golden eggs and harps (could Guinness have been an inspiration?) and

Hints as to where the elusive feline has been abound, adding to your frustration, and even when he's found and captured you still have to get him to the show.
At heart *Show Crazy* is a rather obviously *Quill-ed* effort, despite the addition of somewhat primitive graphics. While experienced adventurers will romp through it, it should suit the less experienced player.
Its novel subject and light tone make it highly playable and while it is a little overpriced it should provide a well-priced it should provide a well-

John Minson

above all...the Giant's bags of gold. As per the original story, the Giant gets upset and pursues you very rapidly indeed. Dodging is extremely hard and the recommended escape is to shin down the beanstalk and grab an axe to cut off his descent. A fresh beanstalk will grow to let you try for more. There are an assortment of other dangers to dodge while this all goes on. Smoke blowing dislodged you from the beanstalk. Snails attack you in the Giant's lair. If you're quick, though, you can dig holes to kill off the snails and slow down the big himself.
It may not be the most novel of programs but it is actually quite a fine game.
Dave and Jan Watterson



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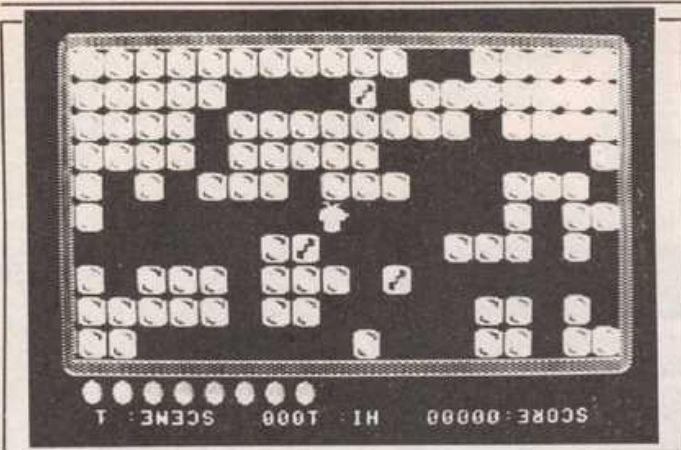


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GU15 3AJ





Richard Corfield

Each game opens with Zany Kong being winched in his cage to the top of the screen, accompanied by appropriate music which plays throughout the game. As usual your task is not easy — involving climbing up a series of ropes or vines preferably in your way are cree- ples called snapers, and aardark birds — whatever they are, I always thought the aar- vark was related to the pig fa- nully — which seem to commu- te up and down the vines in an er- ratic manner as though they changed to avoid the 'woman- in-peril' scenarios and this version has poor Zany Kong kidnapped by the evil Morris. You must collect the keys and release him from the iron- barred cage which holds him prisoner at the top corner of the screen.



Fred Short

red, making this now look very average. Unfortunately for Percy, there are some deadly Sno-bees in the maze with him. The only way he can survive is to avoid contact with the Sno-bees, and to crush them when he gets the chance by throwing some of the ice cubes at them. If he disposes of all of them, another lot appear and he has to start all over again. The game lacks any really striking features to distinguish it from many other similar games — often with better graphics, greater variety, more features, or just more of a challenge.

Unfortunately, in the last year or so, a great many really excellent games have appeared. The simple, but effective, then available for the 64. A small number of decent games have seemed pretty good compared to the relatively 18 months ago, it would published about a year or so. *Percy Penguin* had been Floor, Regent House, Skinner

Program Percy Penguin Mi-

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Frozen

gent House, Skinner Lane, Leeds. **Program Zany King Junior Mi-**

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Leeds. **Program Zany King Junior Mi-**

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gent House, Skinner Lane,

continued on page 32

able, giving a longer or shorter Three 'speeds' are also avail- for are available — diagonal Four different types of mir- displayed.

The first time the child has be shifted into place.

There are three games to be completed. Pegs have to be placed on one side of a line in positions that mirror those already on screen, after which a mirror jigsaw has to be constructed. Finally sections of geometrical patterns have to



Richard Corfield

by persistent catastrophes. been repeatedly demolished had after my new building had I eventually become frustra- would have livened it up. more dramatic for the disasters disappointing and something sound proved to be rather compulsive. The graphics and gily, turns out to be quite a bit different which, surpris-

build a skyscraper on a tiny island in an area wrecked by earthquakes, hurricanes, light-

ning and floods.

The building blocks are fer- ried in by boat, and you have to

airlift them into place by heli- copter. This aspect of the game

is not particularly difficult. How- ever, the natural disasters occur

of the new building are often demolished. Each type of catas-

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search of perfect balance. around various mirrors in symmetrical Scot, wanders That is why MacMan, the terms. recognising symmetry in pat-

eight year olds in the skill of portance of educating four to lesson explains the in- ing this looking glass the booklet accompany-

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Shattered

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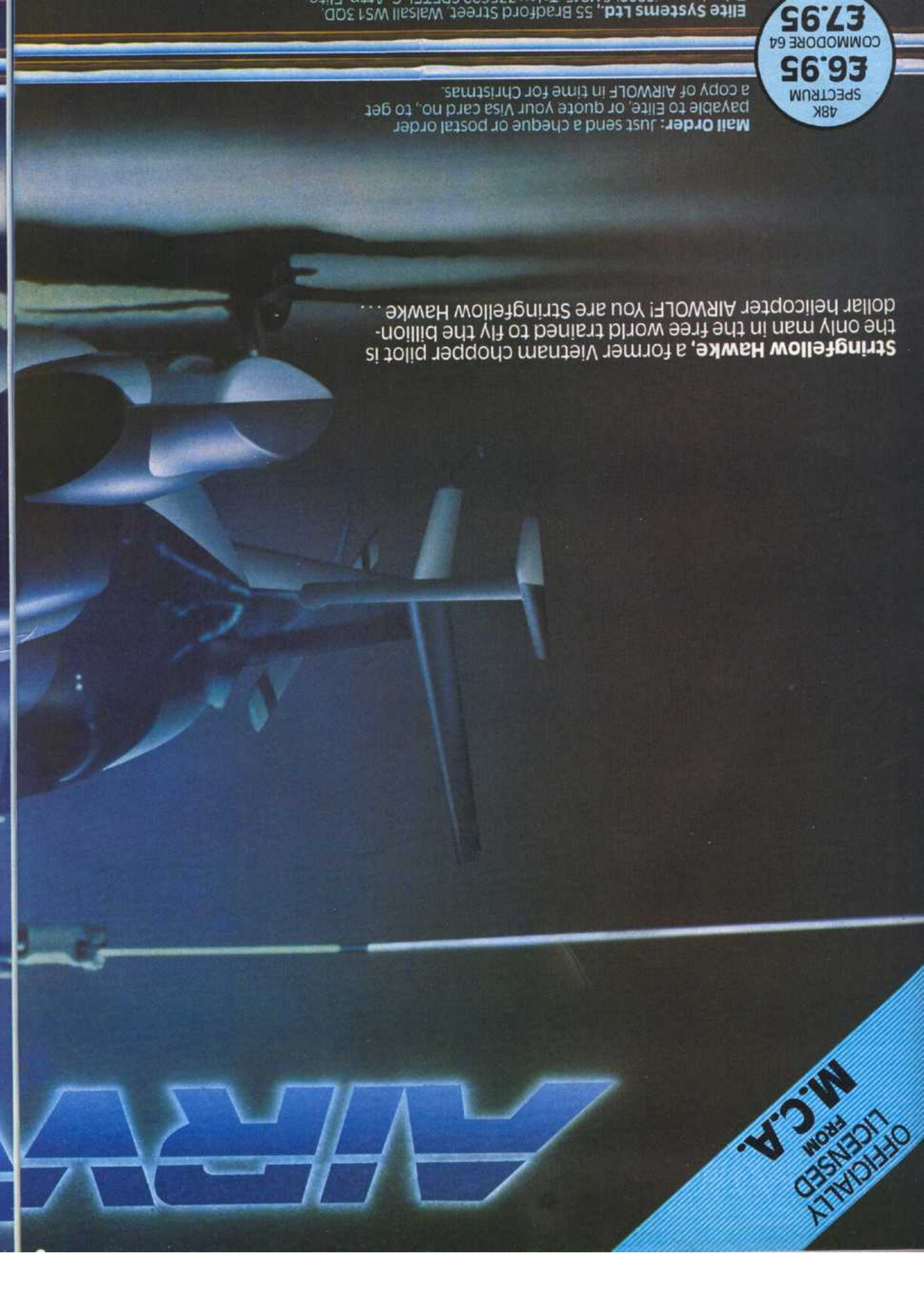
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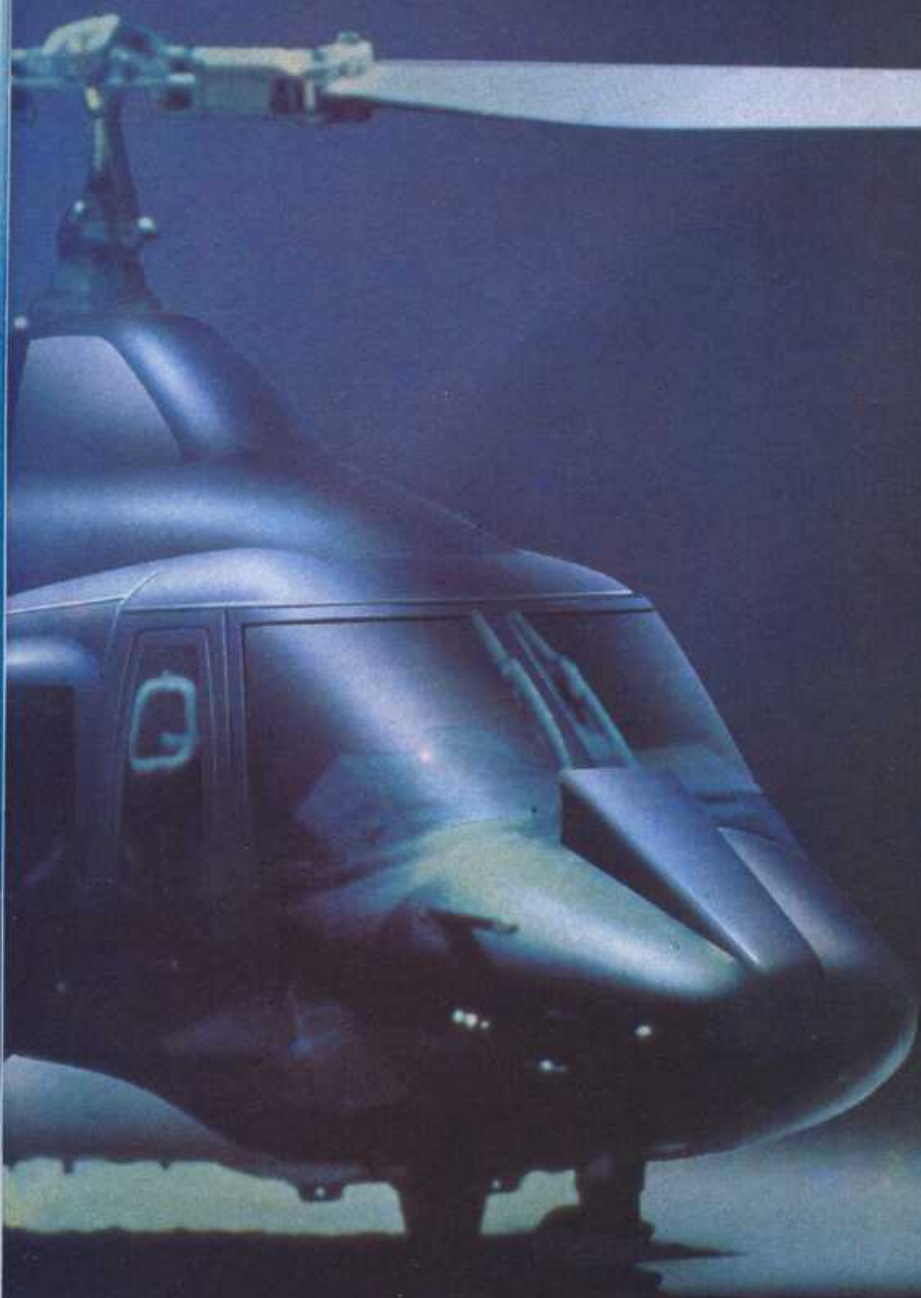
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3 Channel Sound Synthesizer

Any microcomputer is capable of manufacturing sound, however in order to produce a single octave 'C' note with a frequency of 8372 Hz the signal needs attention over 16,000 times per second.



To produce software capable of performing just this one task would be difficult if not impossible, especially when you consider that to produce arcade type sound effects require even greater attention.

The production of these sound effects without the constant attention of the processor is now possible thanks to the AY Sound Chip, its flexibility makes it essential for a wide range of applications including music synthesis and sound effects generation, continuing the monitoring and production of sound after the initial command. More often than not realistic sounds require more than one effect and this function is provided by 3 independently controlled channels, as an example, compare the sound produced by the single note of C, with that produced by the chord 'C' and you will know just what I mean, likewise producing the sound of an explosion using all 3 channels gives games a totally new dimension.

Add to this the ability to alter the pitch tone and shape of the sound you have produced and it's flexibility is unlimited. In simple terms, imagine the note you have produced as a calm sea, by altering the pitch and shape you can produce waves, the top of the wave corresponds with the maximum volume and pitch of the note, which like the wave itself rises and falls.

Free Music Designer Cassette Worth £9.95

Beethoven to Bowie - Starwars to Splats.

The screen display shows all functions. Simply move the cursor along the keyboard, select the desired note by pressing the fire button and the note selected then appears on the screen.

You can vary the tempo/volume and when 'played' the notes simultaneously scroll across the screen. 10 Envelope controls mean that once created, tunes and sounds can be subtly altered given varying attack and decay times to create futuristic music and sound effects. You can record and save up to three different tunes and amend each one as necessary. The dk'tronics Sound Synthesizer is suitable for both Spectrum and Spectrum + models and is guaranteed to give you hours of fun and would make an ideal Christmas gift, you never know you might turn to be another Stevie Wonder.

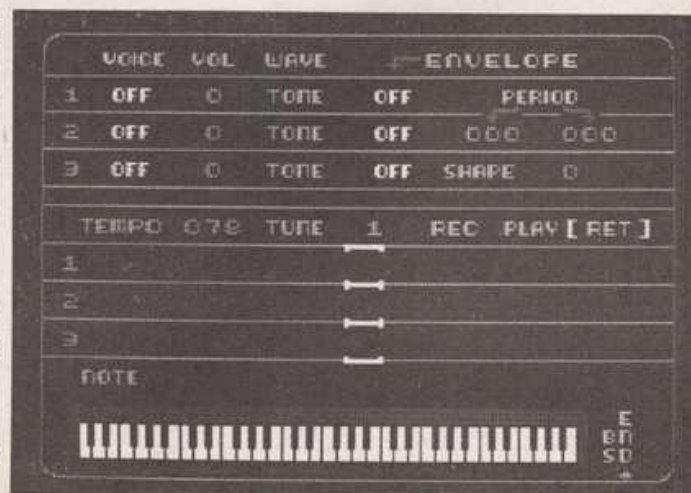
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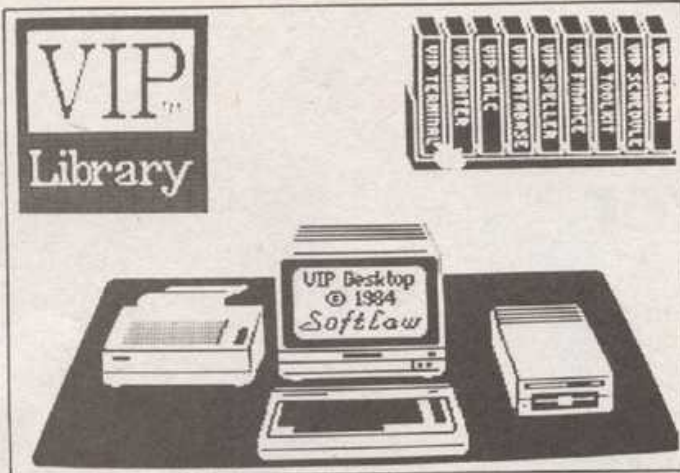


Advanced

System *VIP Terminal Micro*
Commodore 64 **Price** £50 on
disc **Supplier** Impex Designs,
Metro House, Second Way,
Wembley, Middlesex

Modems and the development of phone-in systems seem to be getting a good deal of attention these days. The speeding up of the British Telecom acceptance procedures for modems and the increasing interest of large companies such as Commodore and ICL in the commercial potential of phone-based communications are helping to generate interest. However, we are still somewhat behind the USA in this field and many of the new systems appearing in the UK now are based on American experience.

The VIP Terminal software, developed in Minneapolis, is a good example of the level of sophistication which can be achieved. The package gives nearly all the facilities required to fully exploit phone communications. Nine major functions allow you to set up a wide



range of options: a help facility, a screen display setup, a telephone directory, the communication mode itself, a facility to pre-program short messages on to certain keys, a real-time clock with alarm, disc management and file editing, and a printer-driver routine.

The display can be modified to show 40, 64, 80 or 106 columns of text, in any colour. Of course a monitor is suggested for the highest resolution. Automatic wordwrap can be switched on, and audible margin-warnings can be requested.

The terminal handles baud rates from 50 to 2400, including

split rate 1200/75, assuming that your modem is as versatile. The software gives you full control of such things as parity, stop-bits, duplex, linefeeds, pause characters, the sending of special characters, and so on. All those things which may change from system to system and can cause major problems for the inexperienced or non-technical user, such as myself. It is possible to call for help or modify these settings whilst in the communications mode.

The phone directory lets you keep phone numbers, settings for different systems (such as baud rate), and log-on messages. If you have a suitable

modem you can even get the software to auto-dial and log on for you. Unfortunately this is where the American software is of limited use. Commodore have released a number of modems in the States which are driven by this software, but many modems sold in the UK do not use the same method for auto-dialling.

The disc commands let you set up files on disc, modify files, send stored files through the modem, and receive and store files. Non-Commodore printers as well as the various types of Commodore printer are allowed for to produce a hard-copy of your communications.

The VIP Terminal is a very advanced package, giving facilities and a level of control usually reserved for business micros. The cost takes the software out of the games-software league, and deservedly so. A pity that the auto-dial may only be used by some, although most modems (thanks to BT) do not support this facility in any case. Incidentally the software cannot be used to drive the Compunet modem, nor can it be used to give full access to Compunet.

John Cochrane



Deuce

Program *Match Point* **Price** £7.95 **Micro** Commodore 64
Supplier Psion Limited, 22 Dorset Square, London NW1.

How about this for a last-minute contender for the Christmas No 1 slot? Psion — better known for its Sinclair titles — has produced its first ever program for the

Commodore 64, a conversion of its excellent Spectrum release *Match Point*, the tennis simulation to beat all tennis simulations.

So many Spectrum to Commodore conversions turn out to be disappointing — *Match Point* is a welcome exception. It all bodes well right from the speedy loading, followed by the title screen depicting a hunky specimen of the tennis fraternity.

As you might expect, the

graphics are bolder, even more life-like than the original, as the players skedaddle round the court on little legs at a great rate.

Choose from three speeds of play according to ability and how much you want to thrash the computer at its own game. The quarter final's speed is good for starting off with to enable you to work out how best to play the shots. Semi-final pace gives a good playable game, while the finals will soon have you reaching for the sweatband and umpire's refreshments yourself.

Almost as much fun as playing is watching two players battle it out in demo mode — no tantrums over dubious line calls here, and the Commodore crowd are a passive lot too — they don't turn their heads to follow the ball as they did on the Spectrum.

Three final points worth mentioning: the game is joystick controlled only, the blurb on the inlay says to abort a

match and return to the main menu press F1, whereas on my copy F2 did the trick, and if you press the space bar while serving, you can watch the receiver jiggle about on the baseline. Just like real life.

Christina Erskine

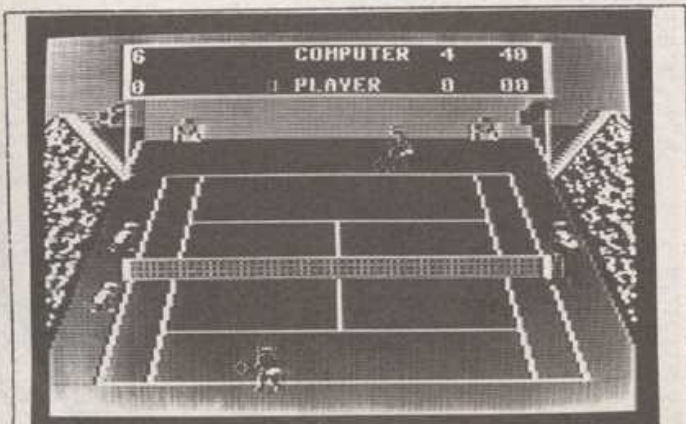


time to complete each task.

Given this element of competition it seems unfair not to display either score or time counting down. I think most children will feel cheated to suddenly find that the mirror 'shatters' because time has expired. And the use of the cursor keys is bad for little hands — why not user-definable ones?

Given these rather major reservations, the game should serve its purpose providing there is suitable parental supervision, something the booklet emphasises.

John Minson



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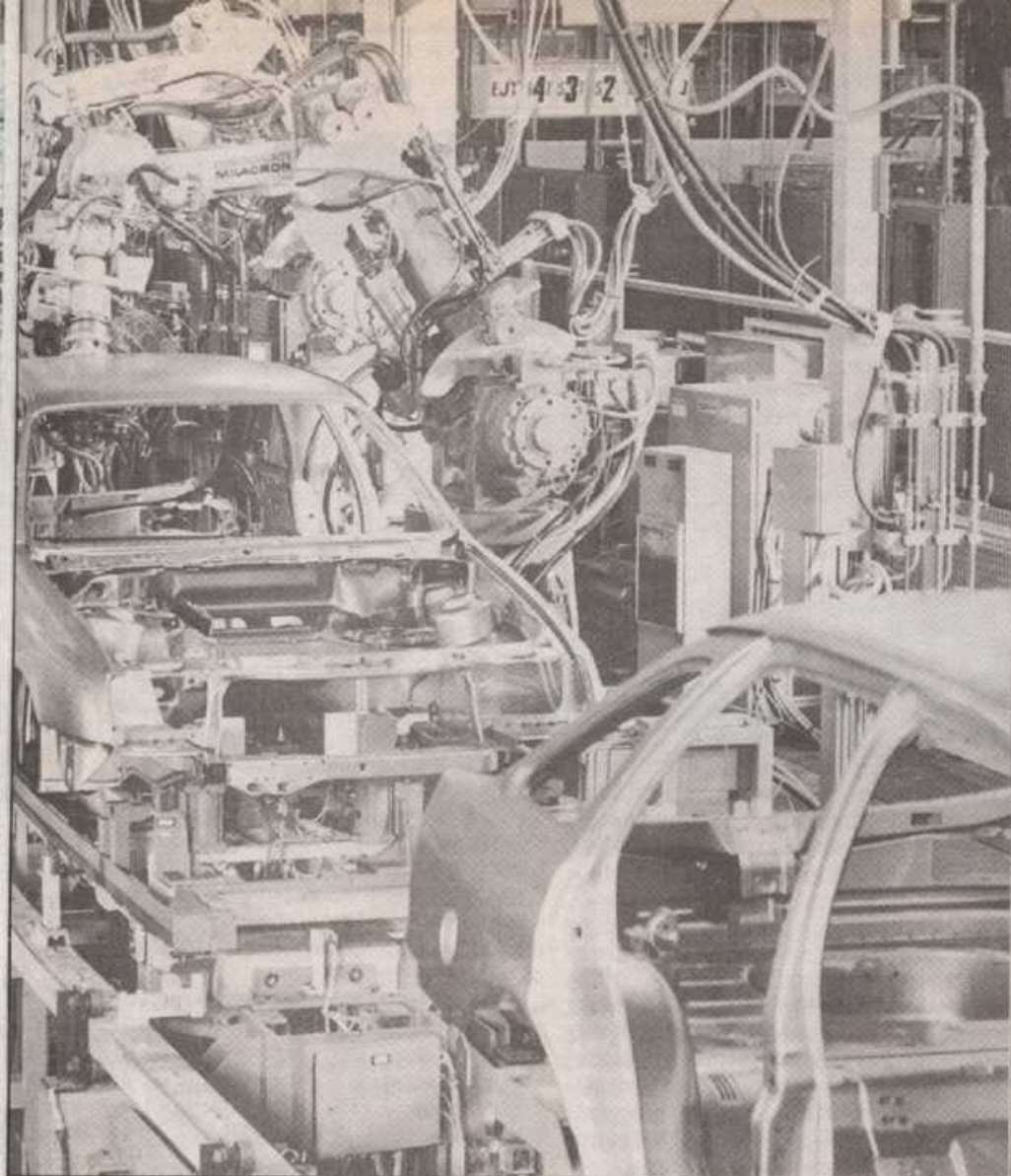
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"Some were named after daughters of the floor workers."

The final operation to take place in the body construction area is quality control. Before leaving in an elevator for the first floor to have the doors and boot lids fitted, the underbody is placed on a large pressure sensitive 'bed'. Electronic sensors connected to a Hewlett-Packard computer check the position of each specific component. The charts produced from the computer immediately show if anything has been finished incorrectly — even a millimetre out of alignment can be detected.



Dave Hutchinson

The robots do not stop here with the assembly of the main body — the paint shop is also now fully automated too.

First the entire body frames are cleaned, degreased, electro-coated — to prevent corrosion — sealed at the joints, and cleaned again, to remove any lingering dirt or dust. Surprisingly, here the final cleaning is done using ostrich feathers. Robot ostriches? Apparently not.

Ostrich feathers are expensive, but last about a year before they need replacing. Their electrostatic properties make them the best for the job — far better than the plastic strips used in an automatic car wash.

The robots are allowed the last word though — they apply each of the seven coats of paint applied to the Sierra models.

The Sierra assembly line in the Dagenham plant is the most technologically advanced in the country. The cost of all the robots now installed on the line amounts to some £250m.

"We went by the robot route to save on constant labour costs and become more efficient," said Dave. "Obviously though we still need the staff to supervise and maintain the robots."

The question of how the robots have taken over from manpower is inevitably a touchy one. In the 1970s — pre-robot days — there were about 50 people working on side-frame assembly alone. Today that number has been whittled down to a fifth. And robots don't have salaries and paid holidays.

Ford maintains that such automation has had to be introduced in order for the company to remain competitive.

frame is constructed.

With the underbody, Kuka robots are again used for spot welding. "These are what we call hard automation robots, because they can't be reprogrammed," said Dave.

"The Kukas you saw on the side assembly are all reprogrammable — you can alter the speed at which they work, the number of spot welds they make, and so on. A separate hand-controlled unit can be plugged in, and the new motions gone through, physically, using the unit. Then you press a button, and the movements are stored in the robot's memory. The new programs are generally stored on tape and two back-up copies made.

"However, the underbody construction is all done with hard automation — the main panel is loaded in at the start, the rear and front floors and engine compartment are then spot welded on to complete the assembly. An electronic signal is also sent to the underbody assembly section to determine whether the components are to be set up for a left-hand or right-hand drive car.

"Automatic transfer devices, similar to the Niko 'hand' pick up the completed underbody — the part we call the 'marriage' — and bring it together with the side frames for the main body-frame assembly.

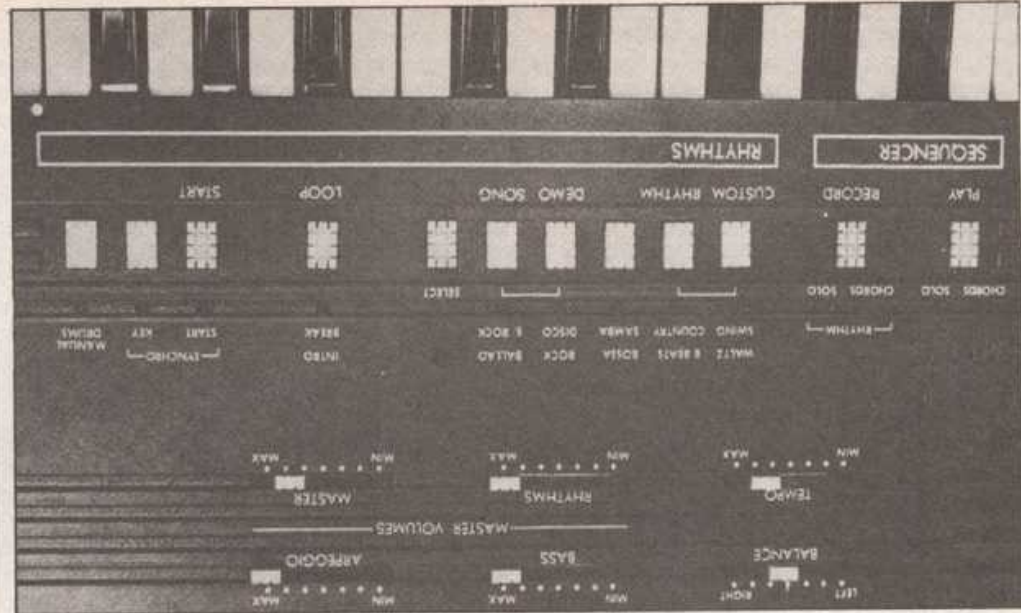
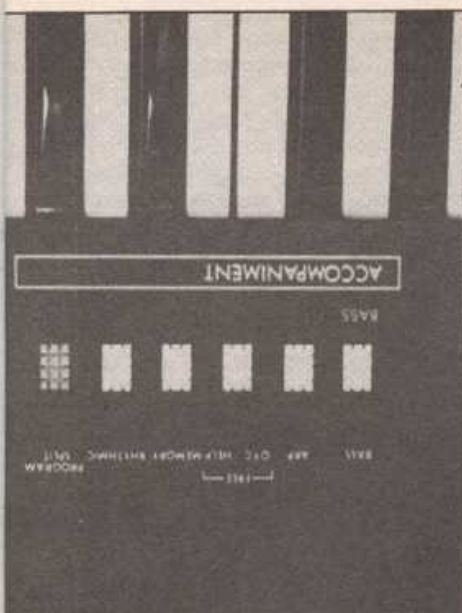
"The main body-frame assembly is still done by hand," admitted Dave. "We simply haven't found a better way yet. The staff on this line use simple clips to attach the roof panels, each side panel and the underbodies together."

Next the assembled Sierra bodies begin their trip down the long line of bulky Cincinnati robots to finally weld the frames together.

The 24 Cincinnati robots which finish off the welding are the most powerful. Standing about six feet high their precise movement is controlled by computer-operated hydraulic pistons and activators — rather than by electric motors. Whereas the spot-welding and clipping, up till now, has only involved the minimum number of connectors and robot movements to hold the frames together at this section of the line, the Cincinnati giants provide the main strength welding finish.

They were among the first robots to be used by Ford and are the only ones at Dagenham to have been given names — two are called Sarah and Anne and those on the second line are called after football teams — West Ham, Arsenal and Fulham.

Intrigued, I had to ask. "It was one way of making the robots seem less threatening when they were installed," Dave explained.



I looked particularly at Sie's two packages for the Commodore — the *Midi Multitrack Composer* and the *Live Sequencer*. The *Composer* is some way towards the on-screen musical score but it uses musical notation which is clearly intended for computer novices rather than experienced musicians. In other words you don't get staves, crochets and quavers. Instead,

But the MK900 has Midi and as such can be linked to a home computer via Sieff's Midi interface unit (£99) and controlled by computer software — at present there are two packages for the Commodore and one for the Spectrum. A BBC Midi interface is

Any of the features may be recorded into the sequencer and will loop round endlessly to provide a simple backing for solos. All in all, it is the elder brother to all those little Casio keyboards, incorporating many of the same features, a few of the limitations, but mostly having much more impressive — very effective and useful.

The rhythm section is good. Digital sounds lift it way above the thin thuds and clicks usually associated with built-in drum units. There is also the facility to create your own rhythms guided by a metronome pulse

A feature which enables two presets to be played at once on the same note makes some of the basic sounds pretty impressive. Even the jarnest, the Piano preset, as is often the case, can be improved by sustain and

latter in more detail. What you get for £449 is a five octave full size keyboard with ten preset sounds, ten rhythms, a sequencer which can remember 60 chords and 280 notes and various

There are two ways of looking at the Siel MK900; as an instrument in its own right and as a computer controlled MIDI keyboard. This being a computer magazine, we'll zoom through the former and look at the

For musicians linking a computer to a keyboard allows a freedom similar to that provided by wordprocessors to writers and typists previously accustomed to typewriters. Software packages can (and, in at least one case, do) allow for multi-part composition with instant playback of one or all parts. Sections of music can be rearranged, moved about, assigned to different instru-

You get more flexibility in the sense that you can cover those areas you are most doubtful about in greater detail and at greater length. Equally it becomes harder for you to cheat — the computer can ensure that you understand some musical point before

of the system meant that the end result sounded like the kind of skull-rumbling ditties you hear in hypermarkets whilst shopping. What a computer can provide is the flexibility that was originally lacking. Using computer programs to learn about music will always be more successful than flashing leds or instant chords (unless it is absolutely horrendously written, which has too often been the case until recently). Because it requires your response and through that response varies the end result. For educational purposes you get more

ger melodies.
All this easy-play technology wasn't total-

know that the real money is not made from professional musicians but rather from dabblers, amateurs who know a little music but want to learn more and who want to be able to crank out a few tunes at parties. Casio tried many different techniques to help people learn music; some of their instruments had little lights — that lit up above each note on the keyboard as a tune stored in its memory was played — the idea being that you would try to 'follow' the lights and thereby learn the tune. Other features, like one-note chords and auto base lines gave an automatic, if rather plastic, accompaniment to your single fin-

look at the other side of the coin. Casio and other manufacturers of cheap musical keyboards have spent much time, effort and money making those instruments as easy to play as possible. Casio and co.

But whilst all this is a pro-synthesiser argument, why involve the computer at all? Why not just buy the instrument? Time to

A synthesiser can give the current crop of computers musical possibilities they could never otherwise possess. Not only ergonomically — you can't play a Qwerty keyboard with any finesse — but also in terms of the quality and range of sounds available. The synthesisers on the market now are capable of such perfect mimicry of acoustic instruments that it's often difficult to tell the difference. Sound chips on available computers are capable of only three or, at best, four channels of sound. This last point means, basically, that you cannot even play

The problem for computer owners is, that so far the jump into Midi has simply been too expensive, whatever their interest in music. Until recently the cheapest Midi equipped keyboard has been £700 at least. However, the new Siel MK900 is a Midi keyboard for just over £400 — not much more than a good printer. It's a big step on the way to the time when a synthesiser is as common a peripheral as a joystick or light pen.

Much has been said of MIDI recently. What began as a long overdue standard for musicians, enabling them to connect together instruments from different manufacturers, looks like being the spark which ignites a whole new area of

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Hardware Review



notes are notated with their letter and a number to indicate which octave you require, eg, C4 equals C in the fourth octave. The # and the b sign are used to indicate sharp and flat respectively. Note length is expressed as fractions of 96, so a quarter note has a duration of 96/4, ie, 24.

Tunes are created on one of six tracks (like a single line of monophonic, ie, single note music) which are then assigned to Midi channels. More than one track may be assigned to each Midi channel and in this way chords may be created using combined single tracks together.

Individual notes may be made staccato or legato by adjusting the 'gate on time' figure — basically slightly adjusting this figure makes the note a little longer or shorter without affecting the 'clock'.

Each track of music may be edited — notes may be removed, added, note lengths changed and so on, tracks may be saved to disc, loaded in, renamed or erased under your command. What does this mean in terms of the MK900?

The keyboard has two Midi channels: 0 and 1. This means that it can have two 'streams of information' operating independently at the same time. If that sounds confusing it isn't, since in practice two Midi channels means that at any given moment two sounds may be used and within each sound the six tracks may be allotted. For example, by assigning tracks one to four to Midi 0 and tracks 5 and 6 to Midi 1 you have set up an arrangement whereby one sound (say, organ) can play chords, up to four notes and the other sound (say, synth) can play up to two notes on a lead line. I should add that whilst the computer is playing the keyboard you can still join in, using the same sounds.

On the Commodore you are provided with a total of 9000 notes to play around with, 1533 over the six channels, enough for anything short of *The Ring Cycle*. The C4,B3=, D5 notation is obviously pretty irksome to tap into the keyboard but if, like me, your musical compositions don't get much beyond three note chords and one

note lead lines it shouldn't be too much of a problem.

The live sequencer is, in a way, the Composer from the other end. Here you set up the program to receive information and play the keyboard. The border flashes as each note is 'received' by the computer, although all that is recorded is the note information, not the particular tone you have set — you can change that as you wish.

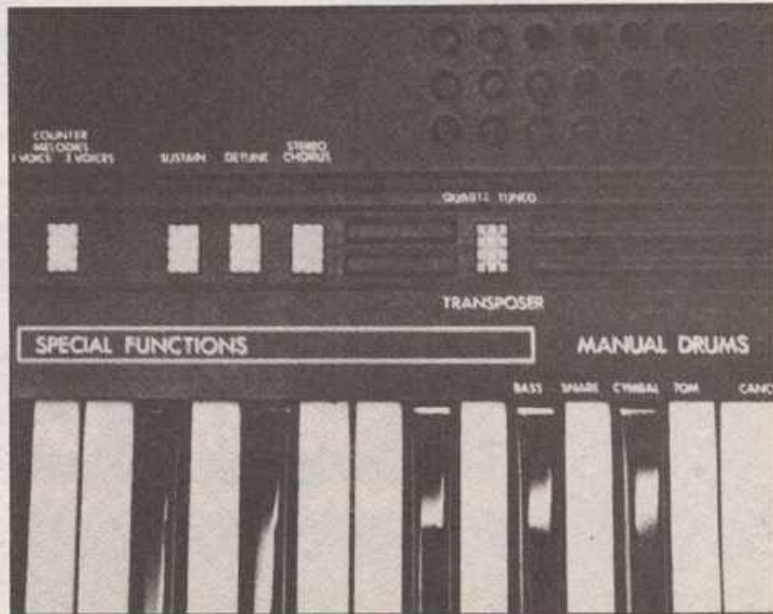
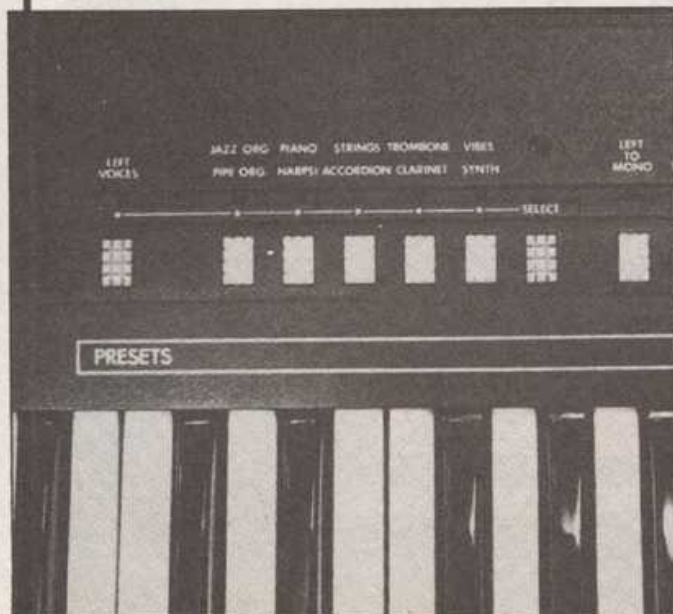
The recorded notes are assigned to a given track and may be played back through the keyboard at a faster or slower speed. New tracks may be recorded and also played back — the effect is very much like having a multi-channel tape recorder with extensive over-dub facilities.

Obviously entering the music with the keyboard is much more convenient than typing in the notes on the Commodore but then you don't get the same degree of editing flexibility. You pay your money... etc, etc. The MK900 is a high quality top-of-the-range portable with enough features and quality sounds to get music that doesn't sound bad with only a little effort. Add a Midi interface and you have, with the right software, an instrument on which you can compose multi-part music, create and replay many lines of melody and generally tinker to your heart's content.

The MK900 lacks two things; firstly it has presets and thus the sound creation is limited and secondly the Midi standard allows for the communication of velocity (how hard you hit the keyboard) but the MK900 is not a velocity sensitive keyboard. In this sense, buying the MK900 is not letting you use all the Midi features possible.

For my money the MK900 is the ideal instrument for those who want a starting point with computer music but aren't too worried about limited sounds and don't want to risk too much money. The auto features are particularly useful and with the software packages that will surely come, sophisticated and impressive arrangements can be created.

Graham Taylor



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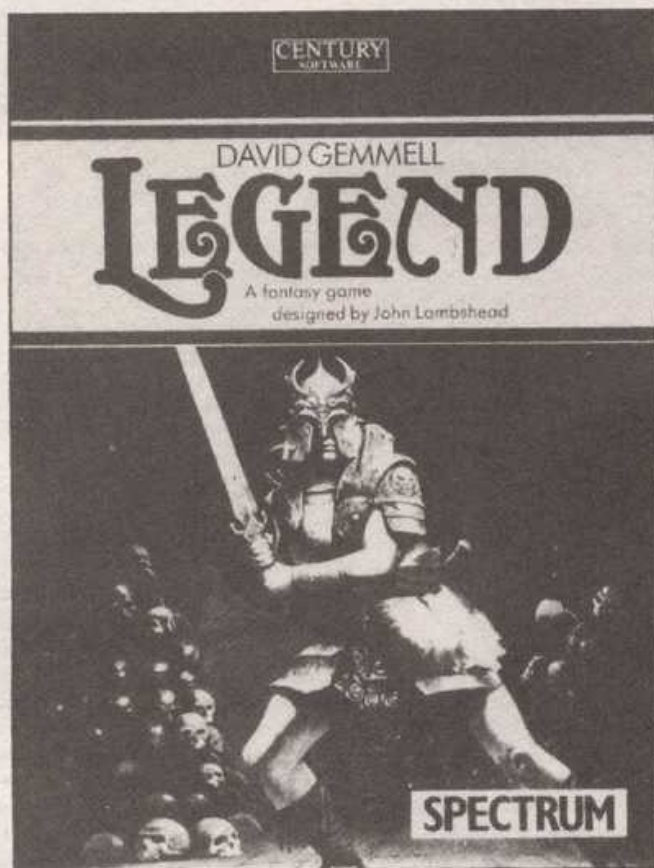


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POPCW

Compatible

Hardware Saga 1 Emperor Micro Spectrum Price £54.95 Supplier Saga Systems Limited, Woodham Road, Woking, Surrey.

It has always annoyed me that so called 'professional' keyboards for the Spectrum have fallen short of anything that could really be used to obtain respectable typing speeds. Admittedly this is primarily the fault of the hopeless double shift and extended modes of the keyboard system. These present manufacturers with endless headaches if they want to provide a board that allows one keypress access to the various punctuation marks.

As I understand it, Sinclair themselves had to resort to special arms within the Spectrum + that physically depress different parts of the membrane to obtain the extra keys such as the semi-colon. On first opening the box of the Saga 1, I dared to hope that someone else had finally come up with a mechanism for doing the same, as most of the punctuation marks are represented on their own as well as selected functions such as *Edit* and *Delete* that can only be accessed using the shift keys. Disappointingly the system they have used in fact only comes halfway to providing these features as they are no more than relabelled copies of the original key and return the unshifted signal when pressed alone.

The idea is that it is easier to spot and use the most common functions and Saga have provided no less than two cap shifts and four (count them) symbol shifts at useful points all over the board. After some practice you realise that this is a good compromise and makes the use of the keyboard faster and more pleasant. Keys also exist for the unshifted functions *Rm*, *Load*, *List*, *Save* and *Cls*. Here are also extra cursors in some extremely sensible positions on the board which unlike the Spectrum +, return the numbers 5-8 when unshifted so they will be fully compatible with all existing software.

Some aspects of the design are irritating. The colour coding on the keys is inconsistent, with symbol shifted functions being represented in various places in black, red and green. This is not made easier by the fact that the various keywords on the main Qwerty area are very hard to read, being much smaller than on the original Spectrum which uses the area above and below the keys to carry a lot of information. Perhaps to allow all the various interfaces to be connected, the bottom of the Spectrum board is actually screwed on beneath the Saga, a system that works much better than I expected even though it does leave a gaping hole around the edge connector. However, this does mean that four rubber feet provided at the bottom of the new

Professional

Hardware Datafax Disc Interface Micro Sinclair Spectrum Price £86.25 Supplier Statcom Distribution Ltd, 18 Grove Road, Sutton, Surrey

Some months back it seemed as if a whole bunch of disc interfaces were about to be launched for the Sinclair Spectrum. Very few of them actually saw the light of day, partly because of micro-drives and partly because the Spectrum was not designed around a disc operating system.



The Datafax interface, consisting of a strongly-built and quite long black box, is the latest attempt to get around this problem. Designed initially to run with a single



Tony Kendle
Enter keys. I think it knocks spots off the competition.

3-inch Hitachi-based drive (available from

although ask them about an all-in-one price) the interface can be used with 3.5, and 5.25 inch drives. A very simple operating system has been developed which allows you to load and save programs, data-arrays, and machine code. The only other facilities provided are to format new discs, to list a disc directory, to erase a saved file, and to make a backup copy of a whole disc.

By keeping the system this simple, the Datafax designers have managed to produce a very useable device which offers high-speed and high-reliability loading and saving without the need to learn a complex new way of using your computer. The interface offers a total capacity of just over 100k per disc side, although work is in hand to operate two drives and to increase the storage per drive. This 100k can be divided between up to 39 separate files.

But what about compatibility with existing hardware and software? In principle all hardware is compatible although this is achieved by the simple expedient of providing a hardware switch to control the expansion port provided. Thus you can switch between, say, joysticks and disc, but you cannot have them both on at once. Most software can also be used, including programs which use nearly all the normal Spectrum memory. This is because the interface permits its own software (which normally uses some of the free Ram) to be overwritten. A special loading procedure allows you to pack in the largest of programs, although you lose the screen display in the process.

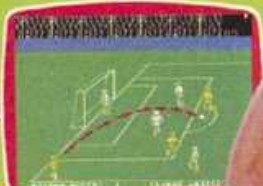
John Cochran

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Moving into reverse

An equation converter written for any Spectrum by Richard Armstrong

One of the biggest difficulties in using a language like Fortran or Assembly language is that expressions like

$A+B+C=D$ have to be written as $AB+C+D=$. This is known as Reverse Polish Notation. Converting to Reverse

Polish (or as it is sometimes known, Postfix) Notation can be difficult, especially if dealing with large expressions. Fortunately, an algorithm produced by a famous computer scientist called Edsger Dijkstra can do the conversion for us. This program is based on that algorithm.

The program is simple to use. Firstly the user is prompted to input the expression he wishes to be translated. The computer then prints out the corresponding Postfix expression. The program can handle the following operators: +, -, *, /, =, (,), Or, And. Operands are represented by the capital letters A to Z.

As an example, the expression $A=B$ and $C+D=E$ would be translated to $AB=C+D+E=$. Note that And and Or should be entered direct from the keyboard, and not spelled out one letter at a time. When the prompt 'More? (Y/N)' appears, the user should press Y to translate more expressions or N to end the program.

The program works by considering each element of AB in turn. If the element under consideration is an operand (A...Z) then it is printed. If the element is an operator (=, +, etc) then its priority must be considered. If the element is an operator printed. If the element is an operator (=, +, etc) then its priority must be considered. If the element is an operator printed. If the element is an operator (=, +, etc) then its priority must be considered.

If the element of AB is an operator, then operators are removed from the stack and there is a left hand bracket on top of the stack, or (finally) the operator on the top of the stack has a lower priority than the element of AB under consideration. The element being considered is then added to the stack. If the element being considered is a left hand bracket, then this is likewise added to the stack. If, however, the element of AB is a right hand bracket, then the operators are removed from the stack and printed until a left hand bracket is found.

Program Notes

Line No	Print instructions and read expression
10-90	
130-180	Loop to scan the input expression and to be translated
190-210	Call appropriate sub-routines
220-270	Decide if more expressions are to be converted
310-360	Print items from the stack until a left hand bracket is found
400-420	Drop an operator from the stack

```

10 REM INFIX TO R.P.N.
20 LET S$=""
30 LET SP=0
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```

430-450 Add the operator under consideration to the stack
 450-580 Considers the priority of the operator under consideration and prints operators or adds operators to the stack as appropriate
 A — Loop control variable
 SP — A 'stack pointer' used to keep track of the end of the stack
 S\$ — A 'stack' used to store operators
 A\$ — Expression input for translation

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Filed, sealed and delivered

A useful filing program for Dragon 32 users written by W Patton

This is a program that allows you write your own filing system and have as many fields to a file as you want. It takes up 1.5K of memory and can store up to 300 entries.

The program is split up into several sections; Line 10 prints out the menu, Lines 20 and 30 get your command to go to the corresponding section of the program. Lines 40-90 are used by Option 1 where you are requested to type in the number of fields that the file you are creating requires. You then type in each entry, pressing *Enter* after each field has been typed in. When you want to finish typing, you must type 'XX' as the first entry to your last file.

Lines 100-110 are used by Option 2. These allow you to add more files to the end of your file. You enter data for this the same way as for Option 1 using 'XX' to return to the menu.

Line 120 is used by Option 3 and can be used to correct any mistakes made while entering your data. You are required to first state the file that the error is in, then the field. You then type in the new item and it will replace the old one.

Lines 130 and 140 are used by Option 4. This allows you to insert a file anywhere in the large file. You must type in the number at which you want the file to go in at, then you must type in the new file. Line 150 is used by Option 5. You must type in the number of the file that is to be deleted then that file will be erased.

Line 160 is used by Option 6 where the file is saved. You have to type in the name you want to call the file. After pressing *Enter* you are given a pause in which time you should press play and record on your cassette recorder. Line 170 is used by Option 7; the loading routine. You have to type in the name of the file to be loaded. When the file has loaded you return back to the menu.

Lines 180-200 are used by Option 8; the print out routine. You are first asked if you wish it to go to the screen or the printer. Press any key to step through the file. When all the file is printed out the program waits for you to press *Enter* before returning to the menu. Lines 210-230 are used by Option 9, where a word is searched for in the file. You just type in the word you are looking for in full, and the computer will search through the large file until it finds it.

Variables

A	= Number of fields
Array AS	= All of the file
EO	= Length of file + 1 in memory
XS	= General input
A1	= Value of key pressed
F/X	= For next loop variables
NS	= Name of file to load or save
D	= General input

```

5 CLEAR 10000
10 CLS:PRINT"(1) START A NEW FILE":PRINT"(2) A
DD TO A FILE":PRINT"(3) EDIT A FILE":PRINT"(4)
INSERT A FILE":PRINT"(5) DELETE A FILE":PRINT
"(6) SAVE FILE":PRINT"(7) LOAD A FILE":PRINT"(
8) PRINT OUT FILE":PRINT"(9) SEARCH FOR A WORD
":PRINT"COMMAND"
20 XS=INKEY$:IF XS="" THEN 20 ELSE A1=VAL(XS):
IF A1<1 OR A1>9 THEN GOTO 10
30 ON A1 GOTO 40,100,120,130,150,160,170,180,2
10
40 CLEAR:INPUT"HOW MANY FIELDS";A:IF A<0 OR A>
11 THEN 40 ELSE DIM AS(300,A)
50 PRINT"TYPE 'XX' TO END"
60 FOR F=1 TO 300:PRINT"FILE ";F:FOR X=1 TO A
70 INPUT AS(F,X):NEXT X
80 IF AS(F,1)="XX" THEN EO=F:GOTO 10 ELSE NEXT
F
90 PRINT"FILE FULL":GOTO 10
100 FOR F=EO TO 300:PRINT"FILE ";F:FOR X=1 TO
A
110 GOTO 70
120 INPUT"WHICH FILE";F:INPUT"WHICH FIELD";X:1
NPUT"TYPE IN NEW ENTRY";AS(F,X):GOTO10
130 INPUT"WHERE IS NEW FILE TO GO";D:IF D>=EO
THEN GOTO 10 ELSE FOR F=EO TO D-1 STEP -1:FOR
X=1 TO A:AS(F+1,X)=AS(F,X):NEXT X,F
140 EO=EO+1:PRINT"TYPE IN NEW FILE":FOR X=1 TO
A:INPUTAS(D,X):NEXT:GOTO 10
150 INPUT"WHICH FILE IS TOP DELETED";D: IF D>=
EO THEN GOTO 10 ELSE FOR F=D TO EO:FOR X=1 TO
A:AS(F,X)=AS(F+1,X):NEXT X,F:EO=EO-1:GOTO 10
160 INPUT"NAME TO SAVE FILE UNDER";NS:PRINT"PR
ESS PLAY AND RECORD":FOR F=1 TO 1000:NEXT:OPEN
"O",#-1,NS:PRINT#-1,EO,A:FOR F=1 TO EO:FOR X=1
TO A:PRINT#-1,AS(F,X):NEXT X,F:CLOSE#-1:GOTO
10
170 INPUT"NAME OF FILE TO BE LOADED";NS:PRINT"
PRESS PLAY CASSETTE":OPEN"1",#-1,NS:INPUT#-1,E
O,A:FOR F=1 TO EO:FOR X=1 TO A:INPUT#-1,AS(F,X
):NEXT X,F:CLOSE#-1:GOTO 10
180 INPUT"(S)CREEN OR (P)RINTER";XS:IF XS="P"
THEN D=-2 ELSE D=0
190 FOR F=1 TO EO-1:PRINT#D,F:FOR X=1 TO A:PR
INT#D,AS(F,X);" ";:NEXT
200 IF INKEY$="" THEN 200 ELSE PRINT#D:NEXT:IN
PUT"ENTER TO RETURN";X:GOTO10
210 INPUT"TYPE IN WORD";XS:FOR F=1 TO EO:FOR X
=1 TO A:IF AS(F,X)=XS THEN 230 ELSE NEXT X,F
220 PRINT"WORD IS NOT THERE":INPUT"ENTER TO RE
TURN";X:GOTO10
230 PRINTF:FOR X=1 TO A:PRINTAS(F,X);" ";:NEX
TX:PRINT:INPUT"PRESS ENTER TO RETURN";X:GOTO10

```


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REWRITE THE HIGH SCORE TABLES



In the parallel universe

Perfect Parallel Printing on the Commodore 64 courtesy of **Adrian Warman**

As many users of Commodore equipment will be aware, little provision is made for those who wish to use non-standard equipment, such as Centronics-equipped printers. A growth market for CBM users is the Parallel Printer interface package, which can range from cheap cable and minimal software, up to expensive hardware add-ons that do everything and cost a corresponding amount.

A typical software interface will come with a short cable to connect from the User Port to the Centronics Printer, and a small piece of machine code software. This software will usually reside in the spare Ram from \$C000 to \$CFFF, since this is untouched by Basic. Modifications are made to the Kernal vectors so that any attempt to access a given device number (say six) will re-directed out of the User Port as a parallel *Ascii* code.

Unfortunately, another growth market, extending the Basic on the CBM 64, also tends to produce packages which *also* use the \$C000 Ram. Such a package is the Simons' Basic cartridge, which uses the Ram for a variety of purposes, including Function Key definition. This means that if you want to have a worthwhile language, you may well be unable to use your Parallel Interface Program.

This article lists and describes a reasonably short Basic package which will drive a parallel interface, as long as you have a suitable connecting cable. The routines are detailed, and could be easily converted for use under other languages. For example, the extremely comprehensive Pascal Compiler from Oxford Computer Systems does not support parallel printers, so using the listed routines it is an easy job to define suitable procedures in Pascal to perform all necessary tasks.

The routines supplied are a little slower than machine code equivalents, and they do not check to ensure that the device is present and connected; however, they don't require any of the file channels, leaving them all free for other purposes.

The package consists of three subroutines. One is used to configure the CBM Input/Output chips to control the data lines. The next is used to place an *Ascii* character onto the data lines (and hence send it to any listening device). It will then wait for an acknowledgement that the character has been received. The last routine will restore the CBM I/O chips to prevent the parallel device being accessed further.

As an example of the routines used, a short program is added to the front of the listing which prints out the *Ascii* characters

from number 32 to number 127 inclusive.

Program notes

Line 140

This line calls the subroutine which will perform the equivalent of Basic 'OPEN' instruction. Since no 'file' is being used, no file number needs to be given.

Line 150

This is the start of the loop to print out the ASCII characters from 32 to 127 inclusive.

Line 160

The subroutine to output characters assumes that the ASCII code is stored in variable *CHAR*. If you wanted to use literal characters, you could use something like: *Char = Asc ("a")*.

Line 170

This line calls the subroutine which will perform the equivalent of a Basic *Print#x, Chr\$(y)* instruction. Note that (as stated above) no file is used, and so no file number is required. In addition, the semicolon after the print instruction is always implied. Thus, to simulate a

continued on page 51

100 REM BASIC PARALLEL PRINTER ROUTINES.

```
110 :
120 REM BY A. WARMAN
130 :
140 GOSUB 60010
150 FOR X=32 TO 127
160 CHAR=X
170 GOSUB 60190
180 NEXT X
190 CHAR=13
200 GOSUB 60190
210 GOSUB 60110
220 STOP
230 :
60000 REM OPEN TO PRINTER.
60010 CIA2=56576
60020 POKE CIA2+3,255
60030 POKE CIA2+1,0
60040 POKE CIA2+2,PEEK(CIA2+2) OR 4
60050 POKE CIA2,PEEK(CIA2) OR 4
60060 POKE CIA2+13,16
```

```
60070 RETURN
60080 :
60090 :
60100 REM CLOSE ACCESS TO PRINTER.
60110 CIA2=56576
60120 POKE CIA2+13,0
60130 POKE CIA2+3,0
60140 POKE CIA2+2,PEEK(CIA2+2) AND 251
60150 RETURN
60160 :
60170 :
60180 REM PRINT OUT CHARACTER 'CHAR'.
60190 CIA2=56576
60200 POKE 49152,PEEK(CIA2+13)
60210 POKE CIA2+1,CHAR
60220 POKE CIA2,PEEK(CIA2) AND 251
60230 POKE CIA2,PEEK(CIA2) OR 4
60240 IF (PEEK(CIA2+13) AND 16)=0 THEN GOTO 60240
60250 RETURN
```


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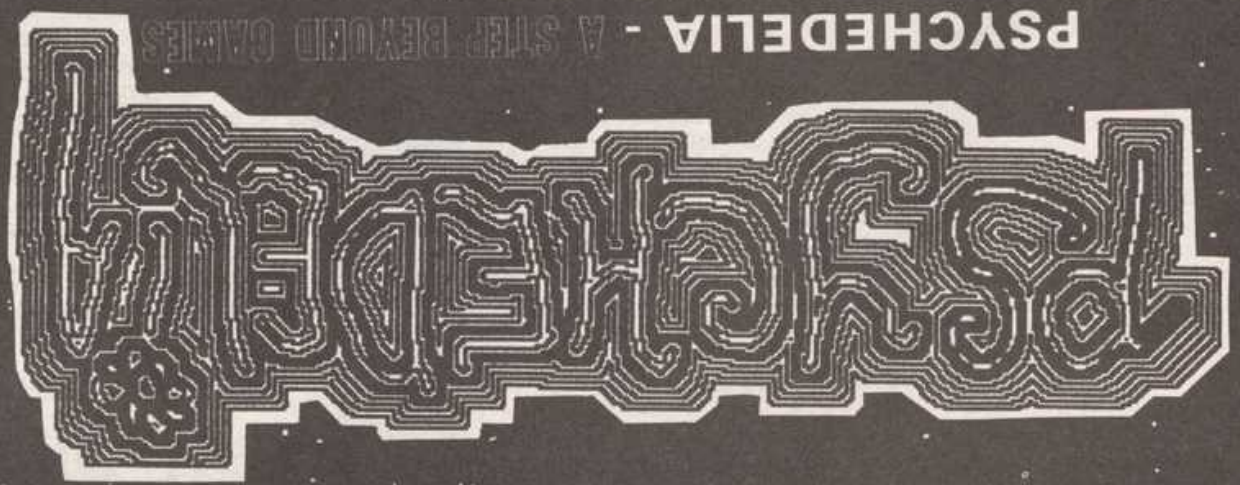
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Commodore 64

Print#x instruction (which would simply print a carriage return), you should use: *Char = 13:Gosub 60190*.

Line 180

Go and do the next character (if there is one to do).

Lines 190-200

Output an *Ascii* carriage return <CR> character. This corresponds to the *Print#x* as described above, and on most parallel printers ensures that any text left in the input buffer will be printed.

Line 210

This line calls the subroutine which will prevent the I/O chips from trying to access any parallel devices on the User Port, by restoring default values.

Line 220

Halt the demonstration program.

Lines 60010 - 70

These lines are responsible for configuring the I/O chips to access the User Port in a manner suitable for controlling a parallel Centronics device. In its absolute minimum configuration, a parallel Centronics port requires eight data lines (called a 'bus'), a *strobe* line to show the parallel

Lines 60010 - 140

device when the data on the bus is valid, and an *acknlg* line to show when the parallel device has accepted the data. The 8-bit bus is set up using Port B of CIA#2, which connects directly to the User Port (program lines 60020-60030). The *strobe* line is bit two of Port A (program lines 60040-60050). Finally, the *acknlg* line is set up using the *Flag* interrupt on CIA#2 (program line 60060).

Lines 60190 - 250

These lines deselect the I/O chips to prevent them accessing the parallel device. The *acknlg* line is disabled so that it can no longer be read (program line 60120). Each of the 8 lines on the data bus is restored to an input line (program line 60130). Finally, the *strobe* line is redefined as an input line (program line 60140).

The key lines of the package. First, a read of the *acknlg* line must be made, in order to check it later (program line 60200) — for the reason, see the *Programmers Reference*

Guide. Note that the data returned is placed in location 49152 simple for convenience! If you wish, you could replace program line 60200 with (say): *Let A = Peek (CIA2+13)*.

Next, the actual *Ascii* code is placed on the data bus (program line 60210). The *strobe* line is switched to show data ready (lines 60220-60230). Since the device may have a delay (such as moving the print head back to the next line), the program must wait for an acknowledgement via the *acknlg* line (program line 60240). Once this has been completed, the character has been sent and received, so we can exit the routine.

Hopefully, you should now see how to modify your own programs in order to incorporate the parallel interface routines. However, this does not get over the fact that a connecting cable is still required. Fortunately, these are available as stand-alone items from advertisers in magazines such as this esteemed paper!

Competition result

Flight Competition winner

The winner of the Flight Simulation Competition we ran in the September 6 issue is Simon Watson, aged 19, from Harlow in Essex.

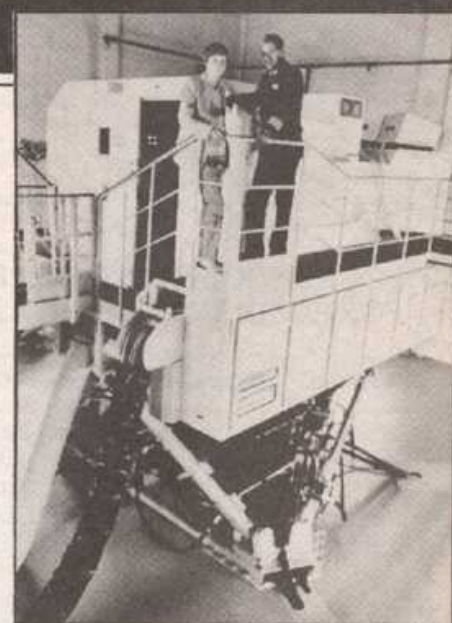
Last week he was awarded his prize — a chance to fly a real flight simulator used to

train commercial airline pilots at British Airways' Cranebrook training centre at Heathrow airport.

British Airways operates three flight simulators at Cranebrook, each of which stands about 40 feet tall and costs a staggering £10m apiece. The machine which Simon spent around two hours flying was a Boeing 757 simulator — a faithful reconstruction of the 757's cockpit supported twenty feet above the ground on powerful hydraulic rams. These are

controlled by two Vax mini-computers to move the cockpit according to the pilot's commands to accurately reproduce the effects of take-off and landing. The illusion is completed with four monitors suspended above the cockpit windows, projecting a high-resolution computer-generated picture of the runway, surrounding buildings, roads and skyline.

It was something of a surprise to discover that Simon already has some flying experience. He hopes to make flying his career and as a first step he



is trying to get private pilot's licence allowing him to fly light aircraft. Even though he has done some flying he has never tried to learn to drive — he says he couldn't afford to do both.

After his two-hour 'flight' he persuaded British Airways' Boeing Training Captain, Roger Benham, to log the simulator 'familiarisation' in his flight record.

Now Simon is looking for a sponsor so that he can continue with his ambition to become a commercial helicopter pilot.



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POWK

Games Designer Competition

Design an arcade Game!

Think you can design an arcade game? This is your chance to put all those great ideas into practice. We want you to design the sequel to Elite's *Kokotoni Wilf*.

Kokotoni Wilf from Elite Software — one of this Autumn's top selling games on both the Commodore 64 and the Spectrum is to have a sequel. The plot? — that's for you to decide!

Popular Computing Weekly offers you the chance to use your own ideas, characters, plot and so on to create the sequel to *Kokotoni Wilf* which will be published by Elite in the new year.

The winner(s) will be credited with the storyline design in all advertising and promotion, and the winner(s) name(s) will be featured in the packaging. In addition, a royalty of 6% of sales achieved will be paid to the winning designer or design team.

What we want you to do

The competition is open to both individual designers or design teams. You are not asked to actually program the game. All you have to do is to prepare a storyboard — a series of screen drawings or sketches — for the sequel which should explain the action from the first screen to the last.

The finished storyboard should be detailed enough for Elite's programmers and designers to use without any major changes — set yourself a limit of no less than 20 screens of action and no more than 60. It might be helpful to divide your storyboard into two sections, a general guide to the story including overall objectives and method of scoring, etc (limit yourself to a maximum of 800 words). The second section should be much more specific detailing exactly what is going on where in each screen, indicating such things as sprites, background layout and movement paths. To help you, we show on the right one such storyboard from a screen in the first *Kokotoni Wilf* program.

How to enter

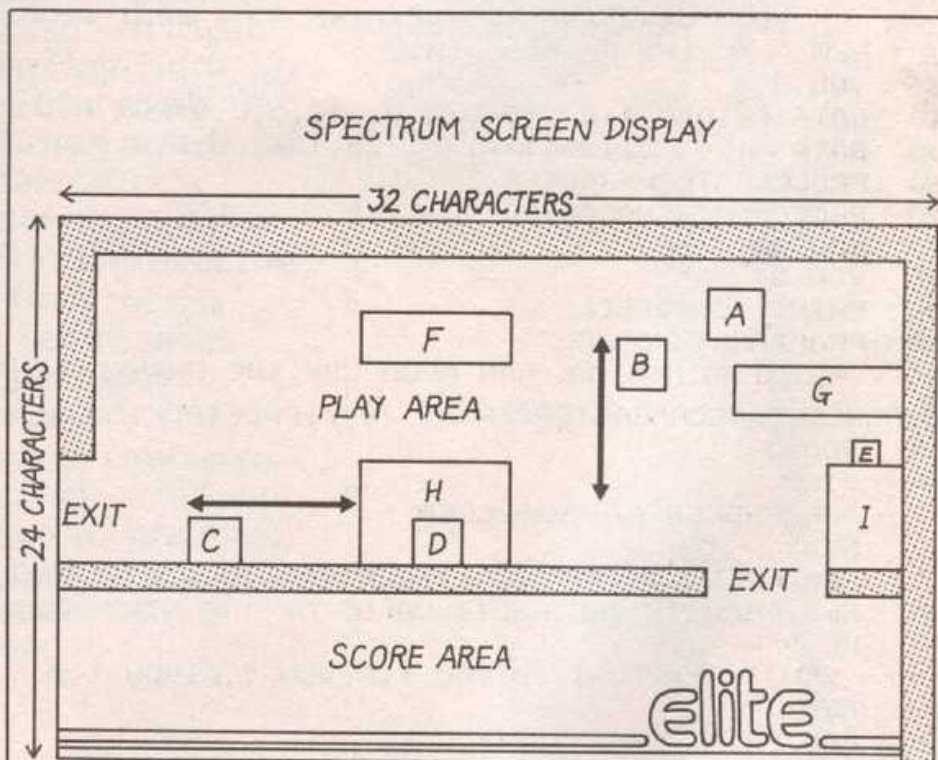
Completed storylines and storyboards should be submitted to Kokotoni Wilf Competition, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2H 7PP, to arrive no later than 1 January 1985.

All entrants requiring an acknowledgement of receipt should submit a stamped self-addressed envelope. Entrants requiring their work to be returned after judging should send a suitable post paid self-addressed envelope with the entry.

The judges decision will be final. Don't forget to include your name and address! Ten runners up will receive copies of the game which will be produced for the Spectrum and Commodore 64.

It is important to remember that the program you create is to be a sequel and so, in a general way, you should maintain the theme and atmosphere of the original. For anyone not familiar with *Kokotoni Wilf* here is the story so far:

"Legend has it that many hundreds of years ago somewhere in Northern Europe lived a great Magician known as Ulrich. Ulrich knew of a magic amulet, fragments of which had been scattered throughout time. Ulrich wished to wield its power, but he was too old and infirm for such an arduous adventure and so charged his protegee Kokotoni Wilf with the epic task. Ulrich sent Wilf back in time to the age of the great dinosaurs, there to begin his quest through the ages for each fragment of the Amulet. Ulrich has provided Wilf with magic wings and time gates to pass from age to age — your task is to guide Wilf in his epic quest."



TIME-ZONE 3: SCREEN 1

- A: STARTING POSITION OF KOKOTONI WILF.
- B: STARTING POSITION OF 'BOOK' SPRITE
- C: STARTING POSITION OF 'BOILING POT' SPRITE
- D: ANIMATED 'FIRE' SPRITE
- E: LOCATION OF AMULET FRAGMENT
- F, G, H, I: SKULL SHELF; POTS SHELF; OPEN RANGE; SKELETON.

BOLD ARROWS SHOW SPRITE MOVEMENT PATTERNS.
SHADED AREA SHOWS IMPENETRABLE BORDERS.

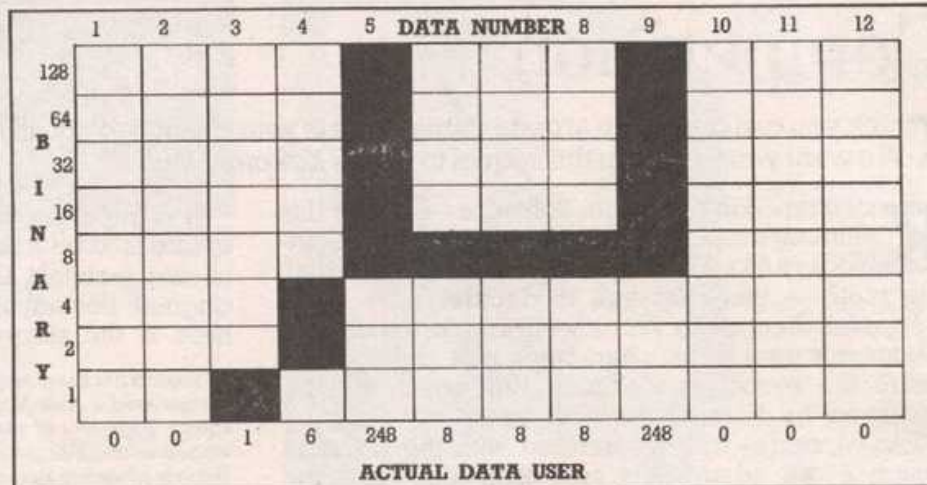
Reform your character

User-defined graphics on your Epson made easy on the BBC B by A Fennell

This program allows you to produce User Defined Graphics on the Epson FX80 printer. The character is defined on an 8 by 12 grid (see right) — as explained in the printer manual — and these values are stored in the Data statements at Lines 40 & 50.

The first numbers are the *ASCII* codes for the characters to be changed, ie [=91. Any character could be used.

As I have shown in the program, the UDG can be used with normal characters (once it has been defined) but the printer must be set back to the original character set, using *Procbacktonormal*, (see Line 120 for example). I have created a μ and a # sign as examples, but the only real limit is your own inventiveness.



```

10 REM program to produce UDG on the FX-80 printer.see page 3-38
    of manual.produces a mu sign VDU2 enables the printer
    VDU3 disables the printer VDU1 sends next character to
20 REM the printer only
30 VDU 2
40 DATA 64,0,0,1,6,248,8,8,8,248,0,0,0:REM @ => MU ON PRINTER
50 DATA 91,0,36,126,126,36,126,126,36,0,0,0,0:REM [ => £ ON PRINTER
60 PROCCREATECHARACTER
70 PROCCREATECHARACTER
80 VDU 3
90 VDU 2
100 PRINT "####[]"
110 PROCBACKTONORMAL
120 PRINT:PRINT "WE CAN ALSO USE THE CHARACTER ";:RESTORE
40:PROCCREATECHARACTER:PRINT "@"::PROCBACKTONORMAL:PRINT " IN A SENTENCE"
130 VDU 3
140 STOP
150 DEF PROCCREATECHARACTER
160 REM
170 REM PRINT CHR$(27); "&"; CHR$(0); CHR$(£); CHR$(£);
180 REM READ IN THE ASCII VALUE OF THE NEW CHARACTER
190 READ A
200 VDU 1,27:VDU 1,38:VDU 1,0:VDU 1,A:VDU 1,A
210 REM
220 REM PRINT CHR$(139);
230 VDU 1,139
240 REM
250 REM DEFINE THE 8*12 SHAPE FOR THE CHARACTER
260 FOR I=1 TO 12:READ A:VDU 1,A:NEXT
270 REM
280 REM PRINT CHR$(27); "%"; CHR$(1); CHR$(0)
290 VDU 1,27:VDU 1,37:VDU 1,1:VDU 1,0
300 ENDPROC
310 DEF PROCBACKTONORMAL
320 REM return printer characters to normal
330 VDU 1,27:VDU 1,37:VDU 1,0:VDU 1,0
340 ENDPROC
    
```




Bristles



JOYSTICK
REQUIRED

Bristles, outrageous graphics, dazzling game play, testing quick reactions, concentration, logic and strategy, it is mind (and joy-stick) boggling!! Featuring Sex-Select, you can choose either boy or girl painters.

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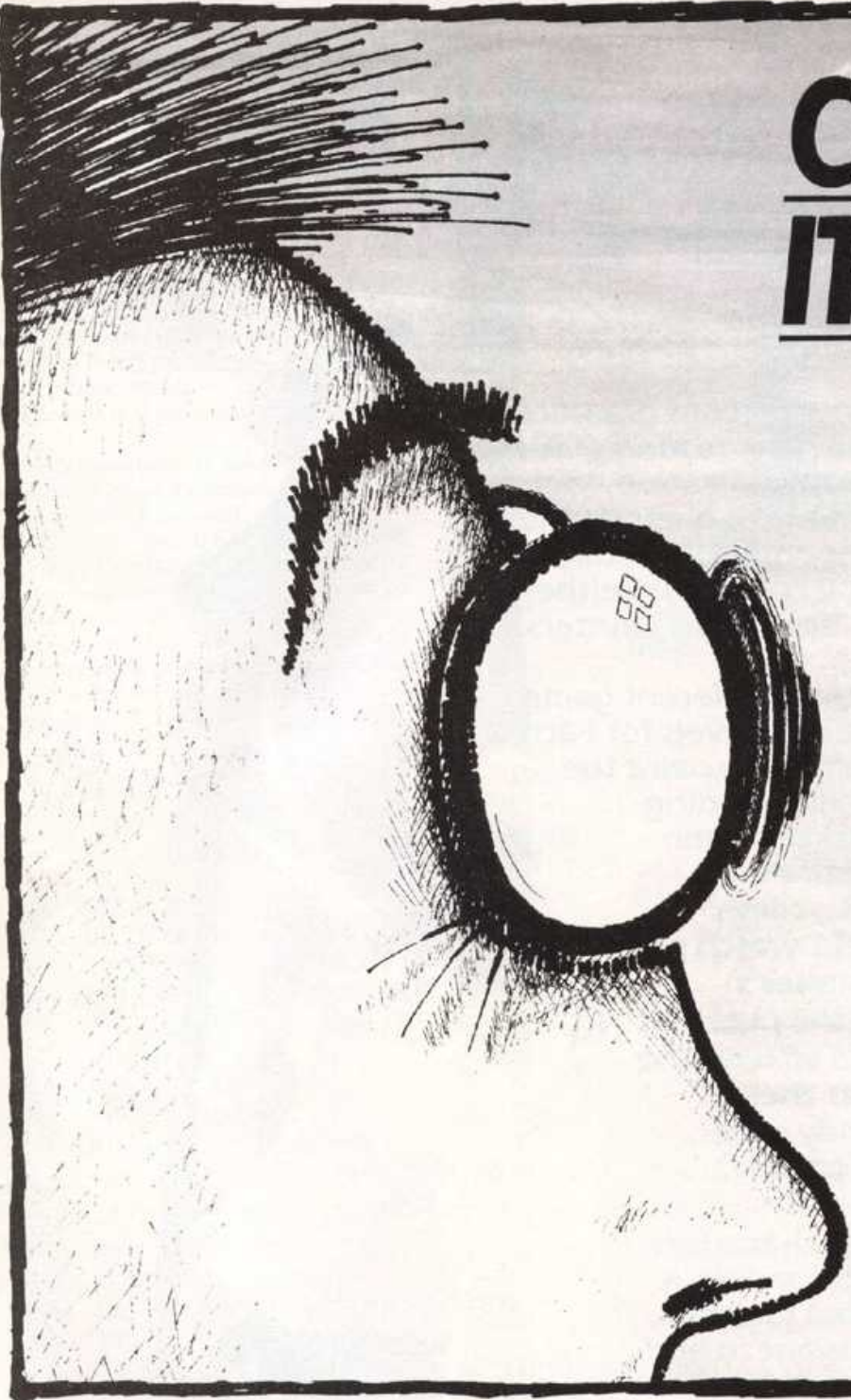
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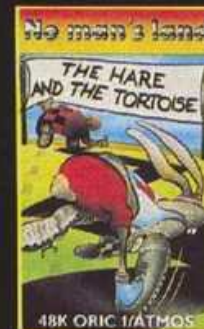
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Routine input

For easier inputting and editing of your data a program from M J Amess

This program consists of one major procedure, called *Cinput*, which provides a convenient method for accepting data from the user's terminal. It provides a number of data formats to allow almost any type of data to be entered and checked for validity.

This routine can reside at the end of your own programs and be called whenever data input is required. It is called by typing *Cinput* and is followed by a list of formal parameters, which will supply data for the procedure. To see what formal parameters are used look at Line 30020 which defines the procedure. The parameters used are, *Row*, *Col*, *Max*, *Min*, *Types*, *Old Ink*, *Old Paper*. *Row* and *Col* define the screen coordinates at which the data is to be accepted. *Max* and *Min* are used to define the maximum and minimum number of characters that are to be accepted by the procedure.

The *Cinput* procedure types periods (.) at the specified screen position to show the user the maximum number of characters allowed (taken from the value entered in the *Max* variable). In case of an error whilst

entering data, messages are displayed in Screen #0.

The most important parameter that must be entered is *Types*. This is a one or two character string defining the type of data to be entered. There are eight main types which are:

- 1) 'D' = Enter a date, in the format DDMMYY. This is edited for a valid Day and Month and redisplayed in DD/MM/YY format.
- 2) 'A' = Alphanumeric. All characters are valid.
- 3) 'In' = Enter any positive integer numeric.
- 4) 'N' = Accept any positive numeric and display it in a monetary form. The numeric is entered without a decimal point. For example, if 10021 is entered this is automatically redisplayed as 100.21.
- 5) 'NN' = Negative numeric. This is exactly the same as the 'N' type except that the numeric entered is changed to a negative. The user enters the numeric as a positive and the computer redisplayes the value as a negative.
- 6) 'Y' = Accept Yes/No or Esc. The computer will await the user to press either the 'Y', 'N'

or 'Esc' keys. Pushing the 'Enter' key will have the same effect as pushing the 'Y' key.

7) 'P' = Accepts an alphanumeric password. This type uses the *Old Ink* and *Old Paper* variables so that any typed data is not displayed in a visible form on the screen. These two variables must be set to the current *Ink* and *Paper* values that are being used.

8) 'V' = Verification — accepts only a carriage return (enter key).

All data which is entered is stored in the variable *Entry\$*, even numeric data, which can be stored later in a numeric variable.

One final facility is that instead of entering the expected data you may enter *End* (or push the Esc key in the 'Y' option). This sets a variable, *Inxctl*, to 3 which could signify that the user wishes to escape from a particular option within his/her program. During normal use *Inxctl* will be set to zero if the procedure is completed Ok. If 'Y' is pushed in the Yes/No field then *Inxctl* is set to 1, or if 'N' is pushed then *Inxctl* will equal 2.

The following is an example of the *Cinput* procedure. Type, *Cinput 10,5,20,5,'A'*.

This will accept any alphanumeric data at position 10,5 on the terminal. The maximum number of characters that will be accepted is 20 and the minimum is 5. Please note that the *Ink* and *Paper* variables need only be entered when using the password option.

```

30000 REMARK ENHANCED INPUT ROUTINE
30005 REMARK COPYRIGHT 1984 M.J.AMESS
30010 REMARK VERSION RS1.0A 19/08/84
30015 REMARK ** **
30020 DEFINE PROCEDURE CINPUT(ROW,COL,MAX,MIN,
TYPE$,OLD_INK,OLD_PAPER)
30025 INXCTL=0:CLS #0
30030 IF TYPE$="D" THEN DATE_ENTER
30035 IF TYPE$="A" THEN ALPHA
30040 IF TYPE$="N" OR TYPE$="NN" OR TYPE$="IN"
THEN NUMERIC
30045 IF TYPE$="Y" THEN YES_NO
30050 IF TYPE$="P" THEN PASSWORD
30055 IF TYPE$="V" THEN VERIFY
30060 END DEFINE CINPUT
30065 REMARK ***** ENTER DATE *****
30070 DEFINE PROCEDURE DATE_ENTER
30075 MIN=6:MAX=6
30080 REPEAT LOOP
30085 ENTER_VALUE
30090 IF INXCTL=3 THEN EXIT LOOP
30095 SET=0
30100 MAX=6:MIN=6:CHK_LENGTH:IF SET THEN GO
TO 30085
30105 MONTH$=ENTRY$(3 TO 4):YEAR$=ENTRY$(5
TO 6)
30110 DTE$=ENTRY$(1 TO 2)
30115 IF MONTH$ < 1 OR MONTH$ > 12 THEN SET=1
30120 IF DTE$ > 31 OR DTE$ < 1 THEN SET=1
30125 IF DTE$ > 29 AND MONTH$=2 THEN SET=1
30130 IF MONTH$=4 OR MONTH$=6 OR MONTH$=9 OR
MONTH$=11 THEN
30135 IF DTE$=31 THEN SET=1
30140 END IF
30145 IF NOT SET THEN EXIT LOOP
30150 END REPEAT LOOP
30155 IF INXCTL <> 3 THEN
30160 AT ROW,COL:PRINT DTE$,"/"/MONTH$,"/"/
YEAR$
30165 END IF
30170 END DEFINE DATE_ENTER
30175 REMARK ***** ENTER ANY ALPHANUMERIC
*****
30180 DEFINE PROCEDURE ALPHA
30185 REPEAT LOOP
30190 ENTER_VALUE
30195 IF INXCTL=3 THEN EXIT LOOP
30200 SET=0:CHK_LENGTH
30205 IF NOT SET THEN EXIT LOOP
30210 END REPEAT LOOP
30215 END DEFINE ALPHA
30220 REMARK ***** ENTER NUMERIC *****
30225 DEFINE PROCEDURE NUMERIC
30230 REPEAT LOOP
30235 ENTER_VALUE
30240 IF INXCTL=3 THEN EXIT LOOP
30245 SET=0:CHK_LENGTH
30250 IF SET THEN GO TO 30235
30255 SET=0
30260 FOR VALUE=1 TO LEN(ENTRY$)
30265 IF CODE(ENTRY$(VALUE)) < 48 OR CODE(ENT
RY$(VALUE)) > 57 THEN SET=1
30270 END FOR VALUE
30275 IF SET THEN GO TO 30315
30280 IF TYPE$="IN" THEN GO TO 30315
30285 IF LEN(ENTRY$)=2 THEN ENTRY$="0" &
ENTRY$:GO TO 30295
30290 IF LEN(ENTRY$)=1 THEN ENTRY$="00" &
ENTRY$
30295 LINE$=ENTRY$(1 TO ((LEN(ENTRY$))-2))
30300 LINE$=LINE$ & "." & LINE$=LINE$ & ENTRY$(
LEN(ENTRY$)-1 TO LEN(ENTRY$))
30305 ENTRY$=LINE$
30310 AT ROW,COL:CLS #1,4:PRINT ENTRY$
30315 IF NOT SET THEN EXIT LOOP

```



```

30320 END REPEAT LOOP
30325 IF TYPE$="NN" THEN
30330 ENTRY$="" & ENTRY$
30335 AT ROW,COL:CLS #1,4:PRINT ENTRY$
30340 END IF
30345 END DEFINE NUMERIC
30350 REMARK ***** SELECT "Y","N" OR ESC *****
30355 DEFINE PROCEDURE YES_NO
30360 MIN=1:MAX=1
30365 REPEAT FIND_LOOP
30370 DOT:PRINT "Y" AT ROW,COL
30375 A=CODE(INKEY$(1))
30380 IF A=78 OR A=89 OR A=27 OR A=10 THEN EXIT FIND_LOOP
30385 END REPEAT FIND_LOOP
30390 IF A=27 THEN AT ROW,COL:PRINT "ESC":
INXCTL=3
30395 IF A=78 THEN INXCTL=2:AT ROW,COL:PRINT "N":
30400 IF A=89 OR A=10 THEN INXCTL=1
30405 END DEFINE YES_NO
30410 REMARK ***** ENTER PASSWORD *****
30415 DEFINE PROCEDURE PASSWORD
30420 INK OLD_PAPER
30425 REPEAT LOOP
30430 ENTER_VALUE
30435 IF INXCTL=3 THEN EXIT LOOP
30440 SET=0:CHK_LENGTH
30445 IF NOT SET THEN EXIT LOOP
30450 END REPEAT LOOP
30455 INK OLD_LINK:PAPER 0
30460 END DEFINE PASSWORD
30465 REMARK ***** VERIFICATION *****

30470 DEFINE PROCEDURE VERIFY
30475 MAX=0:MIN=0
30480 REPEAT LOOP
30485 SET=0
30490 ENTER_VALUE
30495 CHK_LENGTH:IF NOT SET THEN EXIT LOOP
30500 END REPEAT LOOP
30505 END DEFINE VERIFY
30510 STOP
30515 DEFINE PROCEDURE DOT
30520 AT ROW,COL:CLS #1,4
30525 IF TYPE$="P" THEN INK OLD_LINK
30530 PRINT (FILL$(",",MAX))
30535 AT ROW,COL
30540 IF TYPE$="P" THEN INK OLD_PAPER
30545 END DEFINE DOT
30550 DEFINE PROCEDURE ENTER_VALUE
30555 AT ROW,COL:CLS #1,4
30560 DOT:INPUT ENTRY$
30565 IF ENTRY$="" THEN RETURN
30570 IF ENTRY$(1 TO 3)="END" AND LEN(ENTRY$)=3 THEN INXCTL=3
30575 END DEFINE ENTER
30580 DEFINE PROCEDURE CHK_LENGTH
30585 IF LEN(ENTRY$) > MAX THEN
30590 INPUT #0:"ENTRY TOO LONG - CR TO CONTINUE":A$:CLS #0:SET=1
30595 END IF
30600 IF LEN(ENTRY$) < MIN THEN
30605 INPUT #0:"ENTRY TOO SHORT - CR TO CONTINUE":A$:CLS #0:SET=1
30610 END IF
30615 END DEFINE CHK_LENGTH

```



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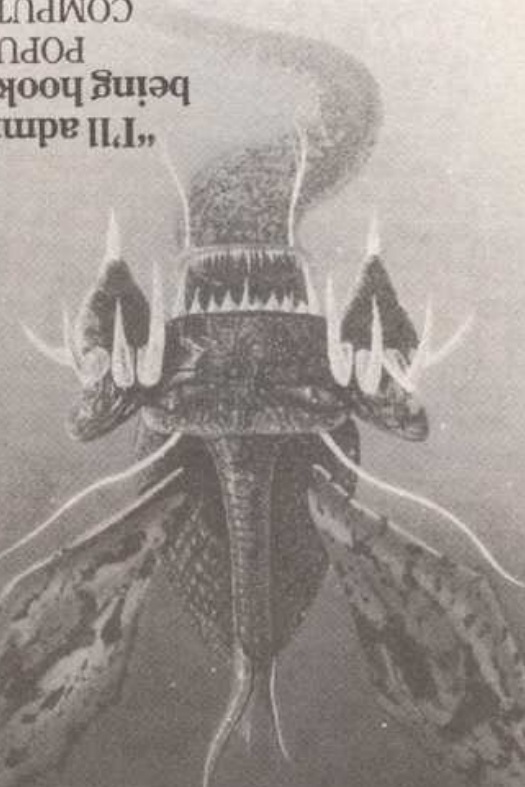
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Inside Arnold

It is interesting to note that although the CPC 464 has been readily available since July, the reports of 'bugs' have

The Rom in the CPC464 is split into two sections. One section of 16K occupies addresses 0-3FFF(HEX) — almost, anyway. The upper Rom occupies C000-FFFF(HEX), and in doing so overlays the screen Ram. The lower Rom overlays part of the user Ram. This arrangement with clever switching releases the maximum possible area to user Ram during Basic operations. It is because of this that the Rom seems to be inaccessible to the Basic user. There is a one line program for the Dragon to produce a Hex or Character Dump of the Rom. No such simple method will work with the Amstrad.

In complete contrast to other computer

Listing A — The Basic Program

Type in the basic program exactly as listed, paying special attention to the Hex num-

the basic program set
the machine-code in r

Line 20 sets Ramiop.
Line 30 defines the number of sets.
Lines 40-70 convert the data to a form that can be stored in reserved Ram. Also a check is made to ensure that the entry is offered to run. Line 100 holds the message on the screen for long enough for the Basic program to read the machine-code in.

Program Notes
Line 20 sets Rantlop.
Line 30 defines the numeric keypad dot to call the machine-code program.
Lines 40-70 convert the hex numbers read from data to a form that is poked into the reserved Ram. Also a checksum is generated to virtually ensure that only a correct entry is offered to run.
Line 100 holds the message from Line 90 on the screen for long enough to be read, then the Basic program self-destructs, leaving the machine-code in reserved memory.

the basic program self-describes, leaving the machine-code in reserved memory.

Type in the basic program exactly as listed, paying special attention to the Hex number in the basic program section, the machine-code in the

Lines 110 to 410 contain the data representing the machine code.

Listing B — the Assembler Listing

The assembly listing was not written to be a model of assembly programming, nor to be the most efficient method or even a structured method. It was written to investigate the use of Rom routines and as such it is worth examination. It undoubtedly will extend to a full blown monitor. If you attempt this you will discover that the *Concise Firmware Specification* has everything you need.

Program Notes

Lines 5-250 define the text for a simple menu and label some Rom routines for the program proper. Lines 260-880 place menu to screen using colours and pass to Line 1680 (Holdup).

Holdup awaits input and then passes control to the appropriate routine. You should be able to follow from there the routines for outputting the hex-dump and character dump. Note the highlighting of Ascii-characters in the dump, by use of colour changes. The Rom routines used (with their official names) are:

- #BB8A Txt Output — Outputs a character or control code to the text VDU.
- #BB18 Km Wait Key — Waits for next key from the keyboard.
- #BB1B Km Read Key — As #BB18 but doesn't wait.
- #BB90 Txt Set Pen — Set ink for writing colours.

- #B900 KI U Rom Enable — Turn on the Upper Rom.
- #B903 KI U Rom Disable — Turn off the Upper Rom.
- #B906 KI L Rom Enable — Turn on the Lower Rom.
- #B909 KI L Rom Disable — Turn off the Lower Rom.
- #BB75 Txt Set Cursor — Set cursor position.
- #BB7E Txt Cur Disable — Disallow cursor display.
- #BB8D Txt Wr Char — Write a character to the screen — control codes are printed and not obeyed.
- #BB03 Km Reset — Reset key manage, clear all buffers, restore standard key expansions and indirections.

Using the Program

When initiated the program offers a Menu. First press *Caps Lock* and then press the letter corresponding to the memory you wish to examine.

L will bein the hex and character dump of *Low Rom* from address 0 (it actually starts somewhat later) to #3FFF. It will stop at the end and return to Menu. *H* will similarly deal with the *High Rom* ending at #FFFF. *R* deals with all *Ram* up to #BFFF (the memory that follows is the default screen memory).

Enter will stop the display to allow closer inspection. Also whilst 'stopped' you have the option to rapidly advance the memory display in increments of 256-bytes by pressing *I*. When the indicator reaches the desired address press *C* to continue. Alternately *E* will return to Basic or *Q* will return

Menu. *Enter* will resume display and scroll.

Screen Display

From left to right the screen display consists of: Hex Address; eight hex values (the first corresponds to the Hex Addr. The remainder correspond to the previous address plus 1).

These are then followed by the character representation of the hex values. The next line increments the address by 8 and so on.

The hex dump is interesting, as it displays text embedded in the operating system. In Low Rom you will discover after the titles some strange names — Schneider for example. Even Arnold, the pet name for the machine, is mentioned. High Rom lists all the error codes. Well, have a look and see!

Potentially the Hex-dump can be very useful. Look for C9 (this is a return instruction) — the codes following this may well be the start of a useful sub-routine.

Within the bounds of a small article and one simple program, many points will go unmentioned — much will be oversimplified.

I hope to have given you a new slant to your machine without incurring too many 'tuts tuts' from those that know more, and those that know better!

```
e, 54, 49, 4e, 55, 45, 0, f5, c5, d5, e5, cd, 7e, bb
220 DATA 3e, c, cd, 5a, bb, 18, 1e, 5, 14, 7e, cd, 5a, bb, 23, 10, f9, 78, fe, 28,
28, f, 3e, d, cd, 5a, bb, 3e, a, cd, 5a, bb, 3e
230 DATA a, cd, 5a, bb, c9, 15, 2, cd, 7a, a6, 21, ba, a2, 6, 25, cd, 21, a4, 15, 2
, cd, 7a, a6, 21, de, a2, 6, 19, cd, 21, a4, 21
240 DATA b, a3, cd, 1f, a4, 16, 1, cd, 7a, a6, 21, f7, a2, cd, 1f, a4, 21, 1f, a3,
cd, 1f, a4, 21, 33, a3, cd, 1f, a4, 21, 47, a3, cd
250 DATA 1f, a4, 21, 81, a3, 6, 1e, cd, 21, a4, 21, 5b, a3, 6, 26, cd, 21, a4, 16,
2, cd, 7a, a6, 21, 9f, a3, 6, 28, cd, 21, a4, 16
260 DATA 1, cd, 7a, a6, e1, d1, c1, f1, c2, 3d, e5, cd, 0, b9, e, 0, 1e, 5, 21, 0, c
0, 3e, c, cd, 5a, bb, 79, fe, 0, 20, 17, 3e
270 DATA d, cd, 5a, bb, 3e, a, cd, 5a, bb, 16, 2, cd, 7a, a6, 3e, d, cd, 5a, bb, cd
, 17, a5, 3e, 20, cd, 5a, bb, cd, 1b, bb, fe, d
280 DATA 28, 63, 16, 2, cd, 7a, a6, 7e, cd, 20, a5, 16, 2, cd, 7a, a6, c, 23, 7b, f
e, 9, 28, 14, 7d, fe, ff, 20, 19, 7c, fe, ff, 20
290 DATA 3c, 7d, fe, ff, 20, f, 7c, fe, 3f, 28, 37, 7d, fe, ff, 20, 5, 7c, fe, bf,
28, 2d, 79, fe, 8, c2, b2, a4, e, 0, 18, 67, 7c
300 DATA cd, 20, a5, 7d, cd, 20, a5, c9, f5, f, f, f, f, cd, 29, a5, f1, e6, f, c6,
90, 27, ce, 40, 27, cd, 5a, bb, c9, 21, 0, c0
310 DATA 18, 2, 21, 0, 0, 3e, 7, cd, 5a, bb, cd, 18, bb, fe, 48, ca, a3, a4, fe, 45
, 28, 17, fe, d, 28, 89, fe, 4c, 28, 15, fe, 51
320 DATA ca, 11, a4, fe, 52, 28, 64, fe, 49, 28, 75, 18, d8, 16, 1, cd, 7a, a6, c9
, e, 0, 1e, 3, 21, 0, 0, cd, 5, b9, 3e, c, cd
330 DATA 5a, bb, c9, b2, a4, c9, 3e, 20, cd, 5a, bb, 3e, 20, cd, 5a, bb, 16, 1, cd
, 7a, a6, d5, 11, 8, 0, ed, 52, d1, e5, d5, c5, f5
340 DATA 7e, fe, 20, fa, a3, a5, fe, 7e, fa, a8, a5, 16, 3, cd, 7a, a6, cd, 5d, bb
, 16, 1, cd, 7a, a6, f1, c1, d1, e1, 23, c, 79, fe
350 DATA 8, 20, d9, e, 0, c3, b2, a4, c3, 11, a4, cd, 9, b9, cd, 0, b9, 3e, c, cd, 5
a, bb, 21, 0, 0, e, 0, 1e, 9, c3, b2, a4
360 DATA 3e, c, cd, 5a, bb, d5, c5, f5, e5, 3e, 2, cd, 90, bb, 21, c6, a3, 6, 16, c
d, 21, a4, 3e, d, cd, 5a, bb, 3e, a, cd, 5a, bb
370 DATA 21, db, a3, 6, 1e, cd, 21, a4, 3e, d, cd, 5a, bb, 3e, a, cd, 5a, bb, 21, f
9, a3, 6, 17, cd, 21, a4, e1, f1, c1, d1, 2e, 0
380 DATA 24, cd, 62, a6, 7c, ba, 20, 3, 61, e, 0, f5, e5, 21, 1, 16, cd, 75, bb, 3e
, 1, cd, 90, bb, 3e, 26, cd, 5a, bb, 21, 1, 17
390 DATA cd, 75, bb, e1, f1, cd, 17, a5, cd, 18, bb, fe, 43, 28, 6, fe, 49, 28, cd
, 18, f3, e, 0, f5, e5, d5, c5, cd, 3, bb, c1, d1
400 DATA e1, f1, 3e, c, cd, 5a, bb, c3, b2, a4, 7b, fe, 3, 20, 5, 16, 3f, e, 0, c9,
fe, 6, 20, 5, 16, ff, e, c0, c9, 16, bf, e
410 DATA 0, c9, f5, e5, 7a, cd, 90, bb, e1, f1, c9
```


[illegible]



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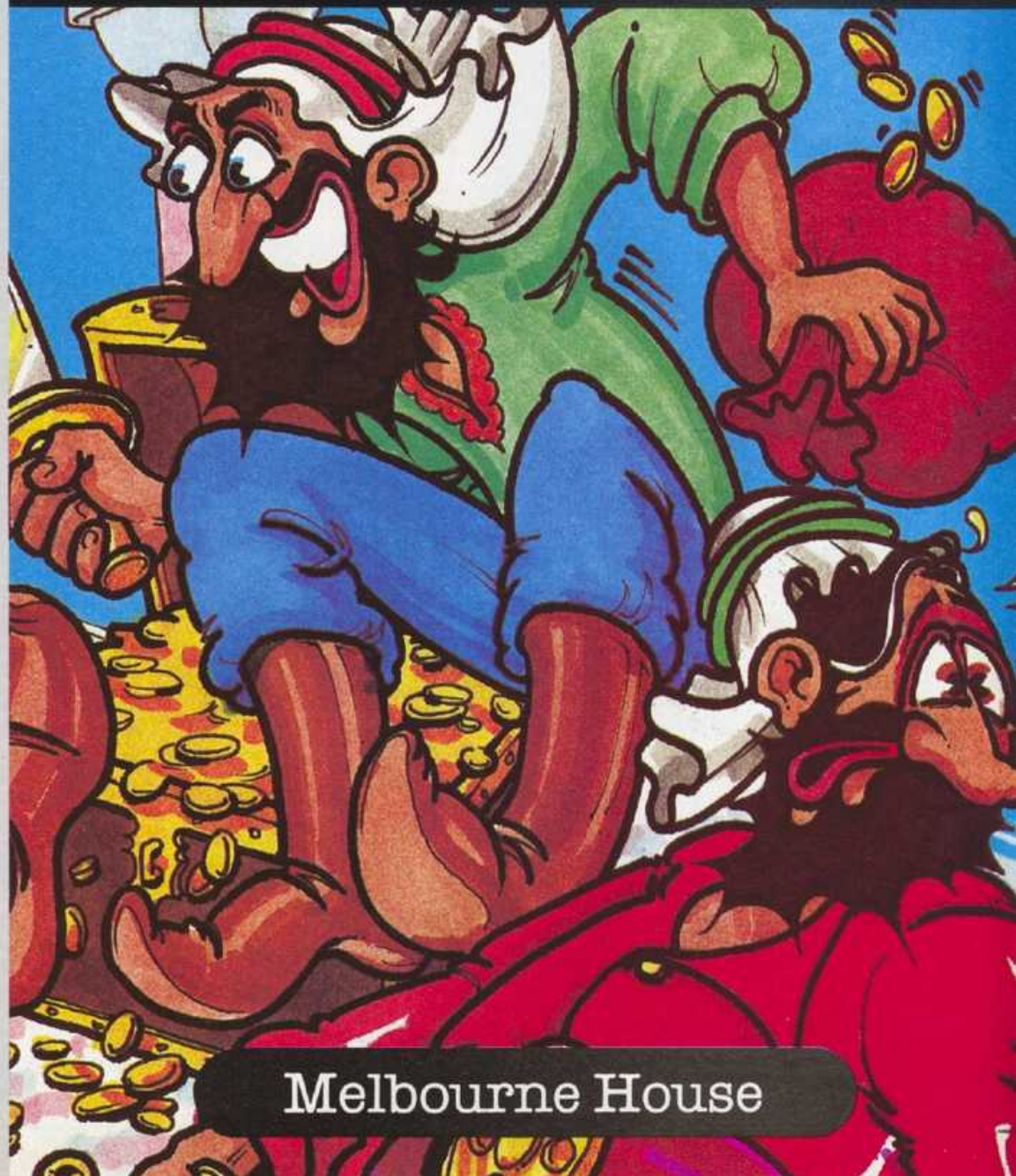
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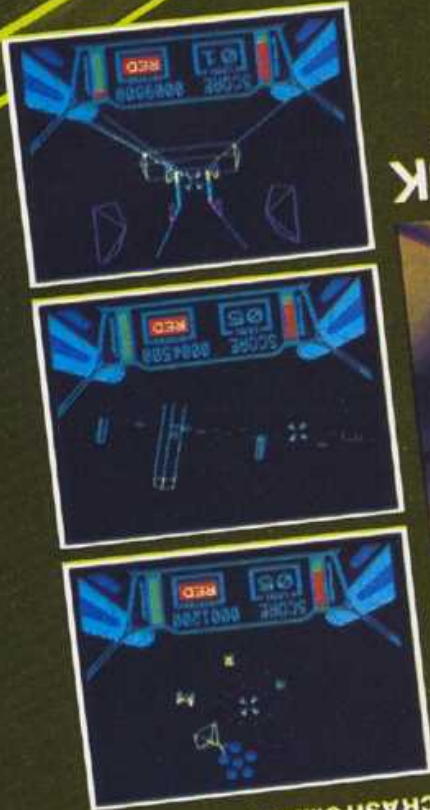
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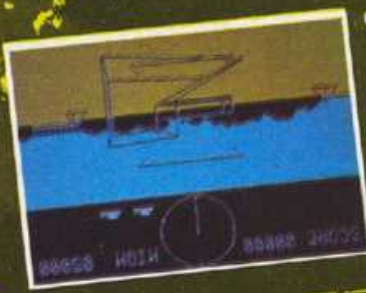
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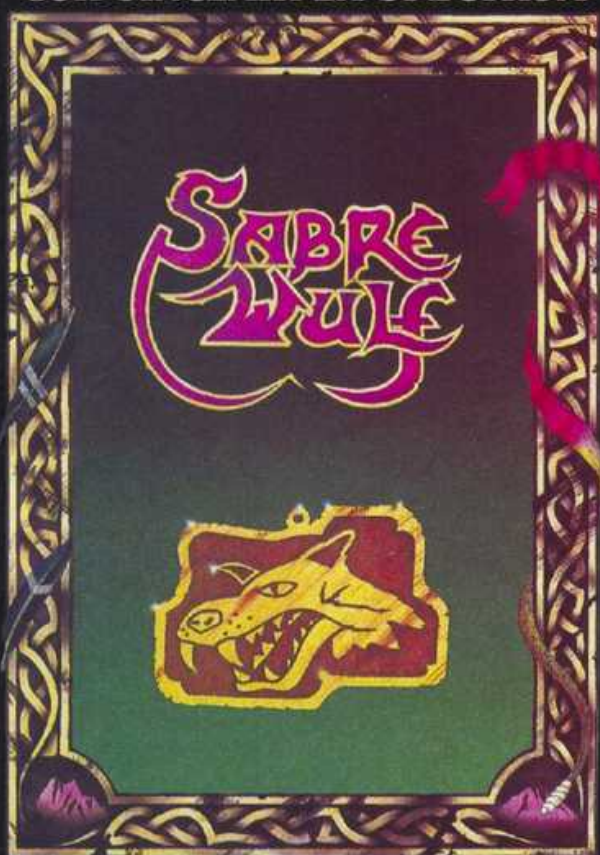
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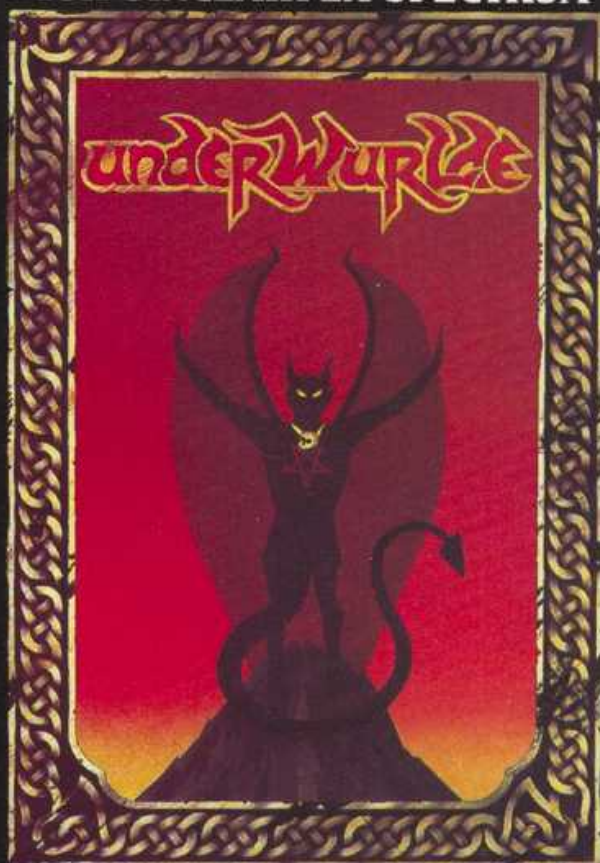


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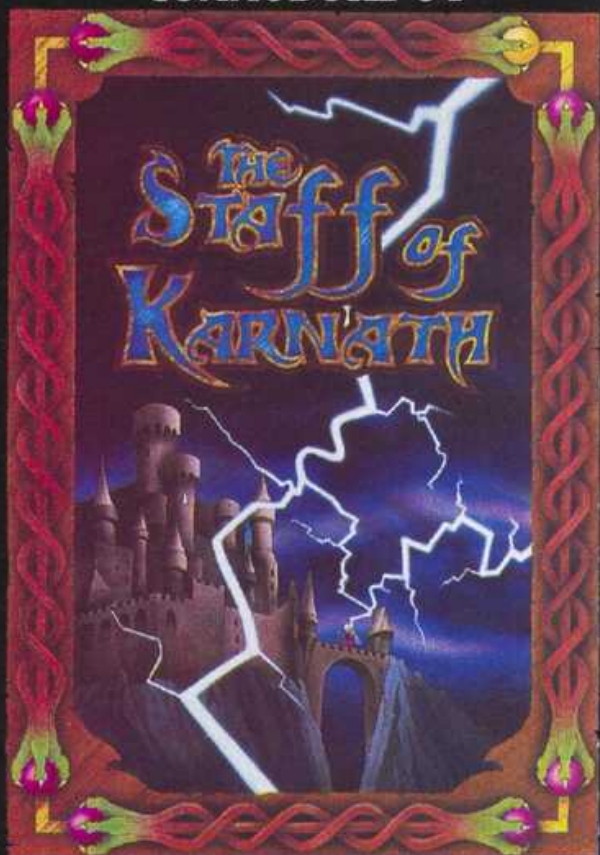
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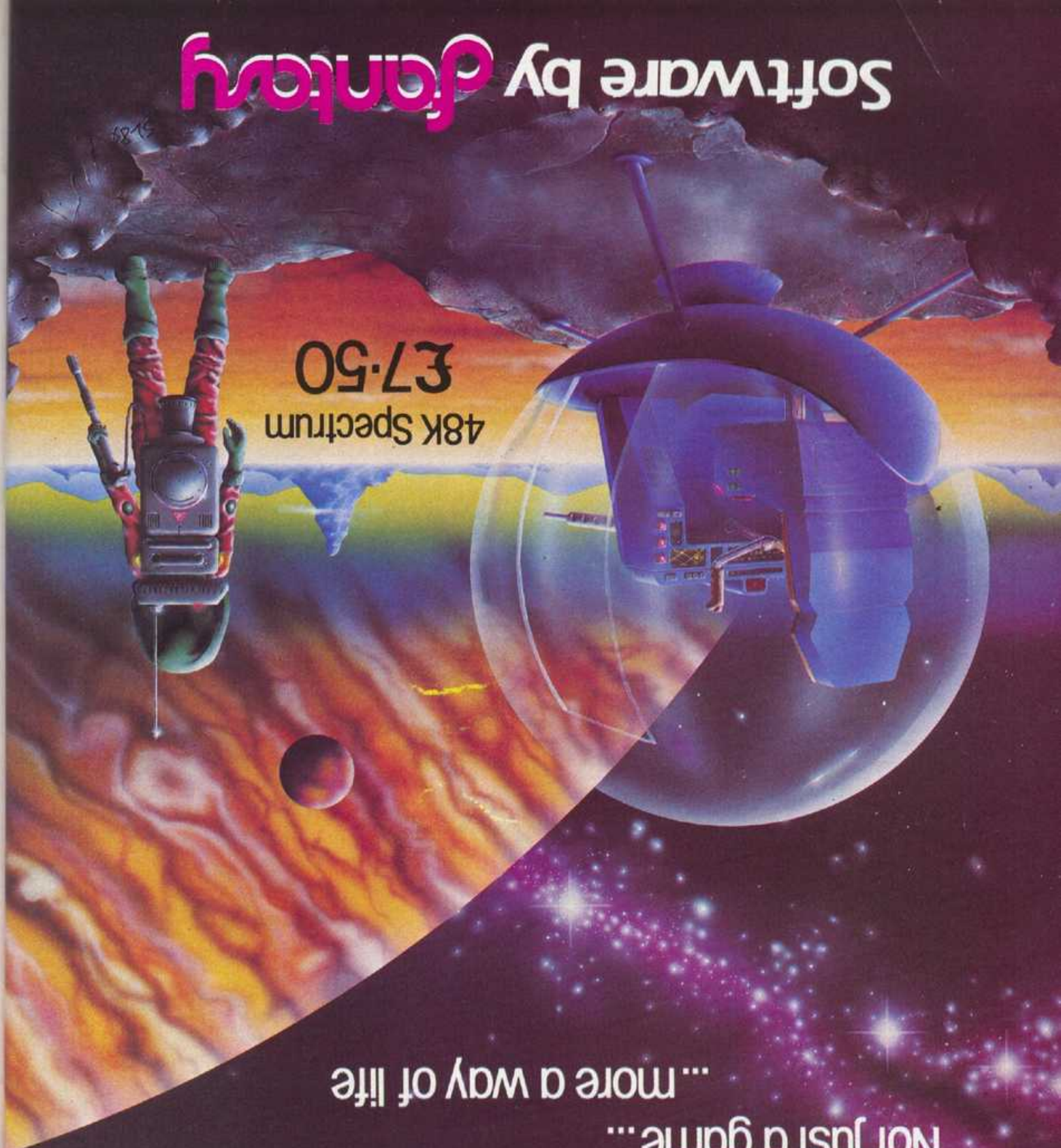
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A542	CD10BB	1700	CALL	KYWAIT		A500	3E0D	2590	LD	A, #0D
A545	FE4B	1710	CP	#4B		A502	CD5AB8	2600	CALL	OPUT
A547	CAA3A4	1720	JP	Z, BEGIN		A505	3E0A	2610	LD	A, #0A
A54A	FE45	1730	CP	#45		A507	CD5AB8	2620	CALL	OPUT
A54C	2B17	1740	JR	Z, NOMORE		A50A	21F9A3	2630	LD	HL, TEXT15
A54E	FE0D	1750	CP	#0D		A50D	0617	2640	LD	B, 22
A550	2B8B	1760	JR	Z, CONT		A50F	CD21A4	2650	CALL	HEXCH
A552	FE4C	1770	CP	#4C		A512	E1	2660	POP	HL
A554	2B15	1780	JR	Z, LOROM		A513	F1	2670	POP	AF
A556	FE51	1790	CP	#51		A514	C1	2680	POP	BC
A558	CA11A4	1800	JP	Z, TOPS		A515	D1	2690	POP	DE
A55B	FE52	1810	CP	#52		A516	3E00	2700	LD	L, 0
A55D	2B64	1820	JR	Z, ALLRAM		A518	2A	2710	ANDT	INC H
A55F	FE49	1830	CP	*1*		A519	CD62A6	2720	CALL	ENSTOP
A561	2B75	1840	JR	Z, UPABIT		A51C	7C	2730	LD	A, H
A563	18DB	1850	JR	HOLDUP		A51D	8A	2740	CP	D
A565	1601	1860	NOMORE	LD	D, #01	A51E	2003	2750	JR	NZ, OKAY
A567	CD7AA6	1870	CALL	COLOUR		A520	61	2760	LD	H, C
A56A	C9	1880	RET			A521	0E00	2770	LD	C, #00
A56B	0E00	1890	LOROM	LD	C, #00	A523	F5	2780	OKAY	PUSH AF
A56D	1E03	1900		LD	E, #03	A524	E5	2790	PUSH	HL
A56F	210000	1910		LD	HL, #0000	A525	210116	2800	LD	HL, #1601
A572	CD06B9	1920	CALL	ONLORO		A528	CD75BB	2810	CALL	SETCUR
A575	3E0C	1930	LD	A, #0C		A52B	3E01	2820	LD	A, #01
A577	CD5AB8	1940	CALL	OPUT		A52D	CD90BB	2830	CALL	SETPEN
A57A	C3B2A4	1950	JP	ISIT		A530	3E26	2840	LD	A, *3*
A57D	C9	1960	RET			A532	CD5AB8	2850	CALL	OPUT
A57E	3E20	1970	CHARS	LD	A, #20	A535	210117	2860	LD	HL, #1701
A580	CD5AB8	1980	CALL	OPUT		A538	CD75BB	2870	CALL	SETCUR
A583	3E20	1990	LD	A, #20		A53B	E1	2880	POP	HL
A585	CD5AB8	2000	CALL	OPUT		A53C	F1	2890	POP	AF
A588	1601	2010	LD	D, #01		A53D	CD17A5	2900	CALL	FOURB
A58A	CD7AA6	2020	CALL	COLOUR		A540	CD10BB	2910	CALL	KYWAIT
A58D	D5	2030	PUSH	DE		A543	FE43	2920	CP	*C*
A58E	110000	2040	LD	DE, #0000		A545	2B06	2930	JR	Z, SOFTY
A591	ED52	2050	SBC	HL, DE		A547	FE49	2940	CP	*1*
A593	D1	2060	POP	DE		A549	2B0D	2950	JR	Z, ANDT
A594	E5	2070	INCH	PUSH	HL	A54B	1BF3	2960	JR	TESTIT
A595	D5	2080		PUSH	DE	A54D	0E00	2970	SOFTY	LD C, #00
A596	C5	2090		PUSH	BC	A54F	F5	2980	START	PUSH AF
A597	F5	2100		PUSH	AF	A550	E5	2990		PUSH HL
A598	7E	2110		LD	A, (HL)	A551	D5	3000		PUSH DE
A599	FE20	2120		CP	#20	A552	C5	3010		PUSH BC
A59B	FAA3A5	2130		JP	M, COLCH	A553	CD03BB	3020		CALL #BB03
A59E	FE7E	2140		CP	#7E	A556	C1	3030		POP BC
A5A0	FAA8A5	2150		JP	M, TEXCH	A557	D1	3040		POP DE
A5A3	1603	2160	COLCH	LD	D, #03	A558	E1	3050		POP HL
A5A5	CD7AA6	2170		CALL	COLOUR	A559	F1	3060		POP AF
A5A8	CD5DBB	2180	TEXCH	CALL	#BB5D	A55A	3E0C	3070		LD A, #0C
A5AB	1601	2190		LD	D, #01	A55C	CD5AB8	3080		CALL OPUT
A5AD	CD7AA6	2200		CALL	COLOUR	A55F	C3B2A4	3090		JP ISIT
A5B0	F1	2210		POP	AF	A562	7B	3100	ENSTOP	LD A, E
A5B1	C1	2220		POP	BC	A563	FE03	3110		CP #03
A5B2	D1	2230		POP	DE	A565	2005	3120		JR NZ, ENS6
A5B3	E1	2240		POP	HL	A567	163F	3130		LD D, #3F
A5B4	23	2250		INC	HL	A569	0E00	3140		LD C, #00
A5B5	0C	2260		INC	C	A56B	C9	3150		RET
A5B6	79	2270		LD	A, C	A56C	FE06	3160	ENS6	CP #06
A5B7	FE0B	2280		CP	#B	A56E	2005	3170		JR NZ, ENS9
A5B9	2009	2290		JR	NZ, INCH	A570	16FF	3180		LD D, #FF
A5BB	0E00	2300		LD	C, #00	A572	0E00	3190		LD C, #00
A5BD	C3B2A4	2310		JP	ISIT	A574	C9	3200		RET
A5C0	C311A4	2320	FINIT	JP	TOPS	A575	16FF	3210	ENS9	LD D, #DF
A5C3	CD09B9	2330	ALLRAM	CALL	OFLORO	A577	0E00	3220		LD C, #00
A5C6	CD09B9	2340		CALL	ONUPRO	A579	C9	3230		RET
A5C9	3E0C	2350		LD	A, #0C	A57A	F5	3240	COLOUR	PUSH AF
A5CB	CD5AB8	2360		CALL	OPUT	A57B	F5	3250		PUSH HL
A5CE	210000	2370		LD	HL, #0000	A57C	7A	3260		LD A, D
A5D1	0E00	2380		LD	C, #00	A57D	CD90BB	3270		CALL SETPEN
A5D3	1E09	2390		LD	E, 9	A580	E1	3280		POP HL
A5D5	C3B2A4	2400		JP	ISIT	A581	F1	3290		POP AF
A5D8	3E0C	2410	UPABIT	LD	A, #0C	A582	C9	3300		RET
A5DA	CD5AB8	2420		CALL	OPUT	ALLRAM	A5C3	ANDT	A618	ADUT
A5DD	D5	2430		PUSH	DE	BEGIN	A1A3	DITS	A529	CHARS
A5DE	C5	2440		PUSH	BC	COLOUR	A67A	CONT	A1DA	ENS6
A5DF	F5	2450		PUSH	AF	ENSTOP	A662	FINIT	A5C9	FOURB
A5E0	E5	2460		PUSH	HL	HERE	A497	HOLDHI	A535	HOLDLO
A5E1	3E03	2470		LD	A, #03	INCH	A594	ISIT	A4B2	ISRAM
A5E3	CD90BB	2480		CALL	SETPEN	KYWAIT	BB10	LOROM	A56B	MISS
A5E6	2105A3	2490		LD	HL, TEXT13	NOMORE	A555	NOW	A43D	OFLORO
A5E9	0615	2500		LD	B, 22	OKAY	A623	ONLORO	B906	ONUPRO
A5EB	CD21A4	2510		CALL	HEXCH	SETCUR	BB75	SETPEN	BB90	SKIP
A5EE	3E0C	2520		LD	A, #0C	START	A64F	TEST11	A540	TEYCH
A5F0	CD5AB8	2530		CALL	OPUT	TEXT11	A39F	TEXT12	A3B1	TEXT13
A5F3	3E0A	2540		LD	A, #0A	TEXT15	A3F9	TEXT3	A2DE	TEXT4
A5F5	CD5AB8	2550		CALL	OPUT	TEXT16	A31F	TEXT7	A333	TEXT8
A5F8	21DBA3	2560		LD	HL, TEXT14	TOPS	A411	UPABIT	A5D8	

The Arcade Corner is a new section for anyone who enjoys playing arcade games. If you have any comments, from playing tips on difficult games or programs you'd like to see, please write to: Tony Kendle, Arcade Avenue, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

Tony Kendle

of in future Avenues, Paul we will be hearing a lot more level. I'm sure that it is a game nish it even at the very easiest movement and have yet to find still astounded at the speed of turn. After weeks of play I am best of its kind for the Spec-Design-Design. "It is surely the plug for Dark Star from Paul also wants to put in a address).

Paul Rhodes of Luton has written to tell me that the price of his Jet-Set Editor I mentioned some weeks ago is in fact £4 (see PCW 27th Sept for the

her? Software's new program Back completed test 5 of Incentive 25th October I successfully

Ford. "At 3am on Thursday from Guy Hedley of Chandlers completely unfamiliar with about a game that I am Now then, here's a letter me it still won't be easy.

Many, many thanks for that the moon and bring it back... must be on). Then get the magnet to get the alarm key on get the key (the HELP feature and the book you can get the get the book. With the ticket Then get the library ticket to banister to get the helmet. ignition keys to slide down the the driving licence to get the the next paragraph NOW! "Get want to know how to do it go to — so those of you who don't give some tips for Pyramagames Andrew then goes on to Melbourne House."

and Terror Daktil 4D from gate, Centipede by C-Tech from are Quicksilver's Time-favourite Spectrum game of all time. Games to keep away Wally. I think this must be my work. Now look out for Life of life Wally will be early for

ken up. For the first time in his "Congratulations. Wally's wo- display and then the message while, there is a short firework alarm key the clock rings for a rama. When you insert the gent's fantastic game Pyrama- writes: "I have finished Mikro- Andrew Dudman of Clossop fall to its death."

the end and the zombie will Bottles. You can then walk off follow you along to the musical on foot to your wall and he will him. You then lead the zombie magenta and you can control him on the back so he turns directly behind him and touch are in the copier you can land close to the others. Then if you pick one out that is not too Then find the zombies and steps at one end to climb up, more points. Don't forget to put possibly can as this gives you blocks high and as long as you of the walls. Make the wall 3 your helicopter to build up one zombies you must first use these tips. "In order to kill the a date. He/she also sends 1233 points, but does not give

who has also finished, with from W E Cowling of Rednith same postbag arrived a letter actually the first because in the sound." It's difficult to say who was what sounds like two channel March of the Forebears in accompanied by a burst of we'll get you...next time' ac- ten us this time human. But message appears "You've been after killing 14 zombies. The pm on Saturday 6th October Ant Attack. "I finished at 1.45 the first to finish Zombie Zom- Hayes comes the claim to be 'first'. From S Ryatt of this week to a couple of congratulations go out

Pyramagames



Arcade Avenue

Screen Fill

by M Poole

```
1 REM **SCREEN FILL**
5 POKES6,28:CLR
20 FORS=7168TO7241:READN:POKES,N:NEXT S
100 DATA169,0,133,87,169,30,133,88,165,87,133,89,165,88,105,120,133,90,169,0,133
110 DATA91,169,0,133,92,162,23,160,22,136,165,91,145,87,165,92,145,89,136
120 DATA208,245,145,89,165,91,145,87,24,165,87,105,22,133,87,144,2,230,88
130 DATA24,165,89,105,22,133,89,144,2,230,90,202,208,211,96
1000 REM 7169&7173 - TWO BYTE LOCATION OF TOP LEFT CORNER OF SCREEN TO FILL
1010 REM 7187 - CHARACTER 7191 - COLOUR 7195 - NO.ROWS 7197 - NO.COLUMNS
```

Screen Fill

on Vic 20

This short machine code routine will work

on the unexpanded Vic 20. It allows the user to fill in any window on the screen in any character and in any colour. The locations which hold the values of the window, character and colour are shown in routine is called by Sys 7168.

The routine can also be used as a partial the whole screen with character φ in black. screen clear by using Character 32. The

We are always actively seeking programs for publication — either for Open Forum, the machine pages or Star Game. When sending in a program for consideration, a clear program listing should be sent, together with, wherever possible, a saved copy on cassette. Documentation — usually not more than 1000 words — should start with a general description of the program, what it does, and then some detail of how the program itself is constructed. We pay very competitive rates, according to the length and nature of the program and the quality of the accompanying documentation.

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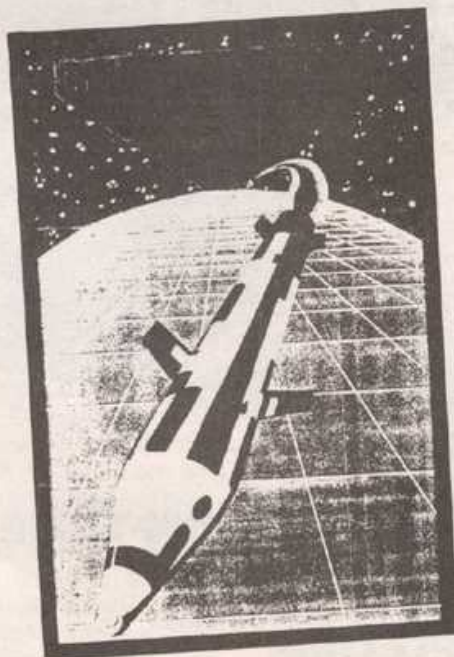
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Row of Four

on Commodore 64

This is a two-player game for the CBM 64, which is quite good fun to play. The listing

```

5 REM *****
6 REM * FOUR-IN-A-ROW *
7 REM * BY *
8 REM * *
9 REM * *
10 REM* NEIL GREENWOOD*
11 REM*****
12 REM* 1984 *
13 REM*****
14 PRINT "RE: REM CLR
15 FOR I=1 TO 15
20 I=INT(RND(1)*15)+1
22 FOR A=1 TO 10
25 POKE53280,I:POKE53281,I
30 NEXT A,I
35 POKE53281,4:POKE53280,9
40 FOR Q=1024 TO 2023: T=INT(RND(1)*126)+1:P
OKEQ,T:NEXT
45 FOR Y=55296 TO 56295: O=INT(RND(1)*14)+1:
POKEY,O:NEXT
46 PRINT "*****FOUR IN
A ROW": REM BLACK
47 PRINT "*****QB BY NEIL L. GREENWOOD
50 PRINT "*****HIT A KEY!": RE
M BLACK
60 GET A$: IF A$="" THEN GOTO
90 LET S=0
95 LET C=0
100 PRINT "*****FOUR-IN-A-ROW": R
EM GREEN & HOME
200 PRINT "*****": RE
M ORANGE
250 PRINT "EQ THE OBJECT OF THIS GAME IS
TO GET FOUR": REM WHITE

```

was done on a Commodore 1520 Printer-Plotter which does not print Graphics characters, so when typing in, you should pay attention to the Rem statements.

Program notes

14-60 Random Display

100-550 Title page
600-1130 Input names of players
1200-1340 Game Screen
1350-2000 Checks key pressed
2100-2840 Prints a score table
2900-2840 Another game
2900-3000 routine

```

300 PRINT "OF YOUR COUNTERS IN A ROW."
310 PRINT "TYPE IN YOUR NAME( NO LONGER TH
AN 19 LETTERS)"
350 PRINT "FIRSTLY YOU TYPE IN YOUR PLA
YER NUMBER:"
400 PRINT "AND THEN THE POSITION YOU WANT
YOUR"
450 PRINT "COUNTER."
455 PRINT "PRESS SPACE WHEN THE GAME IS
OVER"
460 PRINT "YOU WILL THEN BE ASKED WHO WON
,TYPE"
465 PRINT "IN THE WINNERS NAME, IF THE GAM
E WAS "
470 PRINT "DRAWN TYPE IN ERDRAWL": REM WH
ITE, RUS ON & OFF
475 PRINT "Q 10 POINT'S FOR A WIN."
480 PRINT "Q 5 POINT'S FOR A DRAWN GAME
"
485 FOR I=1065 TO 1902: POKE I, 86: FOR Z=1 TO 10:
NEXT Z, I
490 FOR P=56137 TO 56175: X=INT(RND(1)*14)+1
: POKE P, X: NEXT
500 PRINT "*****HIT A KEY.": R
EM YELLOW
550 GET B$: IF B$="" THEN GOTO
600 PRINT "*****POKE53281,7:POKE53280,6: PRI
NT "
650 PRINT "*****FOUR-IN-A-ROW"
660 PRINT "*****"
670 PRINT "Q INPUT PLAYER ONE'S NAME.":
REM ORANGE
680 INPUT "Q": P0$
685 IF LEN(P0$)>19 THEN GOTO
690 PRINT "Q INPUT PLAYER TWO'S NAME.":
REM BROWN

```

```

700 INPUT "Q": PT$
710 IF LEN(PT$)>19 THEN GOTO
750 FOR I=1 TO 1000: NEXT I
800 PRINT "*****POKE53281,6:POKE53280,5: PRI
NT "
850 PRINT "*****FOUR-IN-A-ROW"
900 PRINT "*****"
950 PRINT "*****P0$
1000 PRINT "*****R
R
1010 PRINT "*****R
R
1020 PRINT "*****R
R
1030 PRINT "*****R
R
1040 PRINT "*****R
R
1050 PRINT "*****R
R
1060 PRINT "*****R
R
1070 PRINT "*****R
R
1080 PRINT "*****R
R
1090 PRINT "*****R
R
1100 PRINT "*****R
R
1110 PRINT "*****R
R
1120 PRINT "*****PT4: REM MED
GREY
1130 FOR I=1 TO 2000: NEXT I
1200 PRINT "*****POKE53288,5:POKE53281,5: PRI
NT "
1220 PRINT "*****FOUR-IN-A-ROW"
1230 PRINT "*****"
1233 PRINT "Q"
1235 FOR I=1 TO 5
1237 REM (SHIFT+O, CBM KEY+T, SHIFT+P) NIN

```

Microradio

GW6JJN



Autostart

This weeks mailbag includes a bumper bundle from Michael Farrington of 3 Julia Crescent, Stonebroom, Derbyshire; bringing very good news indeed for readers with the Sharp MZ700 micro. I am often asked about radio software for this machine and so far, there has been very little. Now that situation has changed. Mr Farrington has put together a suite of programs including an interface for radio comms on the Sharp MZ700. It includes RTTY and the driving software for a 300 baud modem.

Firstly, the RTTY program. It is written entirely in machine

code and offers the following features. It can operate at 45.5, 50, 75 and 110 baud which covers most amateur and commercial applications. Split screen mode operates with seven memories, each with one thousand characters making it simple to prepare messages saving air time for slower typists.

As is the norm nowadays with such software, a real time clock is available on screen and for transmission of the time of message. The author points out that only a fairly simple terminal unit is required on the Sharp and this can be home-made or provided with the program. The tone frequencies are extremely accurate and the facility to store call, signs, etc to be sent automatically is present within the software.

Any page that appears on screen, messages, the instructions, menus, memories etc can be dumped to the printer for a permanent record. One aspect of this program that ap-

pealed to me was the Clock function which can be called, when the micro is not actually being used as a terminal to send or receive RTTY, in order to use the screen to display the time as a general purpose digital clock. This function will display the time in 24 hour format in two inch high, seven segment figures.

The nicest touch of all, in my opinion, and something that I've not seen before in such a program is the autostart feature. This is just what is needed for the amateur and it works like this. Once shift/A is pressed, the micro can be left to listen or monitor a particular frequency. On the Amateur bands as well as others, there may be noise, speech or whatever between messages. Most programs interpret this as jumbled characters on the screen. Not so this program. On Autostart, the software listens and can detect only valid RTTY signals and will decode them. All noise, speech, etc is ignored.

Also from Mr Farrington is a terminal emulation program for the Sharp MZ700. The same terminal interface is used as for the RTTY. The terminal program allows for 300 baud semi-duplex and can call, answer or self test the terminal unit. Details of a home constructed acoustic coupler can be had along with the unit.

Michael Farrington's programs at £10 for the RTTY and £8 for the terminal emulation will provide a splendid opportunity for Sharp owners to get on the air. As it is among the best software of its kind that I have seen, all credit must go to Michael and we look forward to the AMTOR programs he promises for the future.

Ray Berry

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.

doing it. get but for the challenge of not for the information they can enjoy breaking into a system — the people who hackers — the people who bad news by most 'traditional' It's probably also seen as various database operators.

along the corridors of BT and cries of outrage ring out hddes once again and hacking has hit the hea-

Breaking in



I don't wish to condone hacking but there is a difference between the new teeny-hackers who got into Prestel and the old style traditionalists. The former are likely to sub-

stantly reduce the facilities available on databases as operators, shocked by the damage done, tighten up.

There was nothing particularly clever about this latest hacking of Prestel. As I understand it, it was more to do with the system management than cracking a mysterious code. Similarly the episode when Telecom Gold was hacked on a live TV show probably had more to do with users not guarding their account num-

bers (the equivalent of your cheque card signature) sufficiently. As long as good database systems like these are fairly secure. What the hackers do is attempt to log-on using sequential numbering and alpha-

lucky. Some also try sequential telephone dialing in particular patterns until they hit an ex-

directory number. It's not really this type of hacking that concerns most people on a serious level —

wire tapping of data lines has more far-reaching implications. My message to hackers is if you must try to break in and prove yourself against the se-

curity, leave it at that, inform the organisation of the security

gap and don't mess about with the system to cause embarrass-ment otherwise the conse-

quences will be much less flexible databases. N.B. If you are using a database with account numbers and log-on passwords change them every week. And select odd combinations of letters and numbers.

Robin Wilkinson

Baud Walk is a new weekly column with news on networking, databases, reviews of modems and software and points of contact for information.

Any readers with experience of networking are asked to send their experiences or news of services to Robin Wilkinson, Baud Walk Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD. He can also be contacted on Prestel mailbox 019983727.

Baud Walk

Row of Four by N Greenwood

```

1530 IF#5=-C THENP0KE1384+16,X:P0KE55656
1520 IF#5=-B THENP0KE1384+13,X:P0KE55656
1510 IF#5=-A THENP0KE1384+10,X:P0KE55656
1500 IF#5=0 THENP0KE1384+7,X:P0KE55656
1490 IF#5=-9 THENP0KE1264+31,X:P0KE55336
1480 IF#5=-8 THENP0KE1264+28,X:P0KE55336
1470 IF#5=-7 THENP0KE1264+25,X:P0KE55336
1460 IF#5=-6 THENP0KE1264+22,X:P0KE55336
1450 IF#5=-5 THENP0KE1264+19,X:P0KE55336
1440 IF#5=-4 THENP0KE1264+16,X:P0KE55336
1430 IF#5=-3 THENP0KE1264+13,X:P0KE55336
1420 IF#5=-2 THENP0KE1264+10,X:P0KE55336
1410 IF#5=-1 THENP0KE1264+7,X:P0KE55336
1400 GET#4:IF#4=-1 THENP0KE1400
1390 GET#4:IF#4=-2 THENP0KE1400
1380 GET#4:IF#4=-3 THENP0KE1400
1370 GET#4:IF#4=-4 THENP0KE1400
1360 GET#4:IF#4=-5 THENP0KE1400
1350 GET#4:IF#4=-6 THENP0KE1400
1340 GET#4:IF#4=-7 THENP0KE1400
1330 GET#4:IF#4=-8 THENP0KE1400
1320 GET#4:IF#4=-9 THENP0KE1400
1310 GET#4:IF#4=-0 THENP0KE1400
1300 GET#4:IF#4=-1 THENP0KE1400
1290 GET#4:IF#4=-2 THENP0KE1400
1280 GET#4:IF#4=-3 THENP0KE1400
1270 GET#4:IF#4=-4 THENP0KE1400
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```

Open Forum

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Can you destroy the wicked wizard of castle Cavelon? Only after negotiating the six levels in his castle. Collect all the door pieces before you can attain the next level. Help is at hand in this all thrills, all action, real arcade game, when excalibur appears, achieve indestructibility.



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pcw11/22

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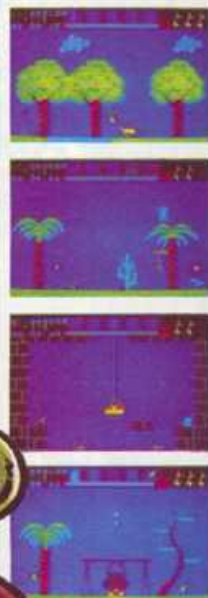
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BY DEREK BREWSTER

22 screens of stunning cartoon animation. Swinging through the trees collect, drop and use the objects scattered around. Speed of reaction is one thing. In Jasper you must also think fast and plan accurately... can you handle it?

Open Forum

Pie charts

on Spectrum

This will convert percentage inputs into 100% as an input. Your various entries are labelled and displayed at the end of the operation.

Pie charts
by D Heron

SINC. USER 12%
P.C. U. 25%
P.C. N. 17%
SINC. PROG. 18%
COMP. TODAY 13%
16/48 TAPE 15%

MARKET SHARE 1980/84

```
350 LET A=ADD/180*PI360 LET X=5
0*SIN A: LET Y=50*COS A
370 CIRCLE 200,88,50
390 PLOT 200,88: DRAW X,Y
400 BEEP .05,0
410 LET I=(A(R)/360)*100
420 PRINT AT K,L:B$(R,1 TO )
430 LET K=K+1:440 NEXT R
445 BEEP .1,30
450 PRINT AT 21,2:"COPY"
460 IF INKEY$="" THEN PRINT AT
470 IF INKEY$="Y" THEN PRINT AT
480 PAUSE 100: GO TO 100
MARKET SHARE 1980/84
SINC. USER 12%
P.C. U. 25%
P.C. N. 17%
SINC. PROG. 18%
COMP. TODAY 13%
16/48 TAPE 15%
```

```
100 REM © DEREK HERON 1984
110 CLS : PRINT INK 2:AT 10,0:"
120 PRINT INK 1:AT 12,0:"
130 PAUSE 0. CLS:350 POKE 23558,8
140 INPUT "CHART TITLE ";T$: B
150 INPUT "NUMBER OF ENTRIES";N
160 BEEP .05,30:170 DIM A(N): DIM
B$(N,10): LET SUM=0:180 FOR T=1 TO N
190 PRINT AT 4,2:"ENTRY NUMBER";T
200 BEEP .05,40
210 INPUT "PERCENTAGE TITLE";B$(T)
225 BEEP .05,40:230 INPUT "PERCENT
AGE ";P:240 LET SUM=SUM+P:250 IF
SUM>100 THEN LET SUM=SUM-P: GO TO
260:270 PRINT AT 6,2:"TOTAL PERCENT
AGE ";SUM:280 LET P=(P/100)*360
270 LET A(T)=P:280 IF SUM=100 THEN
PRINT AT 6,2:"TOTAL PERCENTAGE ";
SUM: BEEP .1,30: GO TO 300:290 NEXT
T:300 CLS:305 PRINT INK 2:AT 1,1:32-
LEN T$)/2: INVERSE 1,1:T$;10 LET ADD
=0:LET K=4:LET L=2:320 FOR R=1 TO N
330 LET T=A(R):340 LET ADD=ADD+T
350 LET T=A(R):340 LET ADD=ADD+T
```

Book Ends



Book Puffin Dic-
tionary of Compu-
ter Words Price
£1.95 Supplier
Puffin Books.

It is a matter of fact that profes-
sionals in any field will inevita-
bly invent special terms and a
short-hand language of their
own, for use in their work. To
an outsider, the use of such
jargon and slang words can be
very confusing, and the world
of computing is no exception.
To the average person, Ram is
nothing more than a sheep, and
such words as glitch, kludge,
Lifo, Logo, and Gigo sound
positively alien. Puffin have
therefore written a very
concise, easy to follow and
well-priced guide to the jargon
of computer technology.

A book that goes totally against
the grain in terms of all that I
hold dear, being totally boring
and uninteresting in terms of
the fact advice of this book
the Spectrum Operating Sys-
tem. Understanding the system
is important for reasons other
than pure academic education.
Many basic machine code rou-
tines, common to all kinds of



John Minson
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Amstrad Price
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traded CPG 464 Sup-
plier Interface
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learn from it.
from nine to 90 can read it and
computers to use it. Anyone
background knowledge of
you don't need any special
The real joy of this book is that
resting and entertaining way.
treated in a very attractive, inte-
entries, and is written and illus-
book contains more than 400
information interesting. The



Book The Spec-
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System Price
£5.95 Micro
Puffin Micro Press
Castle House, 27
Tombidge Wells,
Kent

Graham Taylor
will follow it.
no worse than the ones which
one for you. It is undoubtedly
once or twice then this is the
most of which you will play only
entirely of listings for games,
If you want a book consisting
things.

games listings of various kinds;
there are mental puzzles, short
adventures, simulations, etc.
Each is preceded by just
enough text to explain what the
game does — there is no real
attempt at annotating the lis-

The book does not merely
explain what each routine does
and where they are located in
memory, but contains detailed
information about what ele-
ments of the routine may, and
may not, be played around
with. For example, in some
routines apparently innocent
mutations will play havoc with
the stack pointers causing...
Detailed and useful informa-
tion backed up with numerous
appendices and comprehen-
sive (and vital) index — a good
buy for initiates.

John Minson



'Another winner in The Hobbit class. It's a complex real time adventure which will keep devotees puzzled for hours.' *DAILY EXPRESS*

'Sophisticated, rich in atmosphere and amazingly detailed, Sherlock is a game which no Spectrum owner will want to be without.' *MICRO ADVENTURER*

'Sherlock is a long way ahead of the rest of the competition.' *PERSONAL COMPUTER NEWS*

'In Sherlock you can not only talk to other characters, of whom there are at least thirteen, and ask them to do things for you, but you can also interrogate them and even discuss the case.' *SINCLAIR USER*

'Sherlock Holmes has been well worth waiting for with an 800 word vocabulary, real Victorian transport system - cabs and trains and all, and a cast of characters, peopling screens of graphics designed by Mugsy man Russell Comte.'

YOUR COMPUTER

'An intriguing and absorbing game.'

COMPUTER AND VIDEO GAMES

'I have been totally enthralled with this new brilliant adventure. I thought The Hobbit was good, but the added vocabulary and the even more intelligent characters, makes Sherlock number one in my software collection.'

MR. ROGERS, BATH

'Sherlock must be the most complex adventure ever created.'

The creation of atmosphere is superb (more like that of a novel, than a computer game) in fact playing the adventure feels more like acting than playing a computer adventure.

The characters in Sherlock behave just as they would in real life and have a very human feel to them, not only in the way they react to situations, but also in their displaying of human emotions.'

MR. STERN, HERTS

'Rich mental imagery.'

CRASH

'Sherlock is an adventure which has yet to be beaten.' *YOUR SPECTRUM*

'Sherlock is a superb program and will provide many hours (hours? months more likely) of stimulating entertainment.'

PERSONAL COMPUTER NEWS

'Sherlock is an excellent adventure bursting with atmosphere, challenge and inventiveness.' *PC GAMES*

'Sherlock the adventure is about as devious as Sherlock Holmes the master sleuth.' *POPULAR COMPUTING WEEKLY*

[POP1/12A]

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Melbourne House



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"Eureka! is superb. It's marvellous to have computer software of such high standard from Ian Livingstone" CAROLE SKAIFE.

"It's taken over my life – I only have three hours sleep a night. I hated adventure games before this but Eureka! is brilliant!" ANONYMOUS CALLER.

"Congratulations on producing such an entertaining and stimulating package" J. GOODENOUGH.

"I would like to thank all involved for making such an interesting game, especially the riddles" NORMAN SCOTTER.

"Please, give me a clue to the £25,000"

CHARLES COOPER.

(Sorry, Charles)

"I hate this game. I seem to be missing all my favourite TV shows" ADAM BOWLES. (*Poor old Adam*)

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Out of guarantee

Mark Kinsman of Worthing, Sussex, writes:

Q Do you know of any company that will buy an out of guarantee 48K Spectrum (issue 3). I do not wish to sell it privately as I need to sell it quickly.

A There are a number of "used computers", however, I am not in a position to recommend any of them, not having dealt with them myself, or having heard of anyone else who has dealt with them.

Personally I would try and sell your machine yourself, either via an advert in your local paper, or in PCW Classic (cheap). You should realise that you will get more money for your machine if you sell privately as you cut out the middle man.

Top of the league

Andrew Bolsover of Sheffield, writes:

Q I own a Spectrum and am trying to create, save and load files to and from tape. Please could you tell me how to go about this? The files I want to create are the number of matches currently played by my favourite football team's players. It's the numbers I want to be able to save, in order to be able to load the previous total and add to it accordingly. I hope you follow my drift.

A How about this, Andrew? 10 DIM S(20):REM array for matches played — 20 players

REM set up array of

matches played
100 SAVE "matches" DATA S():REM
stores matches played array
110 REM on cassette.

REM prepare for updating
of matches played
200 LOAD "Matches" DATA S():REM
load matches array back
210 REM into the array S, ready for
updating.

This process of Save and Load Data, can be used for any type of data (string or numeric) and for any length of array. The only point to remember is that you must have executed a Dim statement prior to loading the array, and that the Dim statement must be the same as when you saved the array.

Positional control

Paul Haigh of London, writes:

Q I am looking for methods of positional control using a small micro. The machine that I have is a Spectrum, and I was hoping to use this to control a number of stepping motors. I would be grateful if you could tell me who to contact as regards an interface or whether there is a book on this subject that may help me.

A There is a book that should help you with this project. It is called the Sinclair Database and was written by Beardsmore et al.

One more thing I think you would also be well advised to look at is the Spectrum Hardware Manual published by Melbourn House as it contains a lot of information which will be useful to you.

Stamped issue 3

Paul Shipley of London, writes:

Q I intend buying a second-hand Spectrum. As the issue 3 is the latest version, this is the one I will choose. Is there a big issue 3 stamped on the case, and if not, how can I tell the difference between the three issues?

A Also, is there a short program or routine I could use which will test the machine and draw attention to any faults?

A Unfortunately the issue 3 does not have anything

Design problem

Dominic McCann of Liverpool, writes:

Q I have now had my Spectrum for three months, and all this time I have wanted to write my own game. I can do the Basic loader with no problems. It is just the picture that bothers me. Firstly I have no idea how to design it, and secondly I don't know how to make the screen scroll in any direction. How do I go about this?

A Designing a screen object is a tedious task, but it is a task that requires some artistic talent. If like me you are no Van Gogh, then using tracing paper you can copy pieces of existing drawings and transfer them onto squared paper. Print N Plotter Products manufacture paper suitable for this purpose, which is available from most computer shops.

Your second problem can only be solved by you understanding how the Spectrum display file works, and obtaining, or writing, scroll routines. One good source of such routines is a book that I have mentioned before, Supercharge Your Spectrum, published by Melbourn House.

Data transfer

E A Duncan-Dunlop of Bridgend, Mid Glamorgan, writes:

Q How can I network between a QL and an issue 3 Spectrum? What do I type in to the QL? What do I type in to the Spectrum? Are the baud rates the same? (My QL is the PM version.)

A PCW Vol 3, no 34 contained an article, by B Corhill, on sending QL listings to a ZX printer attached to a Spectrum. The baud rate used (on both machines) was 600, although the article did refer to using the Spectrum printer, the principles of data transfer remain the same. Instead of using Lprint on the Spectrum, the data passed across could have easily been put onto microdrive, or stored in the Spectrum memory.

Unofficial command

J J Smith of Port Glasgow, Inverclyde, writes:

Q I have a ZX Spectrum 48K and know machine code. Only recently, I discovered that there are assembly language mnemonics which exist that are not in the Spectrum manual. Is there any book which lists these 'unofficial' instructions?

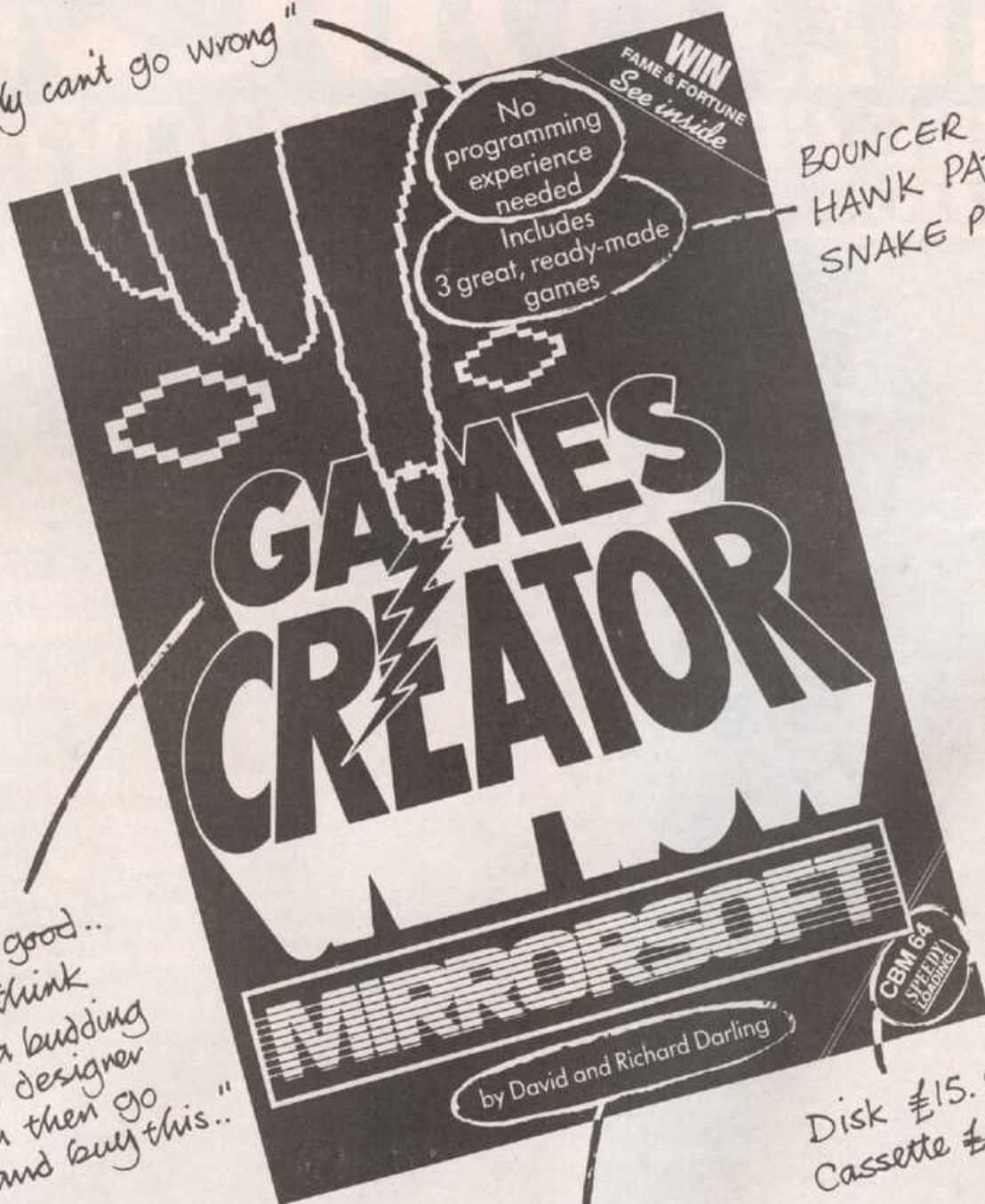
A As you quite rightly point out, there are a number of Z80 instructions that are not documented in the Spectrum manual. This is simply because they are not of particular interest to Spectrum machine code programmers. Having said that however, the book that you want (if you are still interested in pursuing your quest) is Z80 Assembly Language Program-ming, written by Lance Le-ming.

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
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been watching its progress since its release. I hope these tips will get some of you on the way to fulfilling the Quests.

Before I discuss *Machbeth*, which has just been released, I must declare my interest in the program. The team of seven who created the adventure were given their brief by Sunshine Publications, who are the publishers of this magazine. So you can imagine that I feel rather like a distant cousin to someone who has made a Number One record. I wasn't involved in the development of the program but, even so, I've

To find Drapnir, you need to go to the location north from Despat. The way to get there, though is not so simple. First go to the Pits of Hell, and give Olnir to someone. This tip comes from John Ashcroft, who carries on. "I always use Snor, as he will pay you for it then drop it later for you — and he hardly ever gets killed! Then go east, jump to Hel, summon Help. Then go north, and north again, where you will find a chest."

I do an update on the program. mentioned in a couple of weeks time, when comments on Lord of Midnight will be your Thanks for those tips, Iain — your "Finally, a good map is essential."

are just beginning... "Finally, a good map is essential." but I think you will find that your Troubles Hall. This should get you started on Skallir. Drapnir, you can travel north from Klepto's instance, if you are carrying Skornir, but not two conditions instead of the usual one. For to enter certain locations you have to satisfy searching for the later quest objects, is that "An important point to remember, when one.

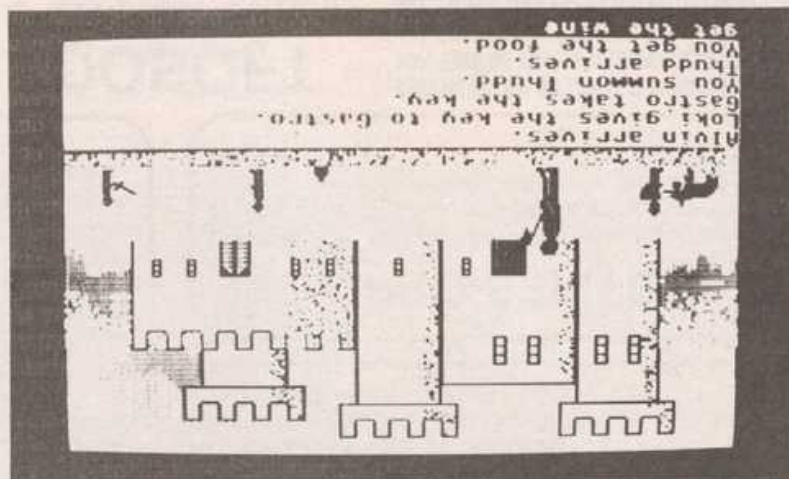
are several where you must not be carrying must carry a helmet to enter, though there use. I haven't found a location where you Felstrong. Likewise, a helmet is not much round to searching for Grimnir, you will than an axe, although when you finally get to enlist help.

heavy for you to open, so that you will need are in chests or cupboards that are too Bodir and Thor) is that all the quest objects with the Gods (especially strong ones like "Another reason for remaining friendly goods. Of course, he may refuse."

God, and ask him nicely to return your friendly God. In this way, if you need it get rid of such an object, then give it to a quest objects. If for some reason you must "It is generally not a good idea to drop ringway in Rankle's Hall.

not possess the Felstrong 'Bug', ie, a of the other objects, even if your copy does Felstrong is much easier to find than many. Felstrong quest is completed. Incidentally, where Felstrong is needed until after the you will not come across any locations 9800. Felstrong is necessary here, though To restart the program after this, type Coto to get an immediate response to Summon. immediate response to Help, and line 2005 into a chest. Omit line 6550 to get an TB), the best way being to put six objects sound a little like Tony Kendle's column, break into the program (this is getting to the game any easier, just a little faster. First, strictly, cheating as it doesn't make the might find the following useful. It's not Help or Summon commands answered "Those of you fed up with waiting to get the had a particularly interesting follow-up: but Iain Gibson, from Hargate in Clydebank, Many of you have written in with this tip, you can lay your hands on it.

Klepto will have your treasure away before quick, however, or else that little thief the object of your first quest. You have to be west. There you will find a chest containing this will enable you to scout off to the north If you do then you have to remove him, and where you will almost certainly meet Krank. Michael. To get Olnir, go to Krank's Hall I hope that I can help you get somewhere, Drapnir seem to present no end of hassles. seem to cause no trouble, but Olnir and all the rest would unfold. "The later objects Quest objects. I'm sure that I can find Olnir everything but still can't find any of the and visited all the locations I can... I've done G Hill. "I have collected all useful objects Please give me a clue!" And this one from P Kay: "I haven't found any of the Quest items, basic than this — like the one from Michael. Actually, the question is often even more who must be present?"



Drupnir meets Machbeth



Tony Bridge's Adventure Corner

Tony Bridge's Adventure Corner

by Creative Sparks with great interest. It has been called, by one reviewer in a rival magazine, "probably the best adventure of 1984".

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Macbeth is one of the bloodiest plays in the English language, and it is thrilling to be able to 'take part' in the action, and dictate it. A "strange device" in the first part of the program, is the newspaper which gives Macbeth information on the outcome of his battles — a novel but useful invention! With

the aid of this, and the text of the play, the player can guide the action along the path he knows it should take. After each section, there is a psychoanalytical interlude, during which the player will lie on the analyst's couch and answer questions on his actions. You don't have to use these extra programs, but your knowledge of the play will be deepened.

There's something here for everyone — the adventures themselves stand up against the best available for the Commodore, while the student of the play itself will learn a great deal from the book and programs.

Finally, some Help in Colditz, the adventure from Phipps. J Houghton writes from Southse: "How do I get rid of the Guard in the Tower? I have tried everything I can!"

Well unfortunately for the poor old guard (who's only doing his job, after all), you must *Kill* him with the sharp knife, and then grasp his uniform — you'll need it later on.

Phipps have just released three of their old favourites in a "Super Value Pack". It really is super value, too, as for just £7.99 you get *Magic Mountain*, *Greedy Gulch* and, one of my personal favourites, *Knight's Quest* all in one package — it's a steal. The company also tells me that they have recently signed a deal with Les Aventures of Paris, to translate their adventures into French. Apparently this feat has been beyond the powers of normal mortals until now, as there are a number of subtle grammatical problems to overcome. So, mes amis. Bon chance dans votre Quest, et do not blow le garlic dans mon visage!

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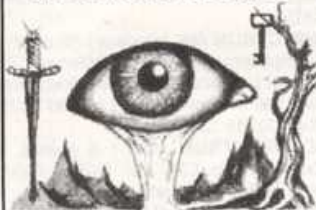
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Twin Kingdom Valley on BBC. How do I get the master key from the dragon without getting burned to death? H Kulbick, 167 Duncan Road, Aylestone, Leicester.

Ship of Doom on Spectrum. How do you get the key from under the glass cover in the key room? Martin Parker, la Crake Avenue, Scartho, Grimsby, S Humberside.

The Castle on Spectrum. How do you get out of the chasm? Donald M Mackay, 2 Stewart Drive, Stormway, Isle of Lewis, Scotland.

Zork's Kingdom on Vic20. I cannot get past the pit. Mrs C Fuller, 83 Hill Grove, Salendine Nook, Huddersfield, W Yorks.

Keys of the Wizard on Dragon. I'm one treasure short - I can't open all the chests but I can kill the jester. P Hampson, 10 Cherry Lane, Lawton Heath, Alsager, Stoke-on-Trent, Staffs.

Hobbit on Spectrum. Where do I go after crossing the fast black river in the wooden boat? I can't get beyond the elvish clearing. Phillip Shooter, 127 Green Farm Close, Loundsley Green, Chesterfield, Derbyshire.

Voodoo Castle on Vic20. How do you go through the crack in the wall? Please help! Geoffrey Bear-dsell, 348 Central Park Road, East Ham, London E6.

Twin Kingdom Valley on Commodore 64. How do you get the master key of the dragon, in the north tower of the Desert Castle? Mark Woolway, 17 Bertram Drive, Meols, Wirral, Merseyside.

Velnor's Lair on Spectrum. Where are the oars for the bathtub? Chris Taubert, 136 Western Avenue, Dagenham, E Essex.

Hobbit on Spectrum. How do I kill the monstrous dragon, once I have got the treasure? M Bird, 35 Ashley Close, Pewsey, Wilts.

The Hulk on Commodore 64. How do I lift the ring? How do I get the wax? How do I get the big gem? Keith Willis, 2 Leicester Close, Hadrian Lodge, Newcastle-upon-Tyne, Wallsend, Tyne-and-Wear.

Pimania on Spectrum. What is the significance of the red fish? Mark Lambert, 3 Mere Farm Grove, Oxtou, Birkenhead.

Mystery of Monroe Manor on Commodore 64. How do I open the wardrobe? P A Taylor, 167 Uplands Road, West Moors, Wimborne, Dorset.



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Amstrad

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
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(Figures compiled by Boots/Websters)

Amstrad

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(Figures compiled by Boots/Websters)

BBC

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
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(Figures compiled by Boots/Websters)

Dragon 32

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
4	(-) Classic Adventure (Amiga)
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(Figures compiled by Boots/Websters)

Spectrum

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
4	(-) Classic Adventure (Amiga)
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9	(-) Classic Adventure (Amiga)
10	(-) Classic Adventure (Amiga)

(Figures compiled by Boots/Websters)

Commodore 64

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
4	(-) Classic Adventure (Amiga)
5	(-) Classic Adventure (Amiga)
6	(-) Classic Adventure (Amiga)
7	(-) Classic Adventure (Amiga)
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10	(-) Classic Adventure (Amiga)

(Figures compiled by Boots/Websters)

Vic 20

1	(-) Marie Miner (Software Projects)
2	(-) Hunchback (Ocean)
3	(-) Classic Adventure (Amiga)
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7	(-) Classic Adventure (Amiga)
8	(-) Classic Adventure (Amiga)
9	(-) Classic Adventure (Amiga)
10	(-) Classic Adventure (Amiga)

(Figures compiled by Boots/Websters)

Top 10

Now voting on Week 4 — £100 to win

Week 2: No winner — £50 added to Week 4 chart fund

1	(1) Daley Thomson's Decathlon (Spectrum/C64)
2	(6) Beach Head (C64)
3	(4) Underworld (Spectrum)
4	(3) Elite (BBC/Electron)
5	(-) Kokotoni Will (Spectrum/C64)
6	(2) Danger Mouse in Double Trouble (Spectrum/C64)
7	(-) Knight Lore (Spectrum)
8	(-) Sherlock (Spectrum/C64)
9	(5) Pyramarama (Spectrum/C64/Amstrad)
10	(8) Deus ex Machina (Spectrum)

Ocean
US Gold
Ultimate
Acornsoft
Elite
Creative Sparks
Ultimate
Melbourne House
Mikro-Cen
Automata

Readers' Chart No 2

Event	Dates	Venue	Admission	Organisers
Electron and BBC Micro User Show	Dec 8-9 10.00am-5.00pm	New Horticentral Halls London SW1	£3.00 adults £1.00 children	Database Publications 081-456 8383
Which Computer? Show (over 18s only)	Jan 15-17 (1985) 10.00am-5.00pm	NEC Birmingham	Free in advance from organisers	Capp and Pollak 01-891 5051
Hi-Techology and Computers in Education Exhibition	Trade: Jan 24 10.00am-1.00pm Educational: Jan 24 1.00pm-8.00pm Jan 25 11.00am-8.00pm Public: Jan 26 11.00am-6.00pm	Barbican London EC2	Free in advance from organisers	Computer Marketplace 01-930 1612
Apriol and Sirius Computer Show	Feb 5-7 10.00am-6.00pm	Kensington Town Hall London W8	Free in advance from organisers	Paradox 01-241 2354
The LET '85 International Trade Show	Feb 17-18 10.00am-6.00pm Feb 19 10.00am-4.00pm	Olympia 2 London W6	Free in advance from organisers	Turner-Whitland 0823 777000

Diary

All you have to do to vote is to fill in the form below with the names of your current three favourite software titles (or copy the form on to another sheet if you don't want to damage your magazine) and send it off as soon as possible to: Top 10, Popular Computing Weekly, 12-13 Little Newport Street, London WC2H 7PP. We will send £50 each week to the person who correctly predicts that week's top three. If there is no winner then that week's prize is automatically added to the chart on which voting is currently taking place, and so on until someone gets it right! (If there is more than one winner that week's prize — whatever the 'pot' stands at — will be split equally between all the correct entries.)

Voting for Week 4 closes at 2pm on Wednesday December 12. Entries received after that time will not be eligible for inclusion in that week's voting.

My top 3: Voting Week 4

Name.....	Address.....
1	2
3	

New Releases

HAIL CAESAR

Caesar the Cat was one of the most enchanting programs I've seen (maybe I just like cats) but I later found out that it was basically intended for young children. Oh well. *Caesar's Travels* is definitely for a young market and is obviously intended to be somewhat educational — it's the computer equivalent of bedtime stories.

The story begins with Caesar the Cat in his larder trying to rid it of mice (see previous program), failing, and being chucked unceremoniously into the yard. From then on you can alter the story by a simple choice of keys at each point. For example, in one section you must decide whether to hide in a bin or run away.

Depending on the choices you make at each point, a different story is followed. Some end with Caesar in a pretty sorry state, others with him safely tucked away in a warm home. Here and there in the program there are sections where you must answer some

simple questions to further the adventure.

The graphics are charming with excellent sound effects (Caesar's purr positively glows with pleasure, his plaintive mew is truly heart-tugging). With a wide variety of possible stories the program should last quite a while before it becomes repetitive. I think if you have children under ten, they should be transfixed by this one and I might add that I was, too.

Program *Caesar's Travels*
Price £7.95
Micro Commodore 64
Supplier Mirrorsoft
Holborn Circus
London EC1P 1DQ

BLACK GOLD

All of Sinclair's recent releases have been educational and many of them have been produced by Macmillan. *Oil Strike* is your big chance to run a multinational company and seek oil.

The main section of the program concerns getting surveys on likely looking areas of rock and trying to deduce from the available visual evidence of rock type and structure whether an oil strike is likely.

As you develop more and more strikes, so the world situation develops, boosting or hampering your expansion. You must adjust the rate of production at each oil well in accordance with world market conditions.

The program combines marketing and financial strategy with simple geology as you take risks and try to maximise profits. One of those rare edu-



cational programs that the pupils should like as much as the teachers.

Program *Oil Strike*
Price £9.95
Micro Spectrum
Supplier Sinclair Research
Stanhope Road
Camberley
Surrey GU15 3PS

BUTTERFLIES

Paddington's Garden Game is a machine code collect and dodge whose only distinguishing feature is that it features a main character that looks vaguely like the famous bear. Also, marmalade sandwiches feature somewhere in the plot.

The idea is to move Paddington around a garden collecting butterflies (surely an environmentally unsound act?) and dodging various other objects like hedgehogs and wasps. The garden extends to several screens of a fairly simple kind livened up with the occasional

pond and fountain.

The sandwich lurks somewhere in the garden and gives Paddington bonus points if he can find it. It's OK and little children who are already Paddington addicts may enjoy it, but, honestly, other than the bear it's really nothing special.

Program *Paddington's Garden Game*
Price £6.95
Micro Commodore 64
Supplier Collins Soft
8 Grafton Street
London W1X 3LA

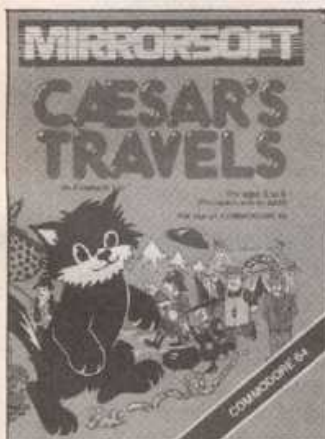
CLEAN UP

Every so often I get programs sent in from readers, most of which are usually dire and are discreetly ignored. But *Litter Bug* from Solsoft is actually pretty good.

Briefly, the plot is to move a little space creature around a scrolling screen collecting rubbish bags and returning them to an incinerator. The screen is full of various sorts of rubbish, some of which is radioactive and must be quickly blasted before it explodes.

The graphics are smooth scrolling sprites and the sound is pretty good too; all in all a perfectly good game. The only problem is the whole thing looks incredibly like an early Ultimate game, so minus marks for originality. Nevertheless, there are worse ways of spending £4.95.

Program *Litter Bug*
Price £4.95
Micro Spectrum
Supplier Solsoft
2 Huntly Road
Liverpool L6 3AJ



This Week

Program	Type	Micro	Price	Supplier	Workshop	Ed	BBC	£9.95	Acornsoft
Number 11	S	Amstrad	£5.50	Camel	Pottit	Arc	C16	£6.99	Romik
Assembler	Ut	Amstrad	£11.60	Amor	Allard's Tome	Ad	Commodore 64	£6.99	Romik
Flex Friend	Ut	Amstrad	£7.50	Camel	Animal Magic	Ad	Commodore 64	£6.99	Romik
Grasp	Ut	Amstrad	£8.50	Camel	Tristan and Isolde	Ad	Commodore 64	£8.95	CRL
Toolbox	Ut	Amstrad	£4.95	Camel	Blaze	Arc	Commodore 64	£6.99	Romik
Holy Horrors	Ad	BBC	£6.99	Romik	Demons of Topaz	Arc	Commodore 64	£5.95	Firebird
The Land of Chark	Ad	BBC	£4.95	Delta 4	Motocross	Arc	Commodore 64	£7.95	System 3
Spooky Manor	Ed	BBC	£9.95	Acornsoft	Paddington's Garden	Arc	Commodore 64	£6.95	Collins Soft

This Week

Some of the puzzles are moderately entertaining for about a minute, but really there is a terrible sense of randomness about the whole thing. In addition, the program is technically lame, written in Basic and would only have some small justification if sold cheap as an educational package. At £6 plus it's just silly. There's another thing, too.



Devils Canseway poses as some sort of arcade game when, in fact, it is closer to being an educational package. You move a little man along a path and every two or three moves are asked to solve various puzzles, remember shapes which are flashed into the screen, play simple arcade games, etc. Unfortunately, not only are some of the games completely random, they are all introduced by people named Sid Shape, Simon Surface. In short, alliteration rears its ugly head again.

UNFORTUNATE

Since all the games have more or less the same format, I chose *Fahrenheit 451* based on the book by Ray Bradbury to look at. Being based on disc you get much more text than you commonly expect — one of the reasons these games are described as interactive fiction rather than graphic adventures. The graphics are detailed though not awe-inspiring, but the text analysis is good —

Commodore 64 has been coming over for quite a while now. However, some of the epic, disc-based adventure games have remained largely unavailable. Changing all that is Trilium, whose multi-disc adventures based on well known science fiction books are being issued in this country for a massive £19.95. Though that figure includes two discs

HOT STUFF

The cover is deeply offensive — the theme of the game is that you are trying to avoid being dragged by the devil into his lair and you stay on the path (allegory, me thinks) by answering the question. The cover depicts a scantily clad girl (obviously morally destitute as she has one shoulder bared) trying to drag a man into hell. Woman, ie, sexual temptation as the devil incarnate. This is sick.

Program	Devil's Causeway
Price	£6.95
Micro Supplier	BBC Warlock Software,
	66 Upper Richmond Road,
	London SW15

There are now quite a few companies selling programs for £1.99 and there are quite a few programs about the Olympics based on *Track and Field*. These two concepts meet each other in *Olympic Challenge* which is not only an Olympic event type program, but costs £1.99. The truth is that most games are not as good as those costing £6 or £7 and *Olympic*

WORTHY

Still, it is a good, sophisticated adventure. At £19.95 maybe you should persuade someone else to buy it for you.

As an adventure, *Fahrenheit 451* is excellent, chock full of mysterious messages and a system of communication via literary quotation that takes a while to get the hang of. The problem lies with the system itself; every five moves or less you must input requires communication between computer and Commodore disc drive — as everybody knows this can take quite a while and means an irritating wait between moves. You need a lot of patience or a better disc drive.

In addition whilst the program is long, I don't think it is really low sides of disc long — I suspect it could have been reduced in size quite a lot by next compression techniques.

Tapper is one of those games you'll either find very addictive and funny or completely boring and insane. When the

LAST ORDERS

Program	Price	Micro	Supplier
Olympic Challenge	\$1.99	Spectrum	Century City
			99 High Street
			Dudley
			West Midlands DY1 1QP

Change is no Daley Thompson's Decathlon. For one thing the little athlete figure is no more than a stick man making the events look more like schematic diagrams than a cartoon. However, if you accept the quality of the graphics what you get is still quite a fun version of *Track and Field* with all the usual elements of key bashing, judgement and multi-events. If you can't afford the expensive programs, then this is a more than worthy substitute.



Star Sphere	UI	Spectrum	\$3.95
Olympic Challenge	Arc	Spectrum	\$13.99
Litter Bug	Arc	Spectrum	\$4.95
Buggy Blast	Arc	Spectrum	\$5.95
3D Starslike	Arc	Spectrum	\$3.95
Galaxias	Ad	Spectrum	\$4.95
Cheas	S	MSX	\$3.95
Worlds of Flight	S	Dragon	\$3.00
Ice Castles	Arc	Dragon	\$3.00
Microdeal			\$3.00
Kuma			\$3.95
Delta 4			\$4.95
Real Time			\$3.95
Firebird			\$5.95
Soft			\$4.95
Century City			\$13.99
Eclipse			\$3.95

Frumpy	Arc	Dragon	£4.95
Demolition Derby	Arc	Dragon	£8.00
Rapid Assembly Syst.	LI	Commodore 64	£14.99
Partis of Bear G.	Ed	Commodore 64	£6.95
Histeach	Ed	Commodore 64	£8.50
Cesar's Travels	Ed	Commodore 64	£7.95
Titans	Arc	Commodore 64	£9.95
Tapper	Arc	Commodore 64	£9.95
Suicide Strike	Arc	Commodore 64	£7.95
System 3	Arc	Commodore 64	£7.95
US Gold	Arc	Commodore 64	£9.95
Romik	Arc	Commodore 64	£9.95
Minorsoft	Arc	Commodore 64	£7.95
Megatron	Ed	Commodore 64	£8.50
Chetahsoft	Ed	Commodore 64	£6.95
Romik	LI	Commodore 64	£14.99
Microdeal	Arc	Dragon	£8.00
Impsoft	Arc	Dragon	£4.95

Pick of
the week

FROG STEW

Mikro Gen's programs have been getting better and better recently — the graphics have got bigger, the games design have improved markedly. The techniques which have improved the arcade games so much have now been introduced to create a graphics adventure with some of the most impressive illustrations yet seen.

The Witches Cauldron not only features excellent graphics, but has an unusual and entertaining plot. You have been transformed by the kind of magic that is part of the standard kit in adventure games, into a frog and must transform yourself, stage by stage through virtually every kind of intermediate animal until you arrive back to your human state.

You actually appear on the

screen as the animal you currently are; one interesting feature of the plot is that your choices within the adventure are limited by what animal you are. There are riddles to be solved in return for help, a nice new character set and intelligent use of colour not only in the graphics, but in the text itself.

It's cute rather than macho with a lot of humour, but fiendish enough for all that. It understands pretty complicated sentences and kept me entertained for hours. What more do you want?

Program *The Witches Cauldron*
Price £6.95
Micro Spectrum
Supplier Mikro-Gen
44 The Broadway
Bracknell
Berks

blurb says that the game has five separate game screens this is true, but really it is only the same idea represented in different ways — in this respect it is a bit like *Life* or *Finnegans Wake* for that matter.

And so the idea on which it all hinges — you are a bartender (the bartender or publican is apparently known as a Tapper in America from whence this program comes — isn't English a funny language?) who must serve a mob of unruly customers, all of whom demand instant service and none of whom pay for their drinks — a bit like our office party ac-

tually.

Your barman must rush about from customer to customer serving their drinks before they overrun the bar. Not only this, but empty glasses are returned by being slid back across the bar top, you have to be there to catch them and return a full glass.

So it's a running about, dodging back and forth at ever greater speed, keeping your eyes open for customers and glasses type of game, and either that's enough or it isn't.

Program *Tapper*
Price £9.95
Micro Commodore 64

Supplier US Gold
Unit 10
Parkway Industrial
Centre
Heneage Street
Birmingham B7 4LY

SUPER FUN

In *Demons of Topaz*, the idea is that you are a spaceman and you must collect legendary sacred crystals from the demon guardians. The way through the many passages to each crystal is difficult and requires much pondering of pace and jumps — watch out if you fall because your little spaceman will crash to earth with decidedly nasty bump! (Hang on a minute, I seem to have written this before somewhere.)

Anyway, it's absolutely fantastic the way you can go through all these screens of action with different problems to be solved on each one (hang on, I'm getting confused — what month is this, what year?). Can you figure out how to get from platform to platform and collect the sacred crystals (I

keep seeing this mine with penguins and kangaroos and keys you have to collect).

What amazingly exciting fun it all is! Aren't you glad you are in such an innovative, razor's edge of technology-type industry?

Program *Demons of Topaz*
Price £8.95
Micro Commodore 64
Supplier Firebird Software
Wellington House
Upper St Martin's Lane
London WC2H 9DL

ROLLS ROYCE

The Expert Sprite Editor is the Rolls Royce of sprite editors, of which there are many for the Commodore 64.

Anything you want for the design of sprites is there, well documented and with all the additional information about using the sprites from Basic you could wish. Expensive but good.

Program *Expert Sprite Editor*
Price £8.95
Micro Commodore 64
Supplier Android Dreams
94 Rednall Road
Kings Morton
Birmingham B38 8DU

Compiled by Graham Taylor

New Releases is designed to let people know what software is coming on 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.



Acornsoft, Betjeman House, 104 Hills Rd, Cambridge CB2 1LQ
Arnor, 76 Isham Road, London, SW16 4TF **CRL**, CRL House, 9 Kings Yard, Carpenter's Road, London E15 2HD, 01 533 2918
Cheetahsoft, 24 Ray Street, London, EC1R 3DJ, 01 833 4909
Camel, Wellpark, Willys Ave, Exeter EX2 8BE, 0392 211892
Century City, 99 High Street, Dudley West, Midlands DY1 1QP, 0384 57077
Collins Soft, 8 Grafton Street, London W1X 3LA, 01 493 7070
Delta 4, The Shieling, New Road, Swanmore, Hants SO3 9PE, 04893 5800
Eclipse, 79 Ardrossen Gardens, Worcester Park, Surrey, KT4 7AX, 01 330 3116
Firebird, Wellington House, Upper St Martin's Lane, London WC2H 9DL, 01 379 6755
Impsoft, 149 Balham Hill, London SW12, 01 675 5577
Kuma, Kuma Computers, 12 Horseshoe Park, Pangbourne, RG8 7JW, 07357 4335
Megatron, 22 Mountfield Gardens, Kenton, Newcastle upon

Tyne, NE3 3DB, 091 285 1721
Microdeal, 41 Truro Road, St Austell, Cornwall, PL25 5JE, 0726 73456
Mirrorsoft, Mirror Group, Holborn Circus, London EC1P 1DQ, 01 353 0246
Real Time, Prospect House, 32 Sovereign Street, Leeds LS1 4BJ, 0532 458948
Romik, 272 Argyll Avenue, Slough, SL1 4HE, 0753 71535
Solsoft, 2 Hurlly Road, Liverpool L63AJ, 0532 458948
System 3, 138 Carlton Avenue, East Wembley, Middlesex, 01 835 3593
US Gold, US Gold, Unit 10 The Parkway Ind Centre, Heneage Street, Birmingham B7 4LY, 021 359 3020.

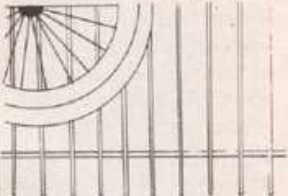
This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

This Week

Locked out

Puzzle No 136

Simon Scatterbrayne has chained his bicycle to the railings outside the 'Dog and Puddle', and now finds that he has forgotten the 3-digit combination that opens the lock. "I know that the number divided by the sum of its digits is equal to my age (in years)," he said hopefully to Dr. Dimwiz, who happened to be passing.



Fortunately, the doctor was pretty good at lighting calculations, and had soon narrowed it down to six possible values.

"I know exactly which one it is," exclaimed Simon, "You see, I have just recalled what the 'units' digit is." Now, the doctor had the advantage of knowing Master Scatterbrayne's age. We don't, but can you determine what the combination was — and Simon's age?

Solution to Puzzle 131

325 blocks can form a triangle of 25 tiers, and squares of 18 x 18 and 1 x 1; 17 x 17 and 6 x 6; or 15 x 15 and 10 x 10.

The program generates successive triangular numbers by summing consecutive integers, each total being tested to see if it can be broken into component square pairs. The first answer that gives three alternative sets of squares is the solution.

10 LET T = 0 20 LET ROW = 1 30 LET T = T + ROW 40 FOR F = 1 TO SQR(T) 50 LET S = T - (F * F) 60 LET SQ = SQR(S) 70 LET SQ = INT(SQ) 80 IF SQ > F AND SQ = INT(SQ) THEN PRINT "T:", "ROWS:", ROW, "SQS:", F, "E", SQ 90 NEXT F 100 ROW = ROW + 1 110 GOTO 30

Winner of Puzzle No 131

The winner is Jenny Lightowler of Burnell Road, Sheffield, who receives £10.

If the puzzle can be sensibly solved using a computer, then the winner will have included a listing of the program used to find the correct answer. The closing date for Puzzle No 136 is December 21.

The Hackers

On the ordinary, commercial scale I see it working something like this. Professor Moriarty, a criminal of deepest dye and one of the most evil men ever to walk this earth, wants to make a fortune and illicit copy of *Plinian Kongroger* Llamarrack for his own vile purposes. The first step of his monstrous plot is to break into the walls of ICE, are ready for him.

At the first break-in attempt, the program hits back! First the screen begins to flicker at a certain strobe frequency, tuned to the rhythms of the optic nerve. This can cause epilepsy and softens up the miscreant for the appalling sub-sonic vibrations which drone from the micro-speaker, at those special low frequencies which stir the guts and fill people with panic and nausea. (Spectrum owners get off lightly here since its sound oscillator isn't too good at even quite ordinary frequencies.) Swirling, convergent, hypnotic patterns follow which fill the screen, sucking in the gaze of the user, producing a deepening hypnotic trance (unless, of course the high-res graphics aren't too hot) until the screen, flashing on and off too swiftly for the eye to read, conveys a subliminal message straight into the deepest levels of the unconscious mind, installing firm commands: Set fire to your tape-copying software. Kick your cassette unit violently across the room. Throw your computer on the floor and jump up and down on it. You MUST obey. You cannot resist.

Do you think it could work? The technical details of all this would, of course, have to be left to the software people to sort out.

I fully expect that as the technique is developed further along William Gibson's lines, the software pirates will become commonplace. There's only one small remaining worry. Recently I was using an assembler which (like so many assemblers) takes several hundred years to load from tape, isn't available on disc, and crashes if you so much as breathe in the same room. One wrong keystroke at the menu level (let alone when actually trying to run machine-code) can make the whole thing seize up. I know this because I hit a cursor key by mistake and the program had a fit. Furious bashing at the break key produced a mysterious pause and then, before I was dumped back into Basic, the message *Copying tapes is illegal* appeared.

I spent several hours hating and cursing whoever wrote that program.

I haven't dared since even to pick up William Gibson's book, just in case...

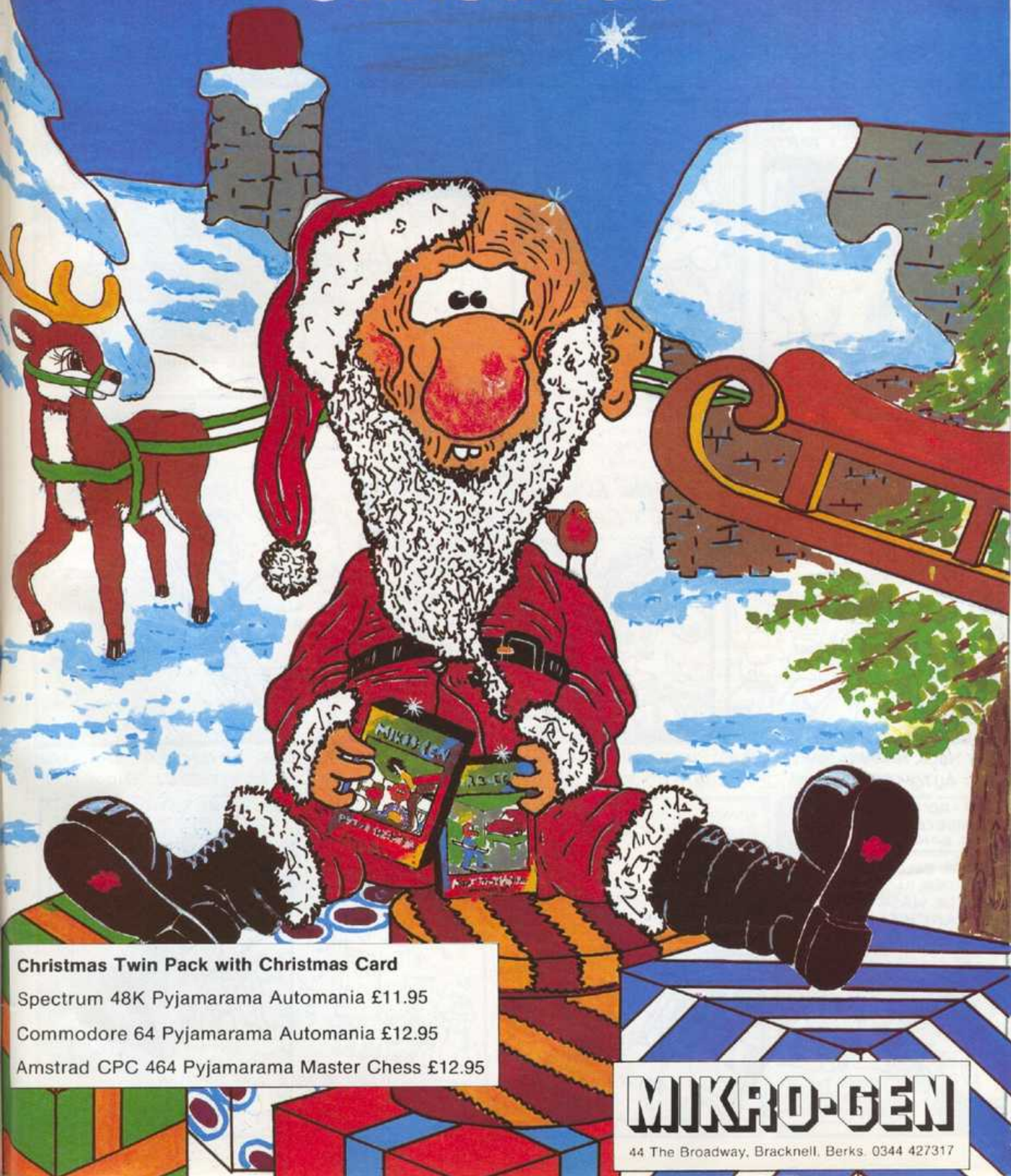
David Langford

Binks lookalikes flooding in. Apart from running twice as fast, So for Pete's sake, be careful not to buy one by mistake.

are becoming a menace! & costing half the price, you can't tell them from the real thing!



Wally A Merry Christmas



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Commodore 64 Pyjamarama Automania £12.95

Amstrad CPC 464 Pyjamarama Master Chess £12.95

MIKRO-GEN

44 The Broadway, Bracknell, Berks. 0344 427317

AHEM, LADIES AND GENTLEMEN, BEFORE WE CONTINUE WITH THIS WEEKS CARTOON, I'D JUST LIKE TO BID THANKS, ON BEHALF OF MY PAIS AT AUTOMATA, TO ALL THE EXHIBITORS AND VISITORS AT THE LAST ALLY PALLY ZX MICROFAIR, WHOSE KIND DONATIONS TO THE ETHIOPIA DISASTER FUND TOTALLED £218. THANK YOU.

THE GANG HAVE PASSED THROUGH THE GATES INTO PILLAND WHERE THEY MUST SORT OUT THEIR TAX...

WELL, D'YOU KNOW ANY GOOD HOTELS?

YEAH-A MATE OF MINE WORKS AT THE SAVELDY.

BEEN BRAHM...

NOW-ZE KARTUNE!!

HE'LL LET US HAVE A ROOM OR TWO FOR A FREE COPY OF BARTZ.

WATCHIT, PIMAN - THAT'S ADVERTISING, NOT EVER NEXT?

WELL? DID YOU FIX US UP?

NO! HE'S LEFT!

SOME PI IN A FUNNY COSTUME WAS THERE...

LET'S TRY THE PILTON!

SORRY, FILTUS VPPUS!

NONSENSE! YOU MUST HAVE SOME SPACE HERE!

NOPE, SORRY.

PRAKTUS TITUS!

LISTEN, SLOB... IF YOU DON'T FIND US A ROOM, WE'RE ALL GONNA BOSS IN YOUR LOBBY-FOR-EVER!!

WELL, PERHAPS THERE IS A SPACE...

GREAT! SITUATED TWIXT A FORDESCORT AND A CHARIOT IN THE HOTEL MULTISTOREY CAR PARK.

WHAT ARE ALL THESE ROMAN PIMEN DOING HERE, ANYWAY?

KEEPING THE LOCALS OCCUPIED?

HEY, I KNOW A SHIPITVAR SONG AROUND SHARIOTS...

SWEET CHA!

OH, COME TO TO CARRY ME 'OME...

I MUST DO MY LAUNDRY - I DIDN'T BRING A CHANGE OF PILLOW-CASE, WHO ELSE IS COMING?

LET'S ALL GO AND WASH OUR DIRTY LIMEN IN PUBLIC!

SOFTWARE LAB

MUST BE FAIRY SNOW!!

HERE WE BEGINNING TO SNOW!

ARE... OH, IT'S BEGINNING TO SNOW!

OH - NO ROOM AT THE LAUNDETTTE EITHER, YOU BOYS GONNA BE LONG?

AR, WE BELONG ON YARNDER ILL, BUT WE GOTTER WASH UMMAR SACKS! WANT ANY SOPE FLAKES?

THANKS, BUT MY CHUM, KASTAPIMAN IS BRINGING SOME

NO MAN, AH SAID AH WAS GREENGIN MAH AERIAL!!

HEY! THERE'S SOMEONE IN THAT MACHINE, GOING ROUND AND ROUND WITH THE SOCKS! STAND BACK!

NAM! DON'T DU THART!!

YEUK! WATER! SOCKS! SUDS, SUDS, SUDS! IM SURROUNDED BY SILKY SUDS, SUDS, SUDS!

E KEEP! AGN, E'AD A MESSIT, SOM WE SHOVERD IM INSIDE!

IT'S ALL PI IN THE SKY!

WELL BEFORE I DELIVER MY MESSAGE...

WHAT'S COMING NEXT? WHAT ARE THOSE GUYS AT AUTOMATA UP TO?

DAVID LAKE PCW

FIND OUT MORE - NEXT WEEK!!!

GET YOUR AUTOMATA XMAS STOCKING! PIMAN'S GREATEST HITS VOL II AND THE 1985 CALENDAR - ONLY £4!! ONLY FROM US: AUTOMATA U.K. LTD, 27, HIGHLAND ROAD, SOUTHSEA, HAMPSHIRE PO4 9DA. TEL (0705) 735242. (END OF AD.)