POPULAR Computing WEEKLY

35p 14-20 July 1983 Vol 2 No 28

This Week

Vic20 software

Mike Grace finds that the quality of the artwork is not always reflected in the quality of the games in his latest review of Vic20 software on page 14.

Spectrum

Ian Logan examines the different priorities involved in expression evaluation on page 20.

Paint your Dragon

Brian Cadge explains how to invert the screen display and change the text colour. See page 22.

New releases

Up-to-the-minute information about all the latest games including *Empire* for the Dragon on page 45.

★STAR GAME

Bomber Run on Commodore 64. See page 10.

News Desk

Vic add-on causing concern

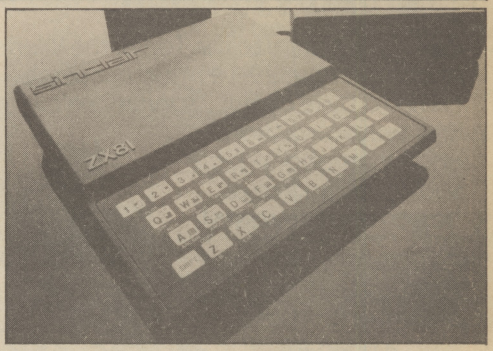
SOFTSWITCH is a new add-on for the Vic20 causing concern to software manufacturers, because it allows 'secured' Rom software packages to be broken into and saved on to tape.

Software houses have condemned the sale of the £19.95 add-on by the Swindon-based General Hardware Company, claiming that it opens the way for the easy piracy of cartridge software.

Although the unit only works with the Vic20 at the moment, its implications are more far-reaching. Many manufacturers are looking increasingly towards Rom software to avoid precisely the same sort of piracy problems, now commonplace for cassette software.

Softswitch is a small unit which plugs into the cartridge port on the Vic20. A games Rom can then be plugged into a port at its back. Softswitch then inhibits the auto-start of

Continued on page 5



No more ZX81 titles at Smiths!

WH SMITH is to stop taking new ZX81 software titles.

A spokeswoman for the company commented: "The reason is simply that consumer demand for the ZX81 has lessened.

"The ZX81 has been around for a long time and the Spectrum machine offers many more facilities."

WH Smith will however, carry on selling the ZX81: "We cannot forecast what future demand for the machine will be, but at present we will continue to sell it and support it with our main lines of software."

A spokesman for Sinclair Research would not confirm that his company had been aware of the WH Smith move, but he said that no ZX81 hardware or software orders

Continued on page 5

Classified

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer. Ring 01-930 3266 and give us the details.

FIVE MACHINE CODE Arcade games, all on one cassette: Missile Commander, Space Escape, Astro Scramble, Decender and Centipede, for only £4.95. Versions of above available for Spectrum, BBC, Vic and Dragon computers (state which). Send cheques/POs to: R. Battacharya, 3 Wensley Close, Harpenden, Herts AL5 1RZ.

TEXAS TI 99/4A CASSETTE LEADS £4.95 INCLUDING POST AND PACKING

Single Recorder only

Orders to: (Dept. *PCW*) Clares, 222 Townfields Road, Winsford, Cheshire CW7 4AX

Tel: Winsford 51374

CRICKET ON 8K/16K VIC20. At last! A Hi-res, Graphical computer game of cricket. Features: Scoreboard, 2-player control, moveable fielders, joysticks or key operation, own team names, for just £2.95. D. Spencer, 230 Low Grange Avenue, Billingham, Cleveland.

BBC, ORIC, LYNX CASSETTE LEADS WITH MOTOR CONTROL DIN to DIN or DIN to JACKS

£2.95

Orders to: (Dept. *PCW*) Clares, 222 Townfields Road, Winsford, Cheshire CW7 4AX

Tel: Winsford 51374

LYNX 48K SPACE CRABS

You've located your missile, survived enemy fire, about to bomb the alien planet, when the space crab comes hunting you. £4.25 cassette. Cheques or POs to A. P. Cowell, 61 Whitney Road, Leyton, London E10.

DRAGON 32/TANDY COLOR

Now 4 – yes 4 – fabulous magazines just for you! ! !

"RAINBOW"

"COLOR COMPUTER NEWS"

"COLOR COMPUTER MAGAZINE"

"HOT CO-CO"

all plus EXCLUSIVE UK/European Supplement and Free advisory service. Send **£2.25** (+57p SAE) for sample copy to **ELKAN ELECTRONICS** (Dept. *POP*). **FREEPOST,** 11 Bury New Road, Prestwich, Manchester M25 6LZ. Tel. 061-798 7613.

DRAGON 32. Five exciting family games: Zombie Island, UFOs, Crak-it, Boat-Blitz, Train. Send PO/cheque for £4.95 to Orion Software, 268 Gladstone Road, Barry, South Glamorgan, CF6 6NH.

Continued on page 40

NOW AVAILABLE FROM W. H. SMITH AND BOOTS

48K Spectrum

EVEREST ASCENT

A graphic simulation of man's ultimate endeavour!

Stake your claim to the Top of the World in this strategic vertical adventure. Aim to conquer the 29,141' summit of the world's highest peak ... struggle from base camp to base camp ... survive the elements ... watch out for avalanches, thin ice and wayward sherpas ... encounter abominable snowmen and cross bottomless crevasses!

A game of skill, strategy and planning for those with a head for heights!

Credit Card Hotline 0628 21107



Only £6.50

48K SPECTRUM

Can you write games like this?

If so, why not send a sample — we offer generous cash rewards!

DEALER ENQUIRIES WELCOME — EXCELLENT DISCOUNTS AVAILABLE
WRITE OR RING JOHN SALTHOUSE ON 0628 21107.

RICHARD SHEPHERD SOFTWARE
FREEPOST, MAIDENHEAD, BERKS SL6 5BY.

POPULAR Computing WEEKLY

14-20 July 1983 Vol 2 No 28

SUNSHINE

The Team

Editor
Brendon Gore

News Editor
David Kelly [01-930 3271]

Software Editor
Graham Taylor [01-839 2504]

Production Editor
Lynne Constable

Editorial Secretary
Caroline Owen

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Alastair Macintosh [01-930 3260]

Classified Executive
Diane Davis [01-839 2476]

Administration
Theresa Lacy [01-930 3266]

Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street,
London WC2 7HF
Telephone: **01-839 6835**
Published by Sunshine Publications Ltd.
Typesetting, origination and printing by
Chesham Press, Chesham, Bucks
Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643
© Sunshine Publications Ltd 1983

Subscriptions
You can have *Popular Computing Weekly* sent to your home:
UK Addresses
26 issues **£9.98**
52 issues **£19.95**
Overseas Addresses
26 issues **£18.70**
52 issues **£37.40**

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

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

Programs should, whenever possible, be computer printed.

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

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

This Week

News 5
Oric price fall

Letters 7
Incompatible portable tvs

Star Game 10
Bomber Run on Commodore 64

Reviews 14
Mike Grace looks at Vic20 software



Programming 17
A library of subroutines

Spectrum 20
Expression evaluation by Ian Logan

Dragon 22
Inverted screen display

BBC in education 26
Drawing the Welsh flag

Open Forum 29
Four pages of your programs

Adventure 37
Tony Bridge's corner

Peek & Poke 39
Your questions answered

New releases 45
Latest software programs

Competitions 47
Puzzle, Top 10, Ziggurat

Editorial

Computer crime is gaining in popularity. Modern-day 'Robin Hoods' are finding more and more ways to steal from the computer and give to the programmer.

The local government audit inspectorate published a survey of computer crime in the UK in 1981. Of the 320 odd companies taking part in the survey, only one in five admitted to being the victims of computer crime. Losses were estimated at £1m over the previous five years.

Unofficial estimates, however, place this figure much higher. In the US, computer fraud may be running as high as $3,000m a year.

Computer crime also enjoys a curious kind of status. The programmer who succeeds in persuading a bank computer to credit him with £½m is regarded in a very different light from someone who holds up that self-same bank armed with a sawn-off shotgun.

The psychology of the computer criminal is also different from that of his more mundane counterpart. The challenge of 'beating the system' is often more important than any monetary gain.

In a world that is becoming increasingly dominated by computers, the opportunities for computer crime are growing at an alarming rate. There are, as yet, few safeguards to prevent the computer criminal from practising his art.

Next Thursday

Find out if you can move up along the conveyor belt, through the holes to the computers in Belt Man, next week's Star Game for the Spectrum — a dynamic 3-D adventure game.

Subscribe to Popular Computing Weekly

I would like to subscribe to *Popular Computing Weekly*.
Please start my subscription from the ..... issue.

UK Addresses: ☐ 26 issues at **£9.98** ☐ 52 issues at **£19.95**
Overseas Addresses: ☐ 26 issues at **£18.70** ☐ 52 issues at **£37.40**
Please tick relevant box
I enclose my cheque to *Popular Computing Weekly* for .....

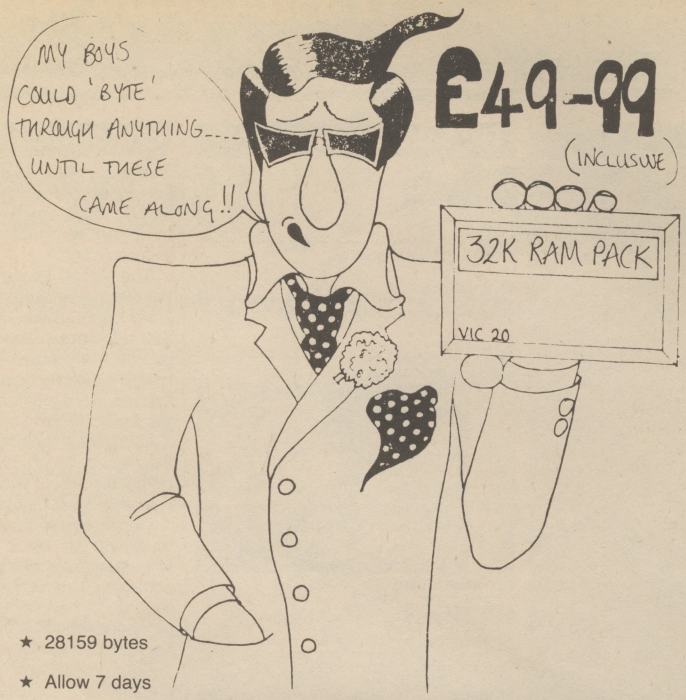
Name .....

Address .....

.....

.....

Please send this form, and cheque, to *Popular Computing Weekly*, Subscription Dept., Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.



★ 28159 bytes

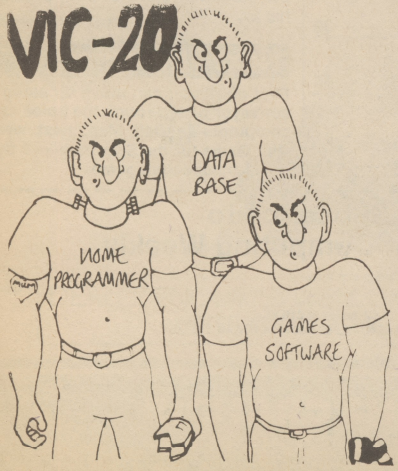
★ Allow 7 days

'GEMINI' SOFTWARE

1. DATA BASE
2. STOCK CONTROL
3. MAILING LIST
4. INVOICE/STATEMENT
5. HOME ACCOUNTS
6. COMMERCIAL ACCOUNTS

£19.95 (incl)

BUY SOFTWARE AND RAM PACK TOGETHER FOR **£59.99 (incl)**



Name.....

Address .....

.....

Please send me ☐ 32K Ram pack/s @ £49.99

Software number ☐ 32K Ram pack @ £59.99.

I enclose cheque/PO for £.....

SEND TO: (No stamp needed)

PLUS 80 LTD
FREEPOST
HARROW
MIDDLESEX HA2 0BR
Tel: 01-423 6393

Vic add-on

Continued from page 1

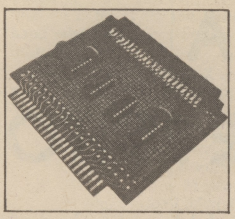
the game, by relocating the expansion Rom to a different area of the Vic20's memory map under software control.

With the auto-run disabled, software in the Softswitch program allows the cartridge program to be copied either to cassette or disc.

To run a program taken from Rom in this way, the Softswitch unit is again used, this time with an 8K or 16K Ram expansion unit used in place of the cartridge, and the program is simply loaded into Ram from cassette or disc.

Commodore's UK software manager Gail Wellington was not at all pleased to hear of the Softswitch development: "Certainly I will take legal action against anyone selling pirated copies of one of our programs, but to take action against individual users making copies for their friends is much more difficult.

"The sad thing is that the only people who will lose out with things like this will be individual software authors — we will have to take increasingly more complicated steps to protect our software and that, inevitably, will mean smaller royalties for authors. It will mean in future we may be looking at only doing our own software — rather than taking any third-party material.



"I can make it impossible for our future software on Rom to be pirated in this way — what we will have to do is make the program write all over itself when it is run. That is fine for a Rom — it wouldn't have any effect. If the program was a pirated Rom, soft-loaded back into Ram, then the program wouldn't work — and somebody would have to do quite a bit of sorting out before it ever would.

"That obviously doesn't help with our existing Vic20 software, but our Commodore 64 Roms are already protected in this way — mainly because piracy was seen as easier: on the 64 there is Ram-backed Rom."

Other manufacturers of Rom software for the Vic20 are also concerned by Softswitch.

Audiogenic's David Smithson commented: "With software piracy becoming prevalent, software houses will begin to lose money and software of reasonable quality will stop being written because it will no longer be worthwhile. Authors might as well go and become postmen — and earn more money."

Thorn EMI sells Rom software for the Vic20 and Atari machines. Hardware manager Peter Chandler said: "We are quite shocked. It is inevitable that people will bring these things out — it is very like a thing called *Mycard* manufactured in Taiwan for the Atari VCS.

"All our software is protected against this kind of thing — it will not work straight away and the pirate will have to do quite a bit of work on the program to run it. Hopefully, we have been devious enough, because the law gives us no protection."

ZX81

Continued from page 1

had been received from the retailer for at least a couple of months. "There has been a drop in ZX81 sales over the last six months and the price drop from £49.95 to £39.95 was designed to keep the machine going," he said.

"The ZX81 is now not selling in anything like the quantities of the Spectrum, but certainly enough to justify it remaining in production."

● Prism, who handled distribution of Sinclair hardware and software to all but the very large retailers, was not aware of Smith's move. Prism managing director Bob Denton commented: "It does not surprise me. WH Smith has been doing some very strange things with the ZX81 recently.

"As far as Prism is concerned, ZX81 software is still very buoyant — we have just introduced some new titles. The hardware, however, has slackened off considerably.

"I expect that by October we will find some product shortages."

Julian becomes the video king

EIGHTEEN year old Julian Rignall has become the 1983 Video Arcade Game Champion.

Julian successfully fought off competition from over 500 of the country's top arcade players to win the title. The best 18 met for the final held in London last Thursday. Julian received a prize of his own arcade machine, worth over £1,500, presented by the sponsors of the competition, UK arcade machine manufacturer, Taitel.

For the last three-and-a-half months aspiring video games whizz kids have been sending in their highest scores on any of six coin-operated games machines — *Donkey Kong, Donkey Kong Jr, Mr Do, Robotron, Amidar* and *Defender*.

The three highest scorers from each machine were then brought together by the competition organisers, *Computer and Video Games* magazine. The six best players — one from each machine — then played off on a new machine none of them had seen — Taitel's *Gyruss*, unveiled for the first time at the final.



Julian achieved his title with a score of 73,100. He won through to the final with a *Defender* score of 5,248,520 on a machine on the Royal Pier, Aberystwyth. From Tregaron in Dyfed, he is currently taking his 'A' levels prior to studying graphic design at Brighton College.

Close runner-up in the competition was David Ross, 15, from the Isle of Wight with a score on *Gyruss* of 72,350.

Prices slashed on Oric

ORIC has announced substantial price reductions on its 16K and 48K machines.

The 48K comes down by £30 to £139.95 and the 16K returns, after a brief spell at £129.95, to its original launch price of £99.95.

This brings Oric prices into line with those of its nearest competitor, the Sinclair Spectrum. Following recent Sinclair cost cutting, the 48K Spectrum was being offered at the same price as the 16K Oric. Now the rival 16K machines are matched price for price, but the 48K Oric remains £10 more expensive than its Sinclair competitor.

The new Oric prices take effect as from July 6.

As an additional bonus, new Oric owners will soon be offered a voucher with their purchase giving them £40 off the cost of the Oric MCP40 four-colour printer/plotter currently selling for £169.95. This offer will take effect "as soon as we can print the vouchers" according to Oric's sales director Peter Harding.

Unexciting trade show

MICROTRADE '83, Britain's first show exclusively for manufacturers and dealers, was rather a let down.

Few exhibitors attended the three-day event at the Barbican last week and even fewer had anything new to offer. The 55 exhibitors included only 15 or so of interest to the home computer user. Four manufacturers were there — Jupiter, Camputers, Video Technology and Oric — with Sinclair, Commodore, Texas and Atari all staying away. On the software side only Microdeal, Imagine, Prism (distributors of Sinclair titles) and Melbourne House showed.

Interesting bits and pieces included: Jupiter's 16+ Ace in a better case at £10 extra (£99.95), Melbourne House's *Terror-Daktil 4D* game, a preview of Camputers' first business software for the Lynx and a new company, Computer Software Associates, with a range of home business packages for the Commodore 64.

UNIQUE OPPORTUNITY!

BE A

SOFTWARE EDITOR

McGraw-Hill is a billion dollar world leader in information technology. In 1982 alone, we invested 42 million dollars to continue our already considerable growth rates. A significant part of this investment went into further developing an extensive range of Software products.

To consolidate our success, we now wish to appoint a dynamic "self-starter", to edit and publish software in the educational, business and personal computing markets.

This is a challenging and rewarding post requiring a high standard of education with the ability to research and identify publishing opportunities in the above areas. In addition, a good knowledge of BASIC is required, along with familiarity with as many of the current micros as possible.

There is an excellent commencing salary. Company car and benefits package for the right applicant. If you are interested in joining one of the world's most prestigious companies, please contact:



Paul Jenkinson
UK and European Personnel Director
McGraw-Hill House
Shoppenhangers Road
Maidenhead, Berkshire SL6 2QL
Telephone: Maidenhead (0628) 23431

Flying backwards

I think I may have found a major bug in Psion's *Flight Simulation* for the 48K Spectrum.

I set course for Lake Long from the SW corner of the map, intending to have a look at it from a great height. At 20,000 ft I dived for a low-level pass over the lake, but at 5,000ft I had left it too late to pull out of the dive. I opted for a downward loop instead, not expecting to complete this manoeuvre. But luck was with me and I emerged in level flight with a view of Lake Long. This was the first time I managed this loop.

But, I was flying backwards! There was no doubt about it, Lake Long was receding in the distance. No, I don't think I was suffering from pilot disorientation!

To complete this unusual flight, I set course for Main East to see if I could land backwards on instruments and a rear view. Needless to say, I did not manage it!

By the way, my height record is 23,000ft.

G D Davies
25 Hart Drive
Sutton Coldfield
W Midlands B73 5RU

Flying backwards?! I do not know about pilot disorientation, but I should think the passengers and crew were somewhat taken aback.
NB: Has anyone ever thought of including a parachute landing routine for pilots who decide to bale out?

Another bug

Further to my recent letter, which you were kind enough to publish (*PCW* 23-29 June), relating to a bug in *The Pit* adventure program, I'm afraid I have discovered another quite important bug.

The problem lies in line 2800, statement 2: *Let z = 1 + Int (Rnd*3)* leads to a random number between 1 and 3 inclusive. However, the program requires a number between 1 and 4, and the result is that it is impossible to enter level 4 as it stands.

The same problem applies to the other statements in this line, which should be, respectively, **20* and **10*. However, this is less important in that as things are, the timewarp destination is never on the right hand edge or the bottom line of the grid.

The matter is explained on page 73 of the Spectrum Manual.

Michael Kirkland
20 Batey Avenue
Rainhill
Prescot
Merseyside L35 8LT

On to a loser!

If any lucky *Penetrator* owners are growing old watching the handwriting which appears every time you start a new game, just press the *A* and *Enter* keys simultaneously — all the writing will appear at once!

PS: Please, please, get rid of 'Losers', it is the only part of your magazine which is totally unreadable.

Craig Mitchell (11)
28 Kirkstall Road
Hollin
Middleton
Greater Manchester M24 3EU

We in the office are all quite fond of Losers, but I suppose you cannot please all the people all of the time. It's funny, though, how our cartoons always seem to arouse such passions, be they for or against. Remember Arthur and Citizen Pain?

Great minds . . .

With reference to the very interesting feature about John Ritman and his *3D Combat Zone* program in the 23-29 June issue, I would like to think that "Great minds think alike" — since the principles and theory which he describes are almost identical to those which we employ in our *3D-Graphics* program.

This program is a general purpose Computer Design Aid which enables users to design any 'wire-frame' figure — just as John Ritman does in *3D Combat* for his pyramids and tanks — and then rotate these about any axis to obtain differing views in full perspective.

For anyone who is interested in the theory, our program can be examined and even altered to your own requirements. Routines for design, rotation, perspective, display, enlargement, etc, are all provided — and even an 'action replay' facility which uses a multiple screen concept very similar to John's.

The latest facility which we have provided is an interface to the RD Labs Digital Tracer and to the DK'Tronics Light Pen. Both of these can now be used to design objects directly — without the need for complex mathematics.

Just for the record, I find *Popular Computing Weekly* top value in providing a balanced diet rather than regurgitated reviews — keep it up.

Mark Orzechowski
Emsoft
37 Lennox Drive
Wakefield
West Yorkshire

Incompatible portable

After many months of monopolising the only colour TV set (a 22-inch Philips) in our house with my Spectrum, I decided to buy a 14-inch colour portable. Off I went to Dixons in Hounslow High Street, and returned with a Hitachi remote control 14-inch set.

The picture was excellent and I was very pleased with it, until I plugged in the computer. I was rewarded by a good picture, but only in black and white! I then phoned Sinclair Research, who told me that they had heard of the problem before and that the tuning on the Hitachi was not fine enough for the Spectrum. Sinclair advised me to avoid Hitachi, Grundig and Toshiba televisions for this reason.

I returned to Dixons, armed with the Hitachi and my Spectrum. They were very helpful and understanding, and let me test my computer on a Sony Trinitron in the shop, which worked perfectly. I was able to change the Hitachi for the Sony. My thanks go to Dixons for their patience and help.

Fellow Spectrum users, therefore, should beware of Hitachi, Grundig and Toshiba, when buying portable TVs, for although they are good sets, they are likely to be incompatible with the Spectrum. I do not know if other computers suffer the same problems with these sets.

W J Rolls
Isleworth
Middlesex

Children only

With reference to your article on the Computer Fair at Earl's Court (*PCW* 23-29 June) I totally agree with you. I found some of the displays interesting, but they couldn't hold my attention for long.

I went by coach to London with my father, and he thought it was a let-down as well. When there is another fair next year, there should be a special day only for children. When we went to any of the displays, we couldn't get close because of the number of children that were there.

I hope there will be a better showing next year.

Christopher Hazell
23 Woodview Rise
Strood
Rochester
Kent ME2 3RP

Now that is an interesting idea — I have heard of trade-only days for fairs, but never children-only days. What do the rest of our readers think . . .?

Where's No 25?

Is there a mistake in your numbering system, do you have a grudge against No 25 or do you like No 24 so much you wanted to print it twice? I am willing to pay a considerable sum for PCW No 25 (Vol 2) if anybody can supply a copy.

Please publish more software for that machine among machines, the Commodore 64.

Gary Foreman
81 Hazelton Road
Colchester
Essex

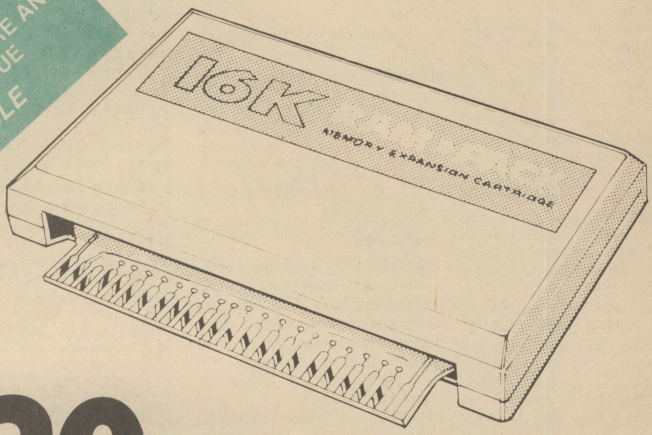
Er . . . well . . . to be honest, we made a mistake. But, if you look at page three of Vol 2 No 24 (second edition), you will see that we printed the correct number inside.

As for your desire for more software for the Commodore 64, see the Star Game in our July 14 issue (Vol 2 No . . .).

STARTECH

Absolutly the lowest prices!

STOP PRESS:
FREE COMMODORE HARDWARE AND SOFTWARE CATALOGUE
NOW AVAILABLE



VIC 20
16K RAM PACK
£28.95

Including VAT and Postage and Packing.

Tick for further information

☐ VIC 20 PRODUCTS

☐ COMMODORE 64

All prices subject to availability or change without notice.

PLEASE SEND ME

VIC 20 16K RAM PACK

Qty	Price	TOTAL
	£28.95	

(24hr. ANSAPHONE SERVICE)

Name _____

Address _____

I enclose Cheque, P/O for .....

CREDIT CARD ☐ ACCESS ☐ BARCLAY CARD ☐

POPC.W.7.83

STARTECH 208 Aigburth Rd, Aigburth, Liverpool L17.051 727-7267

COMPUSENSE
Software for Dragon 32

BARCLAYCARD VISA

PO Box 169, Palmers Green
London N13 5XA

ACCESS

Telephone: 01-882 0681 (24 Hr) and 01-882 6936
Offices at 286D Green Lanes (9.45-6.00 Mon-Fri)

SOFTWARE ON PLUG-IN CARTRIDGE FOR THE DRAGON 32 AND 64

HI-RES £25.30

Our popular 51 × 24 BIG SCREEN upgrade with redefinable character sets (FRENCH, GERMAN, SPANISH, SWEDISH, DANISH, ITALIAN). BASIC works as normal with extensions for PRINT and CLS and SPRITE GRAPHICS. A better keyboard routine gives AUTO-REPEAT and TOUCH-TYPING.

EDIT+ £34.50

Full screen editor with lots of facilities. Includes HI-RES. Available end July 1983.

DASM £18.95

Machine code assembler. Easy to use and excellent value for money. Just read the reviews and you'll be convinced. With manual and reference card.

DEMON £18.95

Our powerful monitor. Now with DUMP to PRINTER. An essential tool for the serious programmer.

DASM/DEMON £30.45

The ideal combination for developing machine code on the DRAGON.

PLEASE ADD 50p for postage and packing

DISKS — PREMIER DELTA SYSTEM NOW IN STOCK

DELTA CONTROLLER **£99.95** DELTA 1 **£299.95**
DELTA 2 **£345.95**

add £4.50 for postage

PRINTERS — with free cable and screen dump program listings

EPSON RX-80 **£342.70** EPSON FX-80 **£503.70**

add £12.50 for carriage

DEMONSTRATIONS BY APPOINTMENT — PLEASE PHONE.
ALL PRICES INCLUDE VAT. SEND LARGE SAE FOR CATALOGUE.

LOOK

DRAGON 32 £175-00
NEWBRAIN A £195-10
NEWBRAIN AD £224-30
VIC 64 £310-40

ALL PRICES INCLUDE VAT.
INSTANT CREDIT AVAILABLE
Also in Stock - BBC Computers, Apple II, Apple III, Spectrum, ZX81
Hundreds of Programs in Stock.
Send SAE for Catalogue.

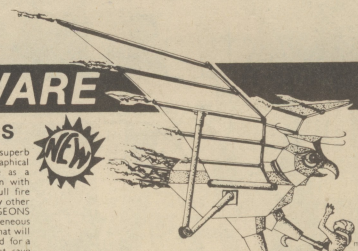


easy parking off the M56 (junc 12)

northern computers
Churchfield Road,
FRODSHAM
Cheshire WA6 6RD

TEL: FRODSHAM (0928) 35110
★ UNBEATABLE PRICES ★
WE WILL PURCHASE AND PUBLISH YOUR PROGRAMS. Call Steve Rhodes for details

ANIROG SOFTWARE



KRAZY KONG

An E-XPANDE-D screen large graphics rolling barrels hammer fireballs lifts handbags and umbrellas as you try to rescue the damsel.Kong has abducted. Spectacular collapse of Kong's lair in the fourth screen. Uses all 21K of your expanded Vic. for this 100% M.C. thriller. Complete with high score table.

KB/JS VIC 20 16K £7.90

MINI-KONG

For UNEXP from the writer of Krazy Kong comes the equally brilliant Mini-Kong. You will wonder how he managed to cram so much in the unexpanded VIC.
Brilliant multi-colour graphics, expanded screen, lift, rolling barrels, ladders, running score/Hi-score and not to forget the hand bag bonus in this all M/C presentation.

K.B./J.S. VIC 20 UNEXP £5.95

XENO II

An E-XPANDED-D screen presentation with superb action packed space thriller, written entirely in machine code with four action packed stages. To destroy the power source of Xeno II you have to fight off waves of robot attack, plasma bombing by the legions of the outer sanctum and finally attack the power source protected by a force field, continuous bombardment by guardians and blockading by wild whirling suicidal space ships. Truly a game for all arcadians.

JS VIC 20 16K £7.90

THE DUNGEONS

Enter the realms of fantasy with this superb high resolution, multi-colour graphical text adventure. Choose your role as a fighter with armour or a magician with spells to do battle with the fearfull fire breathing RED DRAGON and many other horrific monsters in THE DUNGEONS with 100 rooms, many with ingeneous traps. First of the text adventures that will keep you enthralled and frustrated for a very long time if you use the fast save facility or give up and have a new advent-ure.

K.B. VIC 20 16K £5.95

FROGRUN

Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes crocodiles lady frogs turtles cars lorries and logs.

KB/JS VIC 20 Unexp. £5.95
KB/JS SPECTRUM 16K/48K £4.95
KB/JS COMMODORE 64 £5.95

DOTMAN

Ghosts chase you as you try to eat the dots and collect points. You can turn the tables on them by eating the pills. Don't forget the ghosts have been given intelligence and will try to corner you. This feature makes Dotman exciting and challenging. All M.C. game complete with running and highest scores and tunnels.

JS/KB VIC 20 Unexp. £5.95

3D TIME TREK

At last a 3D game for the VIC! Although badly wounded you are determined to seek and destroy the marauding space pirates who have now dispersed around the galaxy in search of fresh prey. A brilliant Startrek game with a difference — spectacular 3D graphics and real arcade actions.

JS VIC 20 16K £5.95
JS COMMODORE 64 £5.95

ZOK'S KINGDOM

Your starcruiser badly damaged in a meteor storm is forced to crash land on the planet ruled by ZOK a time space generated image of Dracula. You are challenged to a battle of wits and endurance as the battle for survival starts in earnest in this big multi-screen graphical adventure in hi-res graphics and M.C. move-ments.

KB/JS VIC 20 16K £5.95

GALACTIC ABDUCTORS

A stunning action packed game which uses all of your TV screen for the superb large animated graphics. Giant Space Hawks whirl and weave in intricate patterns as they drop their deadly homing mines which will destroy your base on contact. While you are busy defending yourself the Hawks will feed on your helpless population returning only their skulls. All M.C. game complete with high score table that will blow your mind with its graphics and sound effects.

JS VIC 20 16K £7.90

SLAP DAB

An exciting game based on the arcade game PAINTER which combines fast action with strategy. Giant insects hiding under the old paint surface are released by your paint brush. You require fast action and quick thinking to outwit them and finish the panel. The game is 100 percent machine code and HI-RES. graphics also includes Hi-score and running score with brilliant sound effects.

KB/JS VIC 20 UNEXP £5.95
KB/JS SPECTRUM 16K/48K £7.95

TINY TOT'S SEVEN

KB SPECTRUM 16K/48K £4.95
KB VIC 20 Unexp. £5.95

PHARAOH'S TOMB

KB VIC 20 16K £5.95

CRAWLER

All M.C. version of Centipede.

JS VIC 20 Unexp. £5.95

CAVERN FIGHTER

All M.C. version of SCRAMBLE.

KB/JS VIC 20 Unexp. £5.95

Also available now

computers

COMMODORE - BBC - SPECTRUM - DRAGON 32
ORIC - Disc Drives - Printers Memory Add ons
and the best selection of software and books
8 HIGH STREET, HORLEY, SURREY.
29 WEST HILL, DARTFORD, KENT.

TRADE ENQUIRIES WELCOME, GENEROUS DISCOUNT
24 HR. CREDIT CARD SALES HORLEY (02934) 6083
PAYMENT BY CHEQUE, P.O., ACCESS/VISA
ANIROG SOFTWARE
8 HIGH STREET
HORLEY, SURREY
Overseas 50p post & packaging

Bomber Run

A game for the Commodore 64 by Les Allan

Bomber Run for the Commodore 64 utilises hi-resolution graphics to construct a random cityscape, and sprites to control the position of the plane and bomb.

The program gives the following options:

1. joystick (port 2) or keyboard
2. skill level (1-5)
3. plane speed (fast-slow)

As the plane flys back and forth across the sky your bombs must destroy the city to enable the plane to land, refuel and embark on another mission.

After each successful landing your flight path is lowered. However, after five successful landings your original flight path is restored and, when applicable, your skill level is automatically increased.

A score table routine is provided which lists the top 10 names against their scores. During this sequence the following options are available:

1. fire button (space bar) — return to game
2. F 1 — change skill level
3. F 7 — quit game

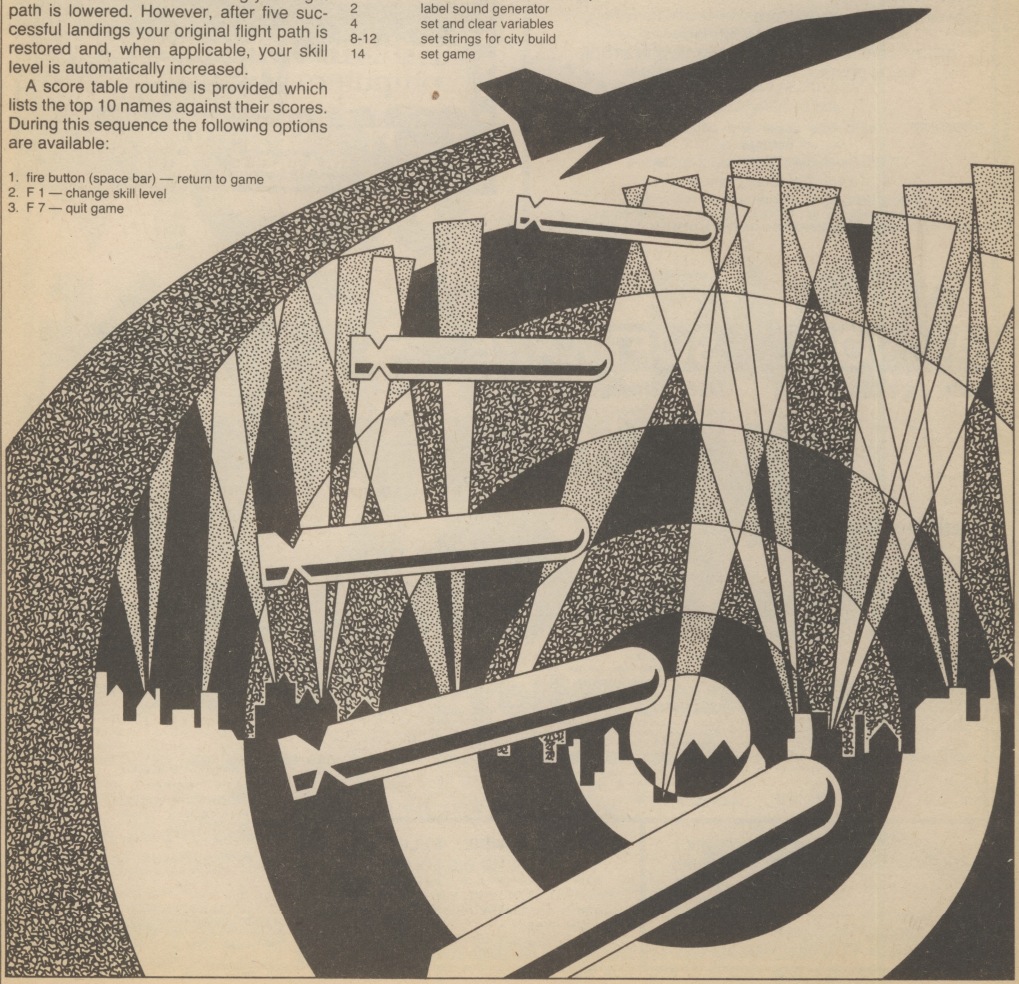
NB. Program should be saved prior to running as pressing F 7 activates re-set mode (SYS 64738). The program also self runs after 30 seconds.

Data is held in the following areas of memory:

12288-12607 — sprite graphics
14336-15359 — keyboard characters
15360-15407 — hi-res graphics

The REM statements in the program should reveal its working, but just in case here is a brief listing.

0	clear screen: dimension arrays
2	label sound generator
4	set and clear variables
8-12	set strings for city build
14	set game
15	title page and instruction routine
16-24	set screen
26-34	set sprite co-ordinates
36-44	control sprite
46	print score
48	check for collision
50-51	advance bomb pointer
52	fire button (space bar) ??
54	drop bomb and demolish building
95	delay to keep speed constant
58	check for plane landing
60	move plane
62-66	landing sequence
70-80	take off routine
82	lower flight path
86-106	print bonus point and pause play
500-510	bomb x,y: determine bomb strength



600-620	check bomb/building contact
H = (1064 + (B − 16)/8 + (BY − 45) * 5)	converts sprite to screen
700-726	crash sequence
800-804	skill level change
1000-1044	set up initial options
2000-2036	title page
3000-3020	instructions (graphics in line 4004 are shifted YOU ARE THE PILOT OF A FIGHTER PLANE)
5000-5080	score table routine
5500-5590	data

Please note that standard abbreviations for basic keywords must be used in order to satisfy some line lengths. These appear on pages 130 and 131 in the User Manual.

NOTES

1. 64th byte is read but not used for sprite generation
2. pointer for protected memory is memory start/256 ie, poke 52,12288/256
3. x co-ordinate of sprite (n) controlled thus:

```
10 for x = 0 to 343
20 poke VC+2,x and 255
30 poke VC+3,y
40 poke VC+16,int(x/256)*n
50 poke VX+21,n
60 next
```

4. **Video Chip Register**

VC —	start address (53248)
VC+2 —	sprite 1 x
VC+3 —	sprite 1 y
VC+4 —	sprite 2 x
VC+5 —	sprite 2 y
VC+17 —	screen on/off
VC+23 —	y expand
VC+27 —	b'ground/sprite priority
VC+29 —	x expand
VC+31 —	sprite/character collision
VC+32 —	border colour
VC+33 —	screen colour
VC+40 —	sprite 1 colour
VC+41 —	sprite 2 colour

5. **Main variables**

A —	read data
B —	bomb x (0-343)
D —	bomb damage
G —	1st game
H —	sprite/character conversion
I —	data pointer
X —	plane x
Y —	plane y
AT —	attack/decay
BP —	bonus points
BS —	bomb start
BX —	bomb x (0-255/083)
BY —	bomb y
DX —	plane movement
HI —	high frequency
HS —	high score
KEY —	joystick/keyboard address
LO —	low frequency
PX —	plane x (start)
PY —	plane y (start)
SB —	flash routine
SC —	current score
SS —	self start
SU —	sustain/release
VC —	video chip
VO —	volume
WA —	waveform
SC(X) —	score table (score)
SC$(X) —	score table (name)

```
0 PRINTCHR$(147):DIMSC(10):DIMSC$(10)
2 VO=54296:WA=54276:AT=54277:HI=54273:LO=
54272:SU=54278
4 D=0:G=0:CO=11:HS=0:LA=0:SC=0:VC=53248
6 FORX=1TO10:SC(X)=0:SC$(X)="* BOMBER
RUN *":NEXT
8 A$=""
10 B$=""
12 C$=""
14 POKEVC+32,0:POKEVC+33,0:IFG=0THENGOSUB
1000
15 GOSUB2000
16 PRINTCHR$(147):POKEVC+32,1:POKEVC+33,1
:POKEVC+24,(PEEK(VC+24)AND240)OR14:POKE
VC+31,0
17 REM **** SET UP SCREEN ****
18 PRINT"SCORE"SC,"HIGHEST SCORE"HS
20 FORZ=1TO38:PRINTLEFT$(A$,24)RIGHT$(B$,
Z)"":NEXT
22 FORX=3TO36:FORY=0TOINT(RND(1)*(14*SK)
+1)
24 PRINTLEFT$(A$,23-Y)RIGHT$(B$,X)MID$(C
$,(X-2AND15)+1,1)"":NEXTY,X
26 IFPY>45THEN30
28 PX=0:PY=45:BS=16
30 X=PX:Y=PY
32 POKEVC+2,XAND255:POKEVC+3,Y:POKEVC+16,
INT(X/256)*2:POKEVC+21,2
34 POKEVO,1:POKEAT,68:POKEWA,128:POKELO,
7:POKEHI,126
35 REM **** MAIN LOOP ****
36 IFX<4THENDX=SP:Y=Y+8:POKE2041,192
38 IFX<256THENPOKEVC+16,PEEK(VC+16)AND253
40 IFX>255THENPOKEVC+16,PEEK(VC+16)OR2
42 IFX>343THENDX=-SP:Y=Y+8:POKE2041,193
44 POKEVC+2,XAND255:POKEVC+3,Y:POKEWA,129
46 PRINT""TAB(8)SCTAB(34)HS
48 IF(PEEK(VC+31)AND2)=2THENPOKEWA,128:
GOTO700
50 IFX<>BSTHEN54
51 BS=BS+DX:IFSP=4THENBS=BS+DX
52 IFX>8ANDX<336ANDPEEK(KEY)=K1ANDD=0THEN
GOSUB500
54 IFD>0THENGOSUB600:GOTO56
55 FORT=1TOSP*10:NEXT
56 POKEWA,128
58 IFX>296ANDY=213THEN62
60 X=X+DX:GOTO36
61 REM **** LANDING SEQUENCE ****
62 FORT=1TO5
64 POKE1936,131:FORTT=1TO250:NEXT:POKE
1936,132:FORTT=1TO250:NEXT
66 NEXT
68 POKE1936,32:POKEVC+21,0:POKELO,0:POKEH
I,0
70 FORX=32TO314STEP2:Y=242-180*SIN(X/200)
72 POKEVC+2,XAND255:POKEVC+3,Y:POKEVC+16,
INT(X/256)*2:POKEVC+21,2
74 POKEVO,1:POKEAT,16:POKEWA,129:POKELO,
7:POKEHI,126
76 FORT=1TO10:NEXT:POKEWA,0:NEXT
78 POKEWA,0
80 POKEVC+16,0:POKEVC+21,0
82 D=0:PX=ABS(PX-344):PY=PY+8:BS=ABS(16
-PX)
84 BP=INT((RND(1)*5+10)*SC/100)
86 PRINT""TAB(11)"BONUS POINTS
"BP
88 PRINT"YOUR PLANE IS RE-FUELLED AND
READY !"
90 PRINTTAB(12)"_________________"
92 PRINTTAB(6)"PRESS | "D$" | TO START"
94 PRINTTAB(12)"_________________"
96 IFPEEK(KEY)<>K1THENSB=SB+1:GOTO110
98 IFPEEK(KEY)<>K2THEN98
100 SB=0:SC=SC+BP:IFHS<SCTHENHS=SC
102 LA=LA+1
104 IFLA=5ANDSK<1THENSK=SK+.15:LA=0:PY=45
106 IFLA=5ANDSK=1THENLA=0:PY=45
108 GOTO16
110 IFSB>20THENPRINTTAB(13)""D$""
112 IFSB>40THENSB=0:PRINT"";:GOTO92
114 GOTO96
499 REM **** BOMB STRENGTH ****
500 B=X:BX=X:BY=Y+8
502 IFB>255THENPOKEVC+16,PEEK(VC+16)OR4
504 D=INT(RND(1)*SP+SP/2)
510 RETURN
599 REM **** DEMOLISH BUILDING ****
600 H=(1064+(B-16)/8+(BY-45)*5)
602 IFH>1943THEND=0:GOTO608
604 POKEVC+4,BXAND255:POKEVC+5,BY:POKEVC
+21,PEEK(VC+21)OR4
606 IFPEEK(H)<>32ANDPEEK(H)<>133THEND=D-1
:SC=SC+1:POKEH,32:IFPEEK(H+40)=129THENP
OKEH+40,130
608 IFD=0THENPOKEVC+21,PEEK(VC+21)AND251:
POKEVC+16,PEEK(VC+16)AND251
610 BY=BY+8
612 IFSC>HSTHENHS=SC
620 RETURN
699 REM **** CRASH SEQUENCE ****
700 POKE(VC+16),PEEK(VC+16)AND251:POKE(VC
+21),2
702 IFDX>0THENPOKE2041,195
704 IFDX<0THENPOKE2041,196
706 POKEVO,15:POKEAT,68:POKESU,240:POKEWA
,129:POKELO,200:POKEHI,40
708 FORV1=15TO0STEP-.25:POKEVO,V1:POKEVC
+40,15-V1:FORT=1TO10:NEXTT,V1:POKEWA,128
710 POKEVC+40,CO:D=0
712 FORPY=YTO213STEP2:POKEVC+3,PY:FORT=1
TO10:NEXTT,PY
714 PRINT""TAB(10)"HARD LUCK   TRY
AGAIN!"
716 FORX=15TO1STEP-1:POKEVC+32,X:POKEVC+
33,X:FORT=1TO100:NEXT
718 POKEVC+17,11:FORT=1TO150:NEXT:POKEVC+
17,27:NEXT
720 FORT=1TO1000:NEXT
722 POKEVC+21,0:POKEVC+16,0
724 PRINTCHR$(147):POKEVC+32,6:POKEVC+33,6
726 POKEVC+24,21:POKE198,0:GOSUB5000:SC=0:
PY=45:GOTO14
799 REM **** CHANGE SKILL LEVEL ****
800 PRINTCHR$(147)
802 POKEVC+32,0:POKEVC+33,0
804 GOSUB1000:RETURN
999 REM **** SET UP GAME START ****
1000 PRINTCHR$(147)
1002 PRINTLEFT$(A$,7)TAB(7)"DO YOU WANT
JOYSTICKS  Y/N"
1004 P=PEEK(197)
1006 IFP=25THENKEY=56320:K1=111:K2=127:D$
="FIRE BUTTON":E$="FIRE BUTTON":GOTO1012
1008 IFP=39THENKEY=197:K1=60:K2=64:D$="
SPACE BAR ":E$=" SPACE BAR ":GOTO1012
1010 GOTO1004
1012 PRINTTAB(11)"SKILL LEVEL     1-5"
1014 PRINTTAB(11)" 1-HARD  5-EASY ]"
1020 P=PEEK(197)
1022 IFP=56THENSK=1:GOTO1034
1024 IFP=59THENSK=.85:GOTO1034
1026 IFP=8THENSK=.7:GOTO1034
1028 IFP=11THENSK=.55:GOTO1034
1030 IFP=16THENSK=.4:GOTO1034
1032 GOTO1020
```

GEM SOFTWARE

for LYNX, DRAGON, SPECTRUM and ZX81 Software

SULTAN'S MAZE by Christopher Hunt. Enter the 3D Maze in search of the Sultan's jewels, but beware, your strength may run out, or, you may come face to face with the Mad Guardian. A multi-difficulty game with fantastic graphics and sound. Price (LYNX & DRAGON) **£7.95**

MONSTER MINE by W. E. MacGowan. Escape from the mine with as much money as you can, but don't get closed in or caught by the prowling monsters. An addictive machine code game, with superb graphics and save facility. Price (LYNX & DRAGON) **£7.95.** Price (SPECTRUM & ZX81) **£4.95.**

GOLF by Pete Allen. An excellent Basic program, giving you an 18-hole course, with handicaps and choice of clubs. A golfing weakness must be specified. Amazing graphics and sound!! Price (LYNX & DRAGON) **£7.95.**

GAMES PACK III by Christopher Hunt.

CHATEAU by Pete Allen. A new type adventure, in which you must wander the Count's old mansion in search of treasure! Of course, when the Count hid his treasure, then died, he left lots of unpleasant surprises for those brave enough to try and seek out his riches!! Come face to face with Ghouls and Ghosts, Vampires and Trolls; do you run or fight? Will the mysterious Travel Agent suddenly appear and whisk you away to far off places? Where can you find the key or the lamp? Is the clock booby-trapped? Will you die a cold and lonely death, or will you win through to claim the fantastic treasures of The Chateau? Price (DRAGON) **£7.95.**

REVERSI. Pit your wits against the Lynx with this easy to learn, yet extremely demanding board game. Five skill levels, from novice to grand master.

SNAKE. Guide the snake to the food, but watch out, he will grow and must not eat the wall or himself.

PONTOON. An excellent implementation of a favourite card game in full colour with sound. Lynx is a mean Banker. Price (LYNX) **£7.95.**

GEMPACK IV by W. E. MacGowan. Two great machine code games, with full colour graphics. In **Sea Harrier** you must land your plane on the aircraft carrier, after dispersing the clouds with chemical bombs, but don't hit the ship! In **Sub Chase** you must depth charge the wolf pack without being sunk. Both with four levels of play from easy to kamikaze! Price (LYNX & DRAGON) **£7.95.**

GEM SOFTWARE
UNIT D, THE MALTINGS, SAWBRIDGEWORTH, HERTS
Telephone: (0279) 723567
TRADE ENQUIRIES WELCOME – PLEASE RING FOR DEALER PACK

DON'T MISS THIS INCREDIBLE OFFER!

50 GAMES



£9.95

YES, 50 GAMES! on cassette for all the following:

FOR YOUR MICRO

GALACTIC ATTACK
SPACE MISSION
LUNAR LANDER
PLASMA BOLT
STARTREK
RADAR LANDING
ATTACKER
GALACTIC DOGFIGHT
ZION ATTACK
IVASIVE ACTION
OXO
BOGGLES
PONTOON
SKI JUMP
HANGMAN
OLD BONES
THIN ICE
MAZE EATER
ORBITTER
MOTORWAY
FORCE FIELD
NIM
TUNNEL ESCAPE
BARREL JUMP
CANNONBALL BATTLE
OVERTAKE
SITTING TARGET
SMASH THE WINDOWS
SPACE SHIP
JET FLIGHT
PHASER
INTRUDER
INFERNO
GHOSTS
SUBMARINES
ROCKET LAUNCH
PLANETS
BLACK HOLE
DYNAMITE
DO YOUR SUMS
DERBY DASH
SPACE SEARCH
UNIVERSE
RATS
TANKER
PARACHUTE
JETMOBILE
HIGH RISE
THE FORCE
EXCHANGE

50 games on CASSETTE only £9.95 inc vat & pp

CASCADE SOFTWARE
CASCADES HOUSE
BARGAN'S LANE
LLANDOGO
GWENT
S.WALES
NP54PA

sinclair
SPECTRUM
ZX81 LYNX
DRAGON
ATARI VIC 20
apple (ON DISC & CASSETTE)
ACORN ATOM
BBC A/B
SHARP
ORIC-1
NEW BRAIN

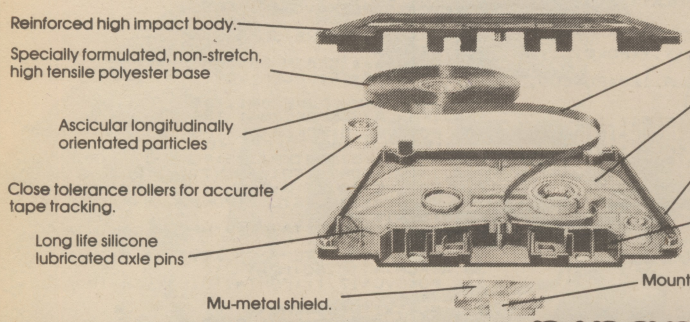
SUPPLY CASSETTE 50 FOR _____ COMPUTER
I enclose cheque/P.O.

Name _____ PCWK2

Address _____

Mail order only.

ORDER NOW!



For some time a specially formulated professional quality data tape has been available to software producers and duplicators. This high quality tape has been specially formulated for micro based data storage systems. With the rapid growth of home computers and the unsuitability of most audio tapes used in short lengths, it has been decided to make this tape available to the general public under the name of PIRANHA.

The PIRANHA computer tape will soon be obtainable through selected retail outlets, but to give you a taste of the PIRANHA's astonishing data performance we are launching a short mail order campaign in the leading Micro magazines where we are offering a limited number of PIRANHA computer cassettes at an amazing price.

piranha Computer Cassettes

Oak House, High Street, Northleach, Gloucestershire GL54 3ET.

Please send the following DC 15 cassettes
Pack of ten at £3.99 plus £1 p&p No. ☐
Pack of one hundred at £39.90 No. ☐
plus £3.50 p&p
I enclose £..... Cheque/P.O.
(Payable to Piranha Computer Cassettes)
Name and Address (Block Capitals) .....
.....
.....
..... Post Code .....
Computer Type .....
Trade/Bulk Enquiries Welcome.

```
1034 PRINTTAB(14)"■■■PLANE  SPEED"
1036 PRINTTAB(11)"■ F-FAST  S-SLOW ]"
1038 P=PEEK(197)
1040 IFP=21THENSP=8:RETURN
1042 IFP=13THENSP=4:RETURN
1044 GOTO1038
1999 REM **** TITLE PAGE ****
2000 POKEVC+17,11:PRINT"■■■■■■■■   ■■■
■■■■■■   ■■   ■■   ■"
2002 PRINT"■■■■ ■■ ■■ ■■ ■■ .. ■■ ■■ ■■
■■■■■ ■■ "
2004 PRINT"■■■■ ■■ ■■ ■■ ■■ ■■■ ■■ ■■ ■■
■■■■■ ■■ "
2006 PRINT"■■■■ ■■■■■ ■■ ■■ ■■ ■■ ■■■■■
■■ ■■■■■■ ■■ "
2008 PRINT"■■■■ ■■■■■ ■■ ■■ ■■ ■■■■■
■■■■   ■"
2010 PRINT"■■■■ ■■ ■■ ■■ ■■ ■■ ■■ ■■
■■■■■ ■"
2012 PRINT"■■■■ ■■ ■■ ■■ ■■ ■■ ■■ ■■ ■■
■■■■■ ■■■ ■"
2014 PRINT"■■■■   ■■■■■   ■■■■■ ■■ ■■
■■■■    ■■ ■■■■ "
2016 PRINTTAB(12)"■■■■     ■■■ ■■ ■■ ■■ "
2018 PRINTTAB(12)"■ ■■ ■■ ■■ ■■   ■   "
2020 PRINTTAB(12)"■ ■■ ■■ ■■ ■■       "
2022 PRINTTAB(12)"■ ■■ ■■ ■■ ■■       "
2024 PRINTTAB(12)"■    ■  ■ ■■ ■■    "
2026 PRINTTAB(12)"■   ■■■■■ ■■■ ■■■   "
2028 PRINTTAB(12)"■ ■■■ ■■■ ■ ■■ ■■■ "
2030 PRINTTAB(12)"■ ■■■■ ■■■■■   ■■■■ ■■
■■ "
2032 PRINTTAB(31)"■BY■■■■LES ALLAN":POKE
VC+17,27
2034 FORT=1TO1000:NEXT
2036 IFG=1THENRETURN
2999 REM **** HI-RES CHARACTERS ****
3000 POKE52,48:POKE56,48
3002 POKE56334,PEEK(56334)AND254
3004 POKE1,PEEK(1)AND251
3006 FORI=0TO1024:POKEI+14336,PEEK(I+5324
8):NEXT
3008 POKE1,PEEK(1)OR4
3010 POKE56334,PEEK(56334)OR1
3012 FORI=0TO47:READA
3014 POKE15360+I,A:NEXT
3016 FORI=0TO319:READA:POKE12288+I,A:NEXT
3018 POKE2041,192:POKEVC+40,CO
3020 POKE2042,194:POKEVC+41,15
3999 REM **** INSTRUCTIONS ****
4000 POKEVC+17,11:POKEVC+24,23
4002 PRINT"■■■■────────────────────────────
"
4004 PRINT"■ ■■ ┌╮ ♠─ │ ┌ ╗└┘ ┌─ ♠ ─│
‖─ ┐♠╱■■ "
4006 PRINT"■────────────────────────────
"
4008 PRINT"■■■■UEL IS RUNNING DANGEROUS
LY LOW AND"
4010 PRINT"■■■IN ORDER TO RE-FUEL  YOUR
BOMBER YOU"
4012 PRINT"■■■MUST DESTROY  THE ENEMY CI
TY  BEFORE"
4014 PRINT"■■■LANDING. ╱SE YOUR BOMBS CAR
EFULLY AS"
4016 PRINT"■■■THERE IS ONLY 1 AVAILABLE
AT A TIME."
4018 PRINT"■■■■ OUR SKILL LEVEL IS INCRE
ASED AFTER"
4020 PRINT"■■■FIVE CONSECUTIVE LANDINGS.
OU MAY"
4022 PRINT"■■■CHANGE YOUR SKILL LEVEL UP
OR  DOWN"
4024 PRINT"■■■AT THE END OF EACH GAME.
■┌─ └─ "
4026 PRINT"■■■■■■■*** ■╱─ ■"E$" ■┌ ♥│♠
─ ■***■"
4028 POKEVC+17,27
4030 IFPEEK(KEY)<>K1THENSB=SB+1:GOTO4036
4032 IFPEEK(KEY)<>K2THEN4032
4034 G=1:SB=0:RETURN
4036 IFSB>10THENPRINTA$TAB(12)D$;
4038 IFSB>20THENSB=0:PRINTA$TAB(12)E$;
4040 GOTO4030
4999 REM **** SCORE TABLE ****
5000 Z=0:FORX=1TO10:IFSC>SC(X)THENZ=X:X=11
5002 NEXT:IFZ=0THEN5020
5004 PRINT"■■■■■■■■■"TAB(7)"ENTER TEXT
FOR SCORE TABLE"
5006 INPUT"■■■■■■■■■■■NAME■■■■...........
....■■■■■■■■■■■■■■■■■";N$
5008 IFLEN(N$)>15THENN$=LEFT$(N$,15)
5010 FORX=1TO15:Z$=MID$(N$,X,1):IFZ$="."
THENN$=LEFT$(N$,X-1):X=16
5012 NEXT
5014 IFZ=10THEN5018
5016 FORX=9TOZSTEP-1:SC(X+1)=SC(X):SC$(X+
1)=SC$(X):NEXT
5018 SC(Z)=SC:SC$(Z)=N$
5020 POKEVC+17,11:PRINT"■"TAB(12)"■** ■SC
ORE TABLE ■**■"
5022 FORX=1TO10:PRINT"■■ RUN■";X;TAB(10);
"■";SC(X);TAB(23);"■";SC$(X)
5024 NEXT
5028 POKEVC+17,27:POKEVC+27,2
5030 FORX=0TO314STEP2:Y=65+100*SIN(X/100)
5032 POKE2041,192:POKEVC+29,2:POKEVC+23,2
:POKEVC+40,7
5034 POKEVC+16,INT(X/256)*2:POKEVC+2,XAND
255:POKEVC+3,Y:POKEVC+21,2
5036 NEXT
5038 POKEVC+21,0:POKEVC+2,0:POKEVC+3,0:PO
KEVC+29,0:POKEVC+23,0:POKEVC+40,CO:POKE
VC+27,0
5040 IFPEEK(197)=4THENSB=0:SS=0:GOTO800
5042 GOTO5052
5044 IFPEEK(197)=3THENSYS64738
5045 GOTO5052
5046 IFPEEK(KEY)<>K1THEN5052
5048 IFPEEK(KEY)<>K2THEN5048
5050 SB=0:SS=0:RETURN
5052 SB=SB+1:SS=SS+1:IFSS=300THENSB=0:SS=
0:RETURN
5054 IFSS>75ANDSS=<150THEN5066
5056 IFSS>150ANDSS=<225THEN5074
5058 IFSB=<2THENPRINTA$TAB(7)"■PRESS ■"E
$" ■TO START";
5060 IFSB>2ANDSB=<4THENPRINTA$TAB(13)D$"";
5062 IFSB>4THENSB=0
5064 GOTO5046
5066 IFSB=<2THENPRINTA$TAB(7)"■PRESS ■F1
]■ TO CHANGE LEVEL";
5068 IFSB>2ANDSB=<4THENPRINTA$TAB(13)"■■
F1]■";
5070 IFSB>4THENSB=0
5072 GOTO5040
5074 IFSB=<2THENPRINTA$TAB(7)"■ PRESS ■F
7]■ TO QUIT GAME! ";
5076 IFSB>2ANDSB=<4THENPRINTA$TAB(14)"■■
F7]■";
5078 IFSB>4THENSB=0
5080 GOTO5044
5499 REM **** HI-RES DATA ****
5500 DATA24,24,24,24,24,60,126,255
5502 DATA255,153,153,255,255,153,153,255
5504 DATA128,152,153,255,255,153,153,255
5506 DATA56,16,124,186,186,40,108
5508 DATA56,186,146,124,56,56,40,108
5510 DATA90,165,90,189,189,90,165,90
5511 REM **** PLANE F'WARD ****
5512 DATA0,0,0,0,0,0,0
5514 DATA0,0,0,0,0,0,0,0
5516 DATA0,0,0,0,0,0,0,0
5518 DATA0,0,0,0,0,0,0,0
5520 DATA0,0,0,0,0,0,0,96
5522 DATA255,254,240,24,96,240,48,192
5524 DATA255,255,227,255,255,251,127,255
5526 DATA255,127,255,251,15,255,195,0
5527 REM **** PLANE B'WARD ****
5528 DATA0,0,0,0,0,0,0,0
5530 DATA0,0,0,0,0,0,0,0
5532 DATA0,0,0,0,0,0,0,0
5534 DATA0,0,0,0,0,0,0,0
5536 DATA0,0,0,0,0,0,0,127
5538 DATA255,6,6,24,15,3,12,15
5540 DATA199,255,255,223,255,255,255,255
5541 DATA254,223,255,254,195,255,240,0
5542 REM **** BOMB ****
5544 DATA0,0,0,0,0,0,0,0
5546 DATA0,0,0,0,0,0,0,0
5548 DATA0,0,0,0,0,0,0,0
5550 DATA0,0,0,0,0,0,0,0
5552 DATA0,0,0,0,0,0,0,0
5554 DATA60,0,0,24,0,0,60,0
5556 DATA0,60,0,0,60,0,0,60
5558 DATA0,0,60,0,0,24,0,0
5559 REM **** CRASH F'WARD ****
5560 DATA0,0,0,0,0,0,0,0
5562 DATA0,0,0,0,0,0,0,0
5564 DATA0,0,0,0,0,0,0,0
5566 DATA0,0,0,0,0,0,0,0
5568 DATA0,0,255,0,0,24,0,96
5570 DATA48,254,240,255,96,240,255,192
5572 DATA255,255,227,255,255,251,127,255
5574 DATA255,127,0,251,15,0,195,0
5575 REM **** CRASH B'WARD ****
5576 DATA0,0,0,0,0,0,0,0
5578 DATA0,0,0,0,0,0,0,0
5580 DATA0,0,0,0,0,0,0,0
5582 DATA0,0,0,0,0,0,0,0
5584 DATA0,0,255,0,0,24,0,127
5586 DATA12,6,6,255,15,3,255,15
5588 DATA199,255,255,223,255,255,255,255
5590 DATA254,223,0,254,195,0,240,0
6000 REM **********************
6002 REM **********************
6004 REM **** COMMODORE 64 ****
6006 REM **** LES     ALLAN ****
6008 REM **** 6TH JUNE '83 ****
6010 REM **********************
6012 REM **********************
```

Taken at face value

Mike Grace looks behind the covers of another range of *Vic20 software*

It seemed to me that, with the passage of time and the increasing number of competitors entering the software scene for the Vic20, the quality of the games market should be on the increase. Indeed, the professionalism of many of the cassette covers helped to create this myth in my mind, for many of the companies have invested in artists, colour printing, and generally improving the overall eye-catching presentation that I personally feel to be very important. And, I would like it to be noted, that when I say important I am not talking about selling the product (though needless to say this is rather important to the software company), but rather from the overall feel that you have bought something that is nice and at least worth what you spent.

So, imagine my surprise on receiving the latest batch of goodies from the editor to discover that I have been both right — and wrong. I had been right in that the covers were indeed improved almost beyond recognition (gone are the days, it seems, of the hastily scrawled sketch of an alien on a mystic horse or whatever), to be replaced more and more by jazzy and highly artistic space or fantasy scenes. But, I was also wrong, in that the first three games I tried out were so poor by comparison with many I've been reviewing of late that I found it incredible they had been marketed at all. Of course, many people may buy these cassettes on the strength of



the covers (let's face it, unless you are at an exhibition it can be difficult to try out a prospective game), but, like many a paperback, it's extremely dangerous in the software world to judge a game by its cassette cover.

But, let's be a little more specific. Lyversoft of Liverpool provided me with two cassettes, both of which demonstrate exactly what I'm talking about. In neither case were there any instructions with the games, except the simple comment "To load type LOAD".

The first game I loaded was *Lunar Rescue* which seemed to be *Frogger* in outer space, and consisted of a mother ship (the equivalent of home) at the top of the screen and three little astronauts at the bottom. Between the astronauts are a stream of continuously moving meteorites (like the cars in the road in *Frogger*) and your mission (should you decide to accept it!) is to pilot a spacecraft between the meteorites, pick up an astronaut, and then pilot your way safely back to the ship.

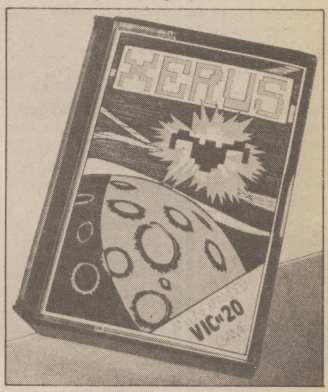
Detonated by a passing meteorite

The game is very slow and relies on the keys *Z* and *M* to move the ship left or right as, once started, your craft will automatically either move up or down the screen, depending on which way you're going at the time. Unfortunately, besides being slow, I found quite often the keys failed to work which meant I was detonated by a passing meteorite most unfairly. I found the game exceedingly boring and gave up playing after about 10 minutes. After all, when you cannot win because the computer doesn't respond to your instructions and the keys don't work — it's not really worth it, is it?

The second cassette has the same lurid cover (this time obviously drawn by someone who couldn't have any idea what the games are about as the picture of one of the games, *Crazy Climber*, shows a savage battling red balloons and giant snakes in a jungle, whilst the game is about a man running up and down ladders on scaffolding in the style of *Krazy Kong* picking up flags). The two games are *Apple Bug* and *Crazy Climber*. The latter is as I've described, with you as a little man running against the clock to collect flags to score points. Every now and then a piece of masonry (I assume) drops inexplicably from above and knocks a flag off before you can get to it, thereby reducing your chance of a high score. You have one minute to collect the flags, then *Time's Up* appears in the middle of the screen and your score is displayed.

The other game, *Apple Bug*, suffers from a mysterious fault where a snake (your enemy) can move much faster than you can. So, whilst your goal is to eat apples in a maze (*Pacman* style), I found I never managed to eat more than one as the snake always got me. One problem was that the keys I pressed to move me seemed to be much slower-acting.

Looking at all three games together, I'm amazed that they've been presented in such a poor form. No attempt has been made to add interest to the graphics, or even the instructions at the start. The use of a joystick these days would seem to be mandatory, yet none of them offer this facility. Written in Basic (I assume), they suffer from slow action. And, perhaps worst of all, they seem to me to be poor imitations of other games. Priced at £6 a cassette, I fail to see any reason for even considering purchase of either cassette in view of some of the other software around in the same price range.



Rabbit Software is another company which has taken recently to packaging its wares in large boxes containing the cassette inside (similar to Commodore's approach). This is a neat trick, as it makes you think (irrationally) that you're getting more for your money, especially as most people probably do as I do and throw the box away on reaching home. However, it does make the initial purchase look more attractive, so as these cost a little more than the average game (£10 a tape) let's see if they give better value.

I had two games to review, both needing extra expansion (8K or over). The first of these was *Cylons*. On loading, the screen goes black and gives you the option of Beginner/Intermediate/Advanced/Expert (by pressing *F1*), the option of a fast start or not (by pressing *F2*), and whether you want to have Ricochet and/or Terrain by pressing *F3* and *F4*. This seemed a little strange on first playing (after all, I didn't even know what half the options meant yet), but I keyed in what seemed to be the safest thing and off we went.

Cylons is really another version of *Asteroids*, with your spaceship resembling a pawn piece out of a chess set and the asteroids being little red whirly-gigs that chase and fire at you with the same degree of skill you'd expect from alien baddies. By pressing *C* at the end of a game you get the options back and have the opportunity of changing. Terrain adds a very basic landscape of mountains to the bottom of

the screen and, if you crash into a mountain, you blow up. Ricochet means that either your ship or your bullets hit the side-walls of the screen and bounce back again. Adding a higher skill level increases both the speed and the variety of the baddies (as we'd expect).

I felt this game was not really worth the extra money and, although I'm not a lover of this type of game, I also tried it out on a number of children, all of whom gave it the thumbs down.

However, the second game from Rabbit, a strangely-sounding thing called *Critters*, started to relieve our depression at this batch of software a little. In *Critters*, you are a stick man who needs to protect a line of apples lying on the ground (the bottom of the screen) from wave after wave of 'vultures' who seem intent on grabbing your apples (I must confess that I was not sent the instructions for either of the Rabbit games and, as none are included in the game itself, I may be missing some vital aspect or doing Rabbit a slight disservice with my own attempts to play, but having said that let's get back to the action).

The graphics are definitely better in *Critters* than in *Cylons* and the vultures look quite realistic. They tend to swoop down on you with sudden and dramatic speed, and your little man jumps about and fires quite realistically as well. Once a vulture is hit, he turns black and is of no more concern. However, I found it quite hard to control my stick man with the agility I would have liked, so it seemed that a vulture could slip in under my guard and swipe an apple every now and then, and I couldn't stop him. Once all five apples have gone, the game is over.

An early solo venture

At £10 for each cassette I did feel both are overpriced. And, although the idea behind *Critters* was a little better than the others I'd tried so far, I still felt much of the originality I've been seeing from people like Llamasoft and Anirog in the past was missing.

Hopefully, I turned to *Xerus* from Electronic Leisure and loaded it in. Again no real instructions with the game, but Electronic Leisure enclose a printed page from a dot-matrix printer (looks like the Vic1515) and that, coupled with the slightly amateurish artwork on the cover, lead me to suspect that Anton Hinxman (the author) may well be running this company as an early solo venture. But, my speculations were soon forgotten as soon as the game loaded.

Instructions appeared, neatly presented and with both joystick and keys explained, then we were off. It is another game where you patrol along the bottom of the screen, firing rapidly as you go (I found it best just to keep my finger on the firing button all the time) and the alien baddies drop down on you and try to zap you away. Movement is fast, the graphics are good (the aliens look



a little like a bull's head with horns) and the score is displayed neatly along the bottom of the screen. I found it relatively easy to hold my own and not be blasted to bits as soon as the aliens appeared (a problem I occasionally have with some games), but as each game ended (you have the usual three lives) I found my score annoyingly well below the 'top score 5000' remark which appears as soon as you finish any game. Perhaps, if you aspire to the heights of a top score, you get a bigger gun (as in *Abductor* by Llamasoft) or perhaps you just get faster and meaner baddies — I don't know yet and from the way I'm going it'll be quite a while before I do — but I liked the game.

Sumlock Electronic Services is a company which has produced efficient and attractive covers for its cassettes. *Skramble* (for the unexpanded Vic at around £8) certainly looks good at first sight, with neat typed instructions, lurid views of a space battle on the front and, on loading, a mixture of flashing screens and a 'theme' tune which sounded very like the theme from Superman. Regrettably, the game proved to be a disappointment, for the graphics are rather amateurish, the speed slowish and, compared with other games at less price, it does seem not much care has gone into presentation. The game is simply another spaceship flying along, firing at aliens ahead or dropping bombs on the enemy bases, whilst beneath the slightly irregular landscape moves along.

To give the game its due, there are several levels, so that if you survive the first wave you get an impenetrable wall of fireballs to manoeuvre through, then it starts to get faster. The time allowed depends on the amount of fuel you have, and to refuel all you have to do is destroy enemy fuel tanks (represented by red or black splodges on the ground, I wasn't sure which). But, again, a little more imagination could have been used.

In fact, *Skramble* brought up several points that I think distinguish a good game from just a mediocre one. Firstly, there is a distinct lack of guidance for the player as to what the screen display is doing whilst you are playing — for example, a white bar starts to move along on the top of the screen as you start, but is this time running out, your fuel, or what? This bar is quite mysterious, as if you do survive until it runs out then instead of a bar a number of mysterious graphic symbols appear (which could be the shape of the alien ship, base, or whatever you have just hit).

The second point is that an irritating tune plays all the time you are engaged in battle, and you can't really turn the sound down as then you lose the satisfying sound effects of your cannons firing and your bombs destroying all alien life! It should be possible to play without a musical background, but retaining the delicious zaps and booms.

Other points are the obvious lack of

continued over the page

Firm	Program	Cost	Value (1-10)
Anirog 26 Balcombe Gardens Horley Surrey	*Xeno II*	£7.90	9
Electronic Leisure 11 Sherwood Close Christchurch Dorset BH23 2DD	*Xerus*		6
Lyversoft 66 Lime Street Liverpool L1 1JN	*Lunar Rescue* *Apple Bug/* *Crazy Climber*	£5.95 £5.95	2 4
Quicksilva 13 Palmerston Road Southampton	*Skyhawk*	£7.95	8
Rabbit 380 Station Road Harrow Middlesex HA1 2DE	*Cylons* *Critters*	£9.99 £9.99	5 6
Sumlock Royal London House 198 Deansgate Manchester M3 3NE	*Skramble*	£7.95	5

imagination used in graphics and colour, the incredible feat of having to play with joystick and keyboard (you have to press the spacebar to drop bombs and the firing button to fire your cannon, preferably simultaneously), the lack of care taken in presenting instructions to the user (I think even I could have improved on the screen display for using keys or joystick) and other little points that help make a game just that little better. It may sound like I'm picking on *Skramble* — I'm not. I'm just using it as an example of a general problem in Vic software.

Skyhawk is a game from Quicksilva (the ones with the splendid full colour adverts in the computer magazines), with another impressive cover of a sleek jet streaking towards us and the rolling English countryside below. Inside the cassette cover is a storyline, giving us a little background to the plot of the tape (it appears that mysterious raiders are bombing a quiet European village to destruction until a mysterious stranger comes to their aid and, at the cockpit of his jet, he patrols the skies above the village, waiting to zap the baddies from the sky).

On loading, a most impressive scene appears of buildings in a green countryside — the graphics department has gone to town with very realistic three-dimensional houses and blocks of offices. Below this scene are three small displays, one for fuel, one for score, and one which is an overall radar screen giving you an idea of where the invaders are, so that you can fly your jet in the appropriate direction. And even your ship looks better than many I've seen in the preceding games.

Style and presentation

In fact, this game isn't any different from *Skramble* in concept — all you do is fly along, firing at the baddies when they appear — but the care and thought which has gone into presentation, plus the superior sound effects and incredible graphics, make it a thousand times more enjoyable to play. In some ways it's the little things that make the real difference (like the fact that a blip warns you when fuel is low and you have to hover over a fuel pad to get restocked) and, as *Skyhawk* costs the same as *Skramble*, it isn't hard to know which one is worth the money (it costs £7.95 and needs an 8K or 3K expansion — make sure you get the right one).

The final game this time is *Xeno II* for the 16K Vic from Anirog Software and priced at £7.90. No flashy cover with my review copy, just a hastily prepared print-out on the 1515 to tell me what to do. But, I've been impressed with Anirog in the past, so I awaited this game with anticipation.

Being 16K, it takes an age to load, but it's well worth the wait. The screen is fully taken up with graphics and the sound effects are good, but it's the style and presentation that wins again. In this game you have four stages to manoeuvre through, starting with another version of *Frogger* in outer space in that you must pilot your spacecraft through the mass of meteorites (sound familiar?) to land safely on the planet's surface. Now, to accomplish this feat you need to apply thrust at the last minute, or else your ship just crashes into the surface. It was here that I began to suspect my joystick was not allowing me to get full value from this game (and possibly others I've reviewed, I must add), as I just could not stop from crashing into the surface no matter how hard I tried. Thus, I never made it to stages 2, 3 or 4.

So, to try and add an element of suspense to these reviews, I'll leave *Xeno II* until I have been able to acquire a better joystick.

To summarise, then, another collection of arcade games for the Vic with approximately the same price-tag, but vastly different in value for money and presentation. With so much software about, I think the best advice I can now give to Vic20 owners is — *don't buy without seeing the goods.* ■

NOW for the JUPITER ACE Superchess II £11.95

ORIGINAL SUPERCHESS
10 levels of play, plus many features
16k ZX81 £4.95
48k Spectrum £4.95

NOW
16k SUPERCHESS £6.95
The best 16k Spectrum Chess program. 3 levels of play with playing strength similar to the 48k version's first three levels. Analyse mode, plays several openings e.g. Queens Gambit, Ruy Lopez, plus more features. Runs on 16k and 48k Spectrum

Specialists in high quality, intelligent games
cp software
Spectrum Software

Superchess II
THE BEST AT £7.95
● 7 levels of play ● Plays a variety of openings e.g. French Defense, Sicilian Defense, Ruy Lopez, Queen's Gambit etc. ● Self play mode ● Analyse mode ● Recommended move
For Sinclair 48K SPECTRUM

BACKGAMMON
Very popular
48k Spectrum £5.95

ZX DRAUGHTS
10 levels of play, very fast
48k Spectrum £5.95

SNAIL LOGO
An implementation of turtle style graphics. Regardless of age, SNAIL LOGO is an ideal way to explore the concepts of form and design and to learn the associated programming procedures, or just to have fun creating interesting patterns. Standard Logo SNAIL LOGO supports commands, e.g. Procedures, Repeat, Parameters, Replace. It includes syntax checking and an editor, plus other detail features.
48k Spectrum £9.95

SPECTRUM FORTH
FORTH - 10 times faster than Basic, much easier than machine code. If you want to discover the advantages of Forth or are already converted, Spectrum FORTH is the ideal package. It is cassette-based and includes Spectrum Forth, a sample Forth program and comprehensive user documentation. It has all Forth structures and allows full use of the Spectrum's colour, hi-res graphics. Specify 16k or 48k when ordering.
16k version, about 114 new words can be defined
16k Spectrum £9.95
48k version, about 1000 new words can be defined
48k Spectrum £9.95

COLOSSAL CAVES
(Adventure 1 by Abersoft)
Enter the Colossal Cave, discover the treasure left by the wizard. On your travels you will meet dragons, snakes, trolls and other denizons of the underworld. Be warned, this adventure can be addictive. Includes a save facility so that the adventure can be continued from the point reached when saved.
48K Spectrum £6.95

SPECTRUM BRIDGE TUTOR
Improve your Bridge with Spectrum Bridge Tutor. Uses the Acol bidding system including Blackwood and Stayman conventions. Each of the 40 hands illustrates a particular aspect(s) of the bidding and play. Following the card play is an explanation of those aspects highlighted in the hand. The correct bid and play must be made in order to progress but a help feature is included.
For 16k and 48k Spectrum -
Beginners (40 hands) £5.95 Advanced (40 hands) £5.95

Speech from the Spectrum 48k
SOFTALK I 'Multiwords' 70 plus words £5.95
SOFTALK II 'Spacegames' 80 plus words £5.95

BEEPER AMPLIFIER
Plugs directly to the Spectrum's EAR or MIC socket. Battery powered (not supplied) £5.95 or SAVE £1 when ordered with any program. Please add 35p for p&p.

UK Prices include post & packing. Despatch within 48 hours of receipt of order. Send SAE for catalogue. (For orders outside UK add 80p for postage). Send cheque or postal order to:
Also available from WH Smith - Computer Branches
CP SOFTWARE, Dept.W6, 17 Orchard Lane, Prestwood, Bucks. HP16 0NN

TOP RATES PAID FOR HIGH QUALITY PROGRAMS -
SEND YOUR MATERIAL FOR EVALUATION AND PROMPT REPLY.

A routine program

***Bryan Skinner** explains the advantages of building up your own library of subroutines*

Although I have stressed the top-down approach to program design (*PCW*, 3-11 May), such a technique does have its disadvantages. Perhaps the most salient of these is that it provides poor detail as to exactly how the various routines required are to be performed.

This article should remedy that deficiency somewhat, as it will approach the problem from the other end. This implies that the best compromise one can make is to design a program from the top-down, but to construct it from the bottom-up.

Most professional programmers and serious hobbyists create for themselves over time a "library" of subroutines; short routines which are kept on disc or tape and which can be appended to the body of a program under development.

Many commercial programs consist of a single master program which calls up, or "chains", other minor programs called "overlays". One reason for this is that the main program itself may be so large that there would be no room in Ram for all the additional routines required. Overlays can be *loaded* into an area of Ram and run from the main program, rather like calling up a subroutine. When they have finished their functions, control is returned to the master program.

Other systems allow subprograms to be "chained" to the main program by *loading* the sub-programs, passing variables to them and *reloading* the master program when they have finished.

The other reason for using such subprograms or subroutines is that it saves having to rewrite often-used routines each time you want to use them. In this article I shall provide coding and examples of routines for the Dragon 32 which I have found to be of particular use.

I have already provided the "press space to continue" routine in a previous article (*PCW*, 23-29 June). A similar routine can be used when one wants to provide the user with the opportunity to check his input and retrace his steps when entering data. This takes the form shown in the flowchart in Figure 1.

This routine needs but two variables, *A$* (the user's input) and *R$* (whether or not to continue). The subroutine itself is represented by the three lines, *Clear Display*, *Display Input* and *Prompt — Accept$Reject*, and is coded as follows:

```
900 CLS
910 PRINT A$
920 PRINT
930 PRINT
940 PRINT "A=ACCEPT/R=REJECT"
950 R$=INKEY$: IF R$<>"R" AND R$<>"A"
    THEN GOTO 950
960 CLS
970 RETURN
```

To use the routine, we first set the user's input as *A$*, using a command such as *Input A$*, then call the subroutine which clears the display, displays the input and asks the user if they want to keep this value, or re-enter it. If they want to re-enter, when the subroutine *Returns* command to the calling routine, *R$* will be set to "*R*", so we can test for this and, if *R$* is *R*, repeat the input procedure.

As an example of the subroutine in use, the following should make things clear:

```
90  CLS
100 PRINT "ENTER ITEM TO SEARCH FOR";
110 INPUT A$
120 GOSUB 900
130 IF R$ = "R" THEN GOTO 90
140 . . . rest of program
```

It should be apparent that this fragment of code will cycle round lines 90-130 until the user makes an entry and responds *A* to the *Accept/Reject* prompt. Note too that the screen will not get cluttered with old entries, due to the *CLS* statements.

You will notice if you try this example that the screen display is still "messy". I firmly believe that you should control very carefully exactly where things appear on the screen. That is, you should never use the *Print* statement on its own — always use *Print@*. Similarly, avoid *Input "Prompt";A$*.

It is not always easy to do this, but the polished and professional appearance of your programs will be well worth the time spent getting things exactly right and will reflect your competence.

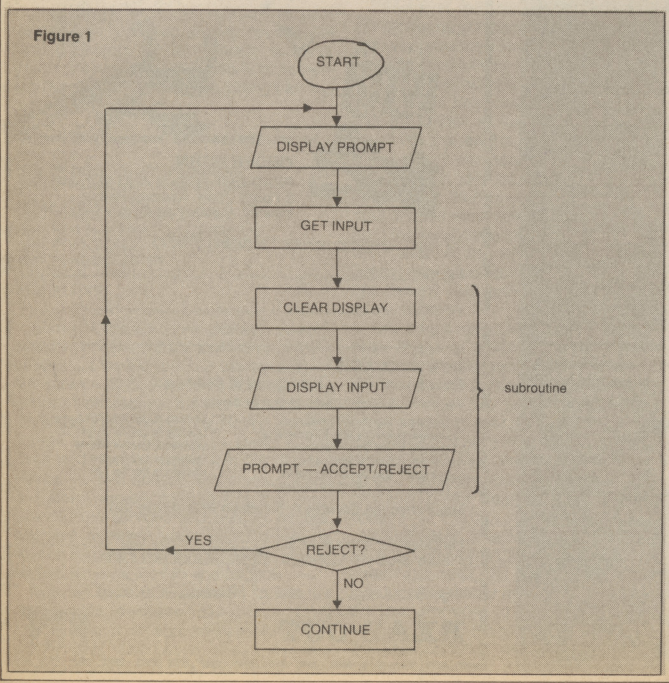
The *Print@* statement is very useful, but I have always found calculating the screen location for an item somewhat tedious. For this reason, I developed the next utility, which is not a subroutine but a device to make programming easier. The problem is how to calculate row and column — given that each row consists of 32 columns, the *Print@* positions for the first few lines are given by:

```
LINE 1 = 0
LINE 2 = 32
LINE 3 = 64
LINE 4 = 96
```

and so on. The easiest way to deal with this is to put these values (the "32 times table") into a numerical array, so that to *Print* on line 9, all you have to write is *Print@ L(9),A$*. Setting up the array can be done at the beginning of a program in a

continued on page 19

Figure 1



Mike Hampson proudly presents the ONLY

SPECTRUM FORTH

WITH FLOATING-POINT

At last! An alternative language with program power! Programmers in their thousands are turning to FORTH as the number one alternative to BASIC and MACHINE CODE because of its incredible SPEED and SIMPLICITY, and now the first ZX Spectrum FORTH with floating-point arithmetic brings a new language with SPEED and POWER to the 48K Spectrum owner.

- ★ All trig functions in radians AND degrees
- ★ Operation of ZX printer
- ★ Full floating-point arithmetic
- ★ Easily mixable integer option included
- ★ Full global control of colour, sound and high-resolution graphics
- ★ CIRCLE, DRAW, OVER etc
- ★ BEEP (like BASIC) plus BLEEP, for machine-code-style sound effects
- ★ Based on FORTH-79 (like the Jupiter Ace)
- ★ Includes all FORTH structures, and recursion
- ★ 190 predefined words
- ★ 32K available to user
- ★ Complete tutorial user manual.
- ★ £2 off if you cut out and send this advertisement

Order code FP50T..... Price £14.95

STILL AVAILABLE
The ONLY Spectrum FORTH at this UNBELIEVABLY low price. Powerful integer arithmetic, sound, graphics, colour, 256 UDGs, over 100 predefined words, 32K available to user, complete tutorial user manual.
Order code SP48T .....Price £5.95

STILL AVAILABLE
The ONLY Spectrum FORTH to run in 16K, at the same LOW, LOW price. Powerful integer arithmetic, graphics, colour, 21 UDGs, over 70 predefined words, 2K available to user, complete tutorial user manual.
Order code SP16T ..... Price £5.95

BUY NOW

WHILE SPECIAL OFFER LASTS

Cheques/POs to: Mike Hampson
7 Hereford Drive
Clitheroe
Lancs BB7 1JP

FOR FIRST TIME USERS...

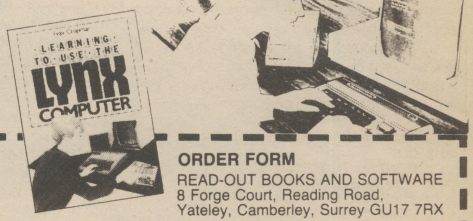
A new series of books which introduce newcomers to the most widely used micros in the marketplace.

The books assume absolutely no knowledge about computers and the reader is shown even the most fundamental operations such as "switching on" and "loading a program". The books lead the reader through simple programming and then onto graphics, with several programs which show how to achieve pictures and even animation. The books contain a number of specially written programs which show the full potential of these machines.

"The text is liberally supported by all manner of useful diagrams and illustrations (including many black and white photographs of the screen). The overall presentation is excellent. The printing, setting out and listings are clear and positively invite the reader to have a go."

EDUCATIONAL COMPUTING

£5.95
(incl. postage)



ORDER FORM
READ-OUT BOOKS AND SOFTWARE
8 Forge Court, Reading Road,
Yateley, Camberley, Surrey GU17 7RX

24 hour answering service Tel (0252) 873373

Name_____

Address_____

NOW AVAILABLE
Please send me.....copy/ies all at £5.95 each
incl. postage & packing. (Allow 14 days for delivery.)

- ☐ Learning to Use the PET Computer
- ☐ Learning to Use the BBC Microcomputer
- ☐ Learning to Use the ZX Spectrum
- ☐ Learning to Use the Apple II/IIe
- ☐ Learning to Use the Commodore 64
- ☐ Learning to Use the VIC-20 Computer
- ☐ Learning to Use the ZX81 Computer
- ☐ Learning to Use the Dragon 32
- ☐ Learning to Use the TI99/4a
- ☐ Learning to Use the Oric 1
- ☐ Learning to Use the Lynx

Make cheques payable to **Newtech Publishing Ltd**

I enclose my cheque for £_____
Please debit my Access ☐ ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signed_____ Date_____

READ-OUT

For . . . Next loop like this:

```
10 DIM L(16)
20 FOR I = 1 TO 16
30 L(I) = (I—I)*32
40 NEXT
```

To *Print* something starting from a certain column on a given line simply requires that you add the column number into the *Print@* statement, eg:

```
PRINT@ L(5)+10,A$
```

This technique of accessing lines also allows you to use a subroutine to clear a group of lines. For example, if we want to clear lines 8-13 inclusive, without clearing the rest of the screen, we set two variables; eg *Fl* (From Line) and *Tl* (To Line), then pass these to a subroutine which is basically a *For . . . Next* loop which prints blank lines, thus:

```
300  FL = 8:TL = 13
310  GOSUB 1000
REST OF PROGRAM . . .
(Subroutine)
1000 FOR CL = FL TO TL
1010 PRINT@ L(CL),""
1020 NEXT
1030 RETURN
```

The variable *Cl* is the loop counter or index which I use here to stand for Clear Line. I often wish that the Dragon's implementation of Basic allowed longer variable names.

Another set of useful subroutines concerned with a screen display covers producing borders for text display screens. There are a number of methods of achieving this, but the fastest use *String$* for the top and bottom lines, eg:

```
2000 REM TOP & BOTTOM OF BORDER
2010 CLS
2020 PRINT@ L(1) ,STRING$(32,42);
2030 PRINT@ L(16),STRING$(31,42);
2040 POKE 1535,106
2050 REM LEFT & RIGHT SIDES
2060 FOR SL = 1056 TO 1472 STEP 32
2070 POKE SL,106
2080 POKE SL+31,106
2090 NEXT
2100 RETURN
```

Some of this code will probably require explanation! Lines 2020 to 2040 print a line of 32 stars on the top and bottom lines of the screen. Notice that line 2030 actually prints 31 characters, the last character on the bottom line has to be *Poked* into the screen memory location to avoid a carriage return which would ruin the display. Notice too that printing a character needs a different number from *Poking* that character to the screen. You can, of course, alter the numbers used and there is no reason that the sides of your border should be the same as the top and bottom.

You will have to experiment to find the relationship between *Printing* a *Chr$* and *Poking* a screen address to match characters. The *Ascii* codes for the alphabet are the same, but other symbols have different numbers.

Lines 2060 to 2090 deal with *Poking* the characters to the sides of the screen. Here we start at location 1056 (the first column of the second line) and go up to 1472 (the first column of line 15) in steps of 32; ie, line by line. Adding 31 to the loop index gives us the last column of the row for the right-hand border.

Having produced a border, we do not want to print over it. There are a number of ways round this. We could add 1 to each print statement, eg:

```
PRINT@ L(6)+1, "ENTER NUMBER ";
```

in order that the statement be printed starting from the second column of line 6, so that it doesn't overwrite the border. (Notice the semi-colon which serves to suppress the otherwise automatic line feed and carriage return after a *Print* which in this case would overwrite the right-hand border!) Other methods of dealing with the problem would be to alter the original setting-up of the array *L*, ie, alter line 30 above to read:

```
30   L(I) = ((I—1)*32)+ 1
```

Alternatively, we could re-define the array in a *For . . . Next* loop viz:

```
1100 FOR I = 1 TO 16
1110 L(I) = L(I) + 1
1120 NEXT
```

Whichever method you use, there are still problems with using *Input*, since when the user presses *Enter*, a carriage return and line feed will be generated which will erase the character forming the right-hand border. The only ways of getting around this are either to keep track of exactly which line the *Input* is on, and then to *Poke* the border character back on-screen (which is not very satisfactory if the *Input* spans more than one line); to call up the right and left-hand border printing routines from the subroutine above by jumping into the routine at line 2060 after each *Input* (which may erase some of the *Input*) or to use *Inkey$* and limit the user's *Input* in some way.

This brings me to my next routine which uses *Inkey$* to simulate *Input*. The only drawback to this method is that the user cannot use the backspace key to delete a character that has been mis-typed. You might be able to alter the coding to achieve this, but things get a bit complicated as you are now working towards the level of screen dependent-cursor control, which is probably better dealt with in assembly code.

Nonetheless, this routine will allow the user to enter up to 60 digits. If the user enters a number that is greater than 10 or less than 1, an error message is displayed, the user prompted to press the space bar to continue and the process repeated until the user complies with the prompt. The routine needs the variable *Mc* to work correctly — here *Mc* is set to 2 so that the user cannot enter more than two digits. It is fairly easy to modify so that one can restrict string entry to a given number of characters and prevent numbers from being *Input*.

The numerical entry routines are as follows:

```
500  CLS
510  PRINT@ L(5),"ENTER A NUMBER BETWEEN
     1 AND 10 ";
520  MC = 2
530  GOSUB 1000
540  REM GET A 2 DIGIT NUMBER
550  NO = VAL (NO$)
560  IF NO<1 OR NO > 10 THEN PRINT@
     L(15),"INVALID NUMBER, PLEASE RE-
     ENTER":GOSUB 0000:PRINT@
     L(15)," ";GOTO 500
570  . . . REST OF PROGRAM . . .
999  REM SUBROUTINE TO GET MC DIGITS,
     RETURNS NO$
1000 NO$ = " ":TM$ = " "
1010 TM$ = INKEY$:IF TM$ = " " THEN 1010
1020 TM = ASC(TM$): IF TM = 13 THEN RETURN
1030 IF TM < 48 OR TM > 64 THEN 1010
1040 IF LEN(NO$) >= MC THEN RETURN
1050 NO$ = NO$ + TM$
1060 PRINT TM$;
1070 GOTO 1010
8999 REM PRESS SPACE BAR TO CONTINUE
     SUBROUTINE
9000 PRINT@ L(16),"PRESS THE SPACE BAR TO
     CONTINUE";
9010 A$ = INKEY$:IF A$ <> CHR$(32) THEN 9010
9020 PRINT@ L(16), STRING$(31,32);
9030 RETURN
```

The central section of this code (lines 999-1070) tests the keyboard and will only display the key pressed if it is a digit (0-9, Ascii codes 48-64). The routine returns with *No$* containing the characters entered. Line 1020 tests for a press of the *Enter* key to allow single digit entries. Notice how the prompt line, the error message and the "Press space to continue" line are erased once used.

Here is the same routine, modified to accept a string up to five characters long:

```
500  CLS
510  PRINT@ L(5),"ENTER A STRING UP TO 5
     CHARACTERS LONG ";
520  MC=5
530  GOSUB 1000
570  . . . REST OF PROGRAM . . .
1000 WD$=" ":AL$=" "
1010 AL$=INKEY$:IF AL$=" " THEN 1010
1020 TM=ASC(AL$): IF TM=13 THEN RETURN
1030 IF TM<65 OR TM > 91 THEN 1010
1040 IF LEN(WD$)>=MC THEN RETURN
1050 WD$=WD$+AL$
1060 PRINT AL$;
```

In line 570, you might call the Accept/Reject routine to allow the user to check *Input*.

This routine is useful in that it will limit the length of an input and so can be used either to protect screen display or to force a limit on the user, but its response to the keyboard is rather slow and there is no facility to use the backspace key which can prove rather frustrating! ■

This program was written for the Dragon 32, but it is designed to be easy to convert for all micros.

The highest priority

***Ian Logan** looks at the different priorities involved in expression evaluation*

One of the more important parts of the operating system of a microcomputer is its expression evaluator. In the Spectrum, there is a sophisticated subroutine that handles both numeric and string expressions. There is also provision for the handling of user-defined functions.

As with all other systems, the expression evaluator of the Spectrum considers that different operations performed within an expression have different priorities, hence avoiding any ambiguity between expressions. The priorities of the Spectrum are:

highest

Any parenthesised expression
All functions (unless excepted below)
Raising to a power
Unary minus
Multiply and divide
Plus and minus
Comparisons
NOT
AND
OR

lowest

If there should be any conflict within an expression because of identical priorities, ie, with *'2*8/4'*, then it is resolved by taking the first operation before the second one — as might be expected.

In the Spectrum, the result of the evaluation of an expression is stored on the calculator stack. If numeric, this 'last value' is a five byte floating-point number, but, if string, then the actual string is described with two bytes holding its length and two bytes addressing its start. The fifth byte is unused in such cases. Note also that the same subroutine is used in both syntax and run time, but in syntax checking an expression there is no 'last value', only a flag to show if it would be numeric or string.

The system variable *Ch add* is used to pick up the characters of the expression one-by-one as they are needed. The end of an expression will be marked by *Ch add* fetching a *'Carriage Return'*, a *':'*, a *';'*, a *','* or a *'THEN'*.

The expression evaluator in the Spectrum starts at address *9467 (24FBh)* and has been given the label *Scanning* by myself and *Exprn* by Sinclair. When evaluating a new expression, the first task is to place a priority marker of *'0'* on the machine stack. This *'0'* will be used later to show that there are no 'stored' priorities left on the machine stack.

Next, a series of functions are considered. These functions all return a 'result' that will go on to the calculator stack. The functions are listed in table one.

With all the functions detailed in the table, the 'result' goes on the calculator stack and bit 6 of the system variable *Flags* is given the appropriate value — set for a numeric result and reset for a string result. If a 'result' is formed in this way, then a jump forward is taken to determine if the expression continues with a binary operator or simply ends.

Unary functions are considered next. In these cases, the appropriate priority and operation code are found for the function, eg:

the function NOT has the priority '4' and the operation code '240.
the function CODE has the priority '16' and the operation code '220'.

The priority codes and the operations codes are stored on the machine stack and a jump is taken back to consider the next 'result' from the expression.

Binary operators and the end of the expression are considered together. A binary operator requires that a 'next' result is to be found, but it is possible that the 'last' operation should now be performed. All binary operators give priority codes and operation codes; eg '+' gives a priority code of *'6'* and an operation code of *'207'*. *'End of expression'* gives both codes the value zero.

Once a binary operator or the end of statement has been found, the 'present' priority is less than the 'present' priority, taken from the machine stack. If the 'last' priority is greater or equal to the 'present' priority, then the 'last' operation is performed and the test repeated. If the 'last' priority is less than the 'present' priority, then the priority and operation codes are stored on the machine stack and a jump taken back to fetch the next 'result' and operator. If both the 'present' priority code

```
    ' " '  -  a string is read directly.
    ' ( '  -  a parenthesised expression will lead to
              SCANNING being called recursively.
 a number  -  The floating-point form following the number
              forms the 'result'.
    ' + '  -  a leading 'plus' is stepped over.
    ' FN'  -  the 'result' of the approriate DEF FN statement
              is found  - using SCANNING recursively.
   'RND'   -  The system variable SEED is updated and the
              'result' obtained by taking SEED/65536.
   'PI'    -  The'result' is read from the 'Table of Constants'.
 'INKEY$'  -  The 'result' is a single character string in
              the work space.
   'BIN'   -  The 'result' is the floating-point number
              obtained by reading the operand of the BIN
              function.
 'SCREEN$' -  The 'result' is a single character string in
              the work space.
   'ATTR'  -  The value of the required attribute byte forms
              the 'result'.
  'POINT'  -  The 'result' on the calculator stack will be
              zero or one.
 a variable -  The variables area is searched for the required
              'result'.
```

and the 'last' priority code are zero, then the expression has been fully evaluated and the single 'result' on the calculator stack is the required answer.

Consider the following example:

the expression NOT RND+2*PI

The quantities *Rnd, 2* and *Pi* form 'results', *Not* is a unary function and '+' and '*' are binary operators.

- Initially, in the evaluation, the priority '0' goes on the machine stack.
- NOT is considered next. The priority '4' goes on the machine stack, together with the appropriate operation code '220'. A jump is taken to look for another 'result'.
- The 'result' for RND goes on to the calculator stack and a jump is taken to look for a binary operator or end of expression.
- The binary operator '+' is found. So the priority code '6' and the operation code '207' are formed. Then, as the 'present' priority — the '6' — is greater than the 'last' priority — the '0' — the codes are stored and the next 'result' sought.
- The 'result' for '2' goes on the calculator stack.
- The binary operator '*' is found. Its priority is '8' and its operation code is '196'. These codes are again stored, as the '8' is greater than the '6'.
- The 'result' for Pi is formed and stored on the calculator stack. The end of the expression has now been reached and that makes the present priority zero.
- The 'present' priority is less than the 'last' priority, so the 'last' operation is performed — 'Pi' and '2' are replaced by 2*Pi.
- Again the 'present' priority is less than the 'last' priority — '0' is less than '6' — so the 'last' operation is performed — 2*Pi is replaced by the result of RND+2*Pi.
- Again, the 'present' priority is less than the 'last' priority — '0' is less than '4' — so that the 'last' operation is performed — RND+2*Pi is replaced by the result of NOT RND+2*Pi.
- Only now are the 'present' priority' and the 'last' priority both zero. So, the exit is taken and the 'last value' on the calculator stack is the required value.

Note that the expression is numeric and bit 6 of the system variable *Flags* will be set. Also see that the three operation codes are all greater than '192'; ie, bits 6 and 7 both set. These bits are used to check the syntax of the expression, as in a numeric expression bit 6 must be found to be set on every occasion.

The actual operations are performed by calling the *Calculator* — at address *13147 (335Bh)*, with the operation code in the *B* register.

The expression evaluator is able to call upon user-defined functions and the implementation of these is worth considering in more detail. In the Spectrum, the user defines a function by using a *Def Fn* statement; eg:

```
DEF FN b(x,y)=a*x*y
```

and causes the evaluation of this by using the *Fn* function in an expression, eg:

```
LET c=FN b(1,2)
```

So, just what are the steps involved in evaluating *Fn b(1,2)?* The first step is to perform a program area search for the appropriate *Def Fn b* statement (so it is best placed near the start of a program). Next the supplied values are copied from the invisible locations in the parentheses of the *Fn b(1,2)* to the invisible locations that exist in the *Def Fn b(x,y)* statement (after the *x* and after the *y*).

The expression in the *Def Fn* statement is now evaluated by calling *Scanning* recursively, but a special point to note is that a *Flag* is set to indicate that the current *Def Fn* statement's parameters should be searched before the variables area, when the expression evaluator is finding the value for a variable.

In this way a result is obtained. It goes on the calculator stack and forms the result of the *Fn* function.

Can you evaluate these Spectrum Basic expressions correctly?

Tied up in *Nots*?

a) PI
b) NOT PI
c) NOT NOT PI

Or cut into Slices?

a) "ABCDEFGH"(1 TO 8)
b) "ABCDEFGH"(TO)
c) "ABCDEFGH"(2 TO 6) (1 TO 3) (2)

George's ideas are liked by Clive S?

a) <>2AND 3=4
b) 1<=2+3<=4
c) 1OR 2+2+2+3+3OR 4

A final message to all readers!

```
CHR$ (30*20/12+11-3+PI*10);
CHR$ VAL "8*8+2*PI-1";
CHR$ (VAL (STR$ 12+STR$ (LN PI+2*LEN "abcd"))
— CODE ".")
```

Next week, we shall examine the Spectrum's calculator. ■



Green on black...

***Brian Cadge** explains how to invert the screen display and change the text colour*

The Dragon's text screen display is not renowned for being the best of all computers. Its lack of lower case letters and its small display area are often criticised. There are ways of overcoming these problems, but only by using the hi-resolution screen, which in turn uses up 6K of memory, plus another 1-2K for character sets and software.

In addition, the standard display of black letters on a glaring green square can often cause eye strain. Unlike many other computers, the Dragon does not give the user any control over the text colour.

To change the Dragon's text display to green on black (the more usual arrangement being easier on the eyes) either involves a small soldering job inside the computer (I don't recommend this!) or a short piece of software, as in the accompanying program. Luckily, every time a character is printed, a call is made to location 359. Normally, this has no effect, but we can use this to divert the computer to our own print routine.

Allowances must also be made for *Cls* (*Cls 1* is *not* the same as *Cls* — *Cls 1* fills the screen with code 143, *Cls* fills it with 96) and the *Clear* key.

If you have an assembler package, you can enter the program directly, otherwise use the Basic loader program. This will check for errors in the *Data* statements and will not run if any are found.

The first section of the program is an initialisation routine which redirects Basic to the new routines. When a *Cls* command is encountered, a call is made to location 416 and, when a key is pressed, to location 362.

The main program is a rewrite of the screen print routine. Location 111 must be checked first — this is the channel number (0,−1 or −2). If it is non zero, the Basic is not interrupted as output is going to the printer or cassette.

When *@Cls* is executed, it checks that there is no following number (therefore you can still clear to a green screen by *Cls 1*) and then clears the screen to black. Every time a key is pressed, the program checks for code 12 (the *Clear* key) and, if found, executes the *@Cls* routine.

As presented, the program will give orange text on a black background which is best for a monochrome television. For a colour tv, green on black is easier to read — type *Poke 32644,5* to change to green and *Poke 32644,13* to change to orange. All other print commands are unaffected, only the text is inverted. Lower case will now appear as black on green.

Another useful routine which can be achieved by changing location 359 is a printer echo — type *Poke 360, 189: Poke 361, 26: Poke 359, 126* to turn on the echo and *Poke 259, 57* to turn it off. Of course, if you are using a printer which has a buffer (as most modern ones do), printing will only take place at the end of a line.

While on the subject of printers, some difficulty has been experienced by users whose printers do not auto linefeed at the end of a line. The Dragon can send a linefeed to the printer for you if you *Poke* the following locations:

155 — number of columns (normally 80 or 40 or 120)
153 — comma field width (normally 16 — the number of spaces between items printed separated with a comma)
152 — PEEK(155)—PEEK(153)
328 — 0 equals send linefeed at end of line, 255 equals send no linefeed (assumes printer will auto linefeed)
330 — 1 is normal setting, 2 will give extra linefeed with every new line (ie, will leave a gap between each printed line). ■

```
5 'SCREEN INVERT (BASIC LOADER)
10 CLEAR200,32580
20 FOR I=1 TO 184:READA$:Z=VAL("&H"+A$):CS=CS+Z:POKE I+32580,Z:NEXT
30 DATA 8E,7F,63,BF,1,68,8E,7F,DE,BF,1,6B,8E,7F,F6,BF,1,A1,86,7E,B7,
1,67,B7,1,6A,B7,1,A0,39,7D,0,6F,27,1,39,32,62,34,16,8E,FF,C0,A7,84,
A7,2,A7,4,A7,6,A7,A,A7,C,A7,E,A7,88,10,A7,9,86,D,B7,FF,22,35,2,34,2,
BE,0,88,81,8,26,8,86
40 DATA 20,A7,84,A7,82,20,1C,81,D,26,4,8D,32,20,14,81,80,24,E,81,20,
25,C,81,60,24,4,84,BF,20,2,80,20,A7,80,BF,0,88,8C,5,FF,23,12,8E,4,0,
EC,88,20,ED,81,8C,5,E0,25,F6,BF,0,88,8D
50 DATA 2,35,96,86,20,A7,80,1F,10,C4,1F,26,F6,39,81,C,27,1,39,34,12,
86,20,8E,4,0,BF,0,88,A7,80,8C,6,0,25,F9,35,92,27,1,39,32,62,20,E6
60 IF CS<>17105 THEN PRINT"DATA ERROR":SOUND 1,2:STOP
70 EXEC 32581:CLS
```

Continued on page 25

NEW

Extend the sound capabilities of your Dragon

FOR DRAGON 32

DRAGON 32

SOUND EXTENSION MODULE

- Fully-cased Module plugs into cartridge port
- Provides 3 channels of sound: 3-note chords and harmonies over 5 octaves
- Uses new BASIC command. No need to 'Peek' or 'Poke'
- Many built-in sound effects (eg bomb, laser)
- Music and graphics can occur together without loss of speed
- Based on popular, well-proven sound generator
- Two Input/Output ports included
- User manual provided, with examples

ONLY
£34.95
inclusive

Cheques/POs/ Access to:

J.C.B. (MICROSYSTEMS)
29 SOUTHBOURNE ROAD
BOURNEMOUTH BH6 5AE
Tel: (0202) 423973

Write or phone for further details

Introducing **ANiK** Software

The Best for Your Business

PRICE LIST	SINCLAIR ZX81,16 K	DRAGON 32 K	SPECTRUM 48 K
PURCHASE LEDGER	£9·95	£12·95	£9·95
SALES LEDGER	£9·95	£12·95	£9·95
COMBINED DATABASE	£9·95	£12·95	£9·95
MICROLYMPICS 1	£9·95	£12·95	£9·95
MICROLYMPICS 2	£9·95	£12·95	£9·95

ALL TAPES COME WITH FREE BACK UP TAPE IN PRESENTATION BOX.

SPECIAL OFFER BUY ANY 1 TAPE AT £9·95 AND RECEIVE MICROLYMPICS 1 OR 2 AT ONLY £2·95 (10 ACTION PACKED GAMES ON EACH 1)

FOR THESE OFFERS AND MORE DETAILS CUT OUT AND SEND TO:
ANIK
30 KINGSCROFT CT.
BELLINGE
NORTHAMPTON

TICK WHICH YOU REQUIRE — 16K | 32K | 48K — Pck
Purchase
Sales
Database

Name
Address

Which Microlympics do you require at only £2·95? 1 ☐ 2 ☐
Games 1
Games 2

TOTAL SUM INCLUDED £
Please make cheques and P/O's payable to ANIK MICROSYSTEMS.

DEALERS SEND FOR OUR TRADE PACK

ANiK

PART OF INTERLEVEL CONTROL LTD



THE WIZARD'S WARRIORS: A fast moving game that matches developments in your skill as a player by becoming increasingly more devious. By offering to you the full range of options you can choose how to control your warrior through the maze. A full implementation of this program enables such features as a continuous series of sound effects, arcade quality graphics, double-point scoring, and--for the very artful --bonus lives. **Spectrum £4.95**

FORTH: A full implementation. Ideal for writing fast moving arcade type games. Allows the full colour and sound facilities of the Spectrum to be used. Future Microdrive enhancements will be made available. **Spectrum 14.95**

ADVENTURE ONE: Features a save game routine as the game can take months to complete. **ZX81 £5.95**
'a remarkably good version....well worth the money.' *...Sinclair User...*

MAZEMAN: A fast action m/c game that reproduces the spirit of the original. **Spectrum £4.95**
'..is very accurate and fast.' *...Which Micro?...* **ZX81 £4.45**

CHESS 1.4: Ten levels of play with this m/c program. Good graphic screen display. **ZX81 £5.95**
'In a class of it's own.' *... Your Computer...*

INVADERS: Very fast m/c action. Includes mystery ship and increasingly difficult screens. **ZX81 £4.45**

7 MAES AFALLEN, BOW ST., DYFED, SY24 5BA
24hr Ansaphone 0970 828851

COMMODORE 64

★ Best Sellers, Latest! ★

I challenge you to find a better deal!
(Prices include VAT, p&p)

WORD PROCESSING 64
Wiza write 64. Special offer price — best value **£64.50**
Paperclip 64..... **£85.50**

RABBIT
Pakacuda, Escape, MCP, Centropods, Annihilator, Monopole, Cyclons..... Each **£5.45**

INTERCEPTOR
Frogger, Scramble, Panic, Spriteman (PacMan), Crazy Kong..... Each **£6.45**

LLAMASOFT
Gridrunner 1, Gridrunner 2 (Matrix), Attack of the Mutant Camels ..... Each **£7.45**

AUDIOGENIC
Motor Mania, Renaissance..... Each **£8.49**
Grand Master Chess ..... Recommended **£17.49**

TERMINAL
Super Scramble, Super Gridder..... Recommended each **£9.89**

ENGLISH SOFT
Superfont Sprite Maker..... **£6.45**

Beat That!

Dealer Enquiries Welcome

Send cheques, postal orders to:
CRESTMAT LTD.
Software Specialists
Orient House, 42-45 New Broad Street, London EC2. Tel: 7492510

Mail order only

TO MAKE A SUPER GAME INTO A FANTASTIC GAME YOU NEED SOFTLINK 1.
This will allow you to use a Kempston type joystick with all the following Spectrum games:
Arcadia, Penetrator, Horace Goes Skiing, Spectres, Flight Simulation and Space Zombies.

ONLY £4.95

SPECIAL OFFER

Spectres plus Softlink 1 ..... **£11.00**
Arcadia plus Softlink 1 ..... **£9.00**

SUPER SOFTWARE FOR YOUR CBM 64
Cyclons, Pakacuda, Escape MCP, Centropods, Anhilator, at only **£5.65 each**

FOR YOUR UNEXPANDED VIC
Escape MCP, Pakacuda, English Invaders, The Catch, Paratroopers, Antimatter Splatter, at only **£5.65 each.**
Crazy Kong only **£6.50.**

FOR ANY VIC
Catcha snatcha, Wacky Waiters, Arcadia only **£5.25 each.**

FOR YOUR VIC PLUS AT LEAST 8K
Critters, Cyclons, only **£5.65 each.**

New for your 64
Star Trek, Panic 64, Frogger 64
Cheques and postal orders to

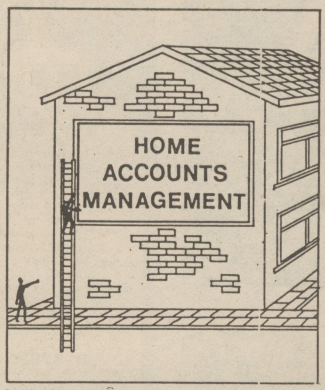
BYTEWELL
203 COURT ROAD, BARRY
SOUTH GLAMORGAN CF6 7EN
Tel: (0446) 742491

Q E D Systems presents software for your **Dragon, Spectrum and Oric**



for the Dragon 32

With this powerful software realise the full potential of this splendid micro by writing your own machine code routines and programs. Full operating instructions are included **£6.95**



for the Dragon 32, Spectrum 48K & Oric 48K

Plan all your financial affairs with this Q.E.D. quality system. Features include budget creation, maintenance and balance of all accounts (including credit cards). Full monitoring of expense against budget. Full operating instructions are included..... **£9.95**



for the Oric-1 48K

Probably the best ORIC program on the market. With this powerful software the full potential of the ORIC can be realised by writing your own machine code routines and programs. Full operating instructions are included..... **£6.95**

Please send me on cassette.....
I enclose my cheque/postal order for £..... (payable to Q.E.D. Systems).
Name..... Address.....

Q.E.D. SYSTEMS, 2 SEFTON GARDENS, AUGHTON GREEN, ORMSKIRK, LANCS, L39 6RZ

```
7F45
7F45 8E7F63
7F48 BF0168
7F4B 8E7FDE
7F4E BF016B
7F51 8E7FF6
7F54 BF01A1
7F57 867E
7F59 B70167
7F5C B7016A
7F5F B701A0
7F62 39
7F63 7D006F
7F66 2701
7F68 39
7F69 3262
7F6B 3416
7F6D 8EFFC0
7F70 A784
7F72 A702
7F74 A704
7F76 A706
7F78 A70A
7F7A A70C
7F7C A70E
7F7E A78810
7F81 A709
7F83 860D
7F85 B7FF22
7F88 3502
7F8A 3402
7F8C BE0088
7F8F 8108
7F91 2608
7F93 8620
7F95 A784
7F97 A782
7F99 201C
7F9B 810D
7F9D 2604
7F9F 8D32
7FA1 2014
7FA3 8180
7FA5 240E
7FA7 8120
7FA9 250C
7FAB 8160
7FAD 2404
7FAF 84BF
7FB1 2002
7FB3 8020
7FB5 A780
7FB7 BF0088
7FBA 8C05FF
7FBD 2312
7FBF 8E0400
7FC2 EC8820
7FC5 ED81
7FC7 8C05E0
7FCA 25F6
7FCC BF0088
7FCF 8D02
7FD1 3596
7FD3 8620
7FD5 A780
7FD7 1F10
7FD9 C41F
7FDB 26F6
7FDD 39
7FDE 810C
7FE0 2701
7FE2 39
7FE3 3412
7FE5 8620
7FE7 8E0400
7FEA BF0088
7FED A780
7FEF 8C0600
7FF2 25F9
7FF4 3592
7FF6 2701
7FF8 39
7FF9 3262
7FFB 20E6
7FFD
```

```
20      PRT
30 @INIT LDX #@START
30      STX 360
30      LDX #@KEYS
30      STX 363
30      LDX #@CLS
30      STX 417
40      LDA #126
40      STA 359
40      STA 362
40      STA 416
40      RTS
50 @START TST 111
50      BEQ @SCREEN
60      RTS
70 @SCREEN LEAS 2,S
70      PSHS A,B,X
80      LDX #$FFC0
90      STA ,X
90      STA 2,X
90      STA 4,X
90      STA 6,X
90      STA 10,X
90      STA 12,X
90      STA 14,X
90      STA 16,X
100     STA 9,X
110     LDA #5+8
110     STA $FF22
120     PULS A
120     PSHS A
130     LDX 136
140     CMPA #8
140     BNE @NOTBACKSPACE
150     LDA #32
150     STA ,X
150     STA ,-X
150     BRA @DONE
160 @NOTBACKSPACE CMPA #13
170     BNE @NOTLINEFEED
170     BSR @LFEED
180     BRA @DONE
190 @NOTLINEFEED CMPA #128
190     BHS @PRINT
200     CMPA #32
200     BLO @DONE
210     CMPA #96
210     BHS @INV
220     ANDA #191
220     BRA @PRINT
230 @INV SUBA #32
240 @PRINT STA ,X+
250 @DONE STX 136
260     CMPX #1535
260     BLS @NOSCROLL
270     LDX #1024
280 @SCROLL LDD 32,X
290     STD ,X++
300     CMPX #1504
300     BLO @SCROLL
310     STX 136
310     BSR @LFEED
320 @NOSCROLL PULS A,B,X,PC
330 @LFEED LDA #32
330     STA ,X+
340     TFR X,D
350     ANDB #31
350     BNE @LFEED
360     RTS
370 @KEYS CMPA #12
370     BEQ @CLEAR
380     RTS
390 @CLEAR PSHS A,X
390     LDA #32
390     LDX #1024
390     STX 136
400 @FILL STA ,X+
400     CMPX #1536
400     BLO @FILL
410     PULS A,X,PC
420 @CLS BEQ @DEF
420     RTS
430 @DEF LEAS 2,S
430     BRA @CLEAR
440     END @INIT
```

Flying the flag . . .

***Michael Batty** presents a program to draw the Welsh flag*

There are plenty of programs around for drawing flags with regular geometric properties such as the Union Jack, but programs for irregular designs are more unusual. This program draws the Welsh flag which consists of a red dragon laid across the join of two rectangles, the top rectangle being white, the bottom green.

The program is designed for the BBC model B computer and plots a series of flags of different shapes and sizes in the colours of the Welsh flag using *Mode 5*.

The program illustrates a number of important features of BBC Basic. There is extensive use of procedures to read in data, print text captions and plot the flag itself. The flag is constructed using the triangle fill routine *Plot 85*. The upper and lower rectangles are plotted first and then the co-ordinates of the dragon, stored by sequence in arrays, are used to construct and fill the shape of the dragon. The program also shows how the shape and size of the basic flag can be transformed by scaling the co-ordinates and plotting the flag in different positions on the screen.

The program is structured to first read in the 225 x-y co-ordinates of points defining the dragon from data statements. Then a full screen flag is plotted with greetings captions in Welsh and English. If you look closely when the flag is plotted, you can see the triangle fill routine at work. The vertical and horizontal scales of the flag are then systematically altered and different sized flags plotted. Finally, nine small identical Welsh flags are plotted on the screen showing the limits of resolution for *Mode 5*. ■



```
  10 REM WELSH FLAGS:(C)MICHAEL BATTY:1983
  20 DIM X(225),Y(225),XX(30),YY(30),N%(24)
  30 MODE5:CLS:CLG
  40 VDU23;11,0,0,0,0;
  50 VDU19,2,2,0,0,0
  60 M%=24:MN%=225
  70 REM Reads in Data
  80 PROCINDATA
  90 REM Plots Welsh Flag with Captions
 100 PROCTEXT1
 110 VDU29,XO;YO;:XJ=1:YJ=1
 120 PROCFLAG(XJ,YJ)
 130 PROCTEXT:G=INKEY(200):CLG
 140 REM Plots Flags of Different Sizes
 150 FOR XJ=0.4 TO 1 STEP 0.2
 160 FOR YJ=0.4 TO 1 STEP 0.2
 170 PROCFLAG(XJ,YJ):G=INKEY(100)
 180 CLG:NEXT YJ:NEXT XJ
 190 REM Plots 9 Flags on the Screen
 200 XJ=0.3:YJ=0.3
 210 FOR IX%=213 TO 1279 STEP 426
 220 FOR IY%=171 TO 1023 STEP 341
 230 VDU 29,IX%;IY%;
 240 PROCFLAG(XJ,YJ)
 250 NEXT IY%:NEXT IX%
 260 G=GET:MODE7
 270 END
 280 REM Reads Coordinates of Welsh Dragon
 290 DEF PROCINDATA
 300 FOR I%=0 TO M%
 310 READ N%(I%)
 320 NEXT I%
 330 ZX=1279:ZY=1023
 340 XD=1400:YD=900
 350 XO=ZX/2:YO=ZY/2
 360 TRANS=ZX/XD:YADJ=YD*TRANS/2
 370 FOR I%=0 TO MN%
 380 READ X(I%),Y(I%)
 390 X(I%)=X(I%)*TRANS-XO
 400 Y(I%)=Y(I%)*TRANS-YADJ
 410 NEXT I%
 420 ENDPROC
 430 REM Plots a Flag of Size XJ_YJ
 440 DEF PROCFLAG(XJ,YJ)
 450 COL%=3:REM Plots Flag Top in White
 460 XC=XO*XJ:YC=YADJ*YJ
 470 PROCBOX(XC,YC,COL%)
 480 COL%=2:REM Plots Flag Bottom in Green
 490 PROCBOX(XC,-YC,COL%)
 500 GCOL0,1:REM Plots Dragon in Red
 510 L%=0:J%=N%(0)-1
 520 FOR I%=0 TO M%
 530 Q%=0:IF I%=M% THEN GCOL0,3
 540 FOR K%=L% TO J%
 550 XX(Q%)=X(K%)*XJ:YY(Q%)=Y(K%)*YJ
 560 Q%=Q%+1:NEXT K%
 570 MOVE XX(0),YY(0):MOVE XX(1),YY(1)
 580 FOR K%=2 TO N%(I%)-1
 590 PLOT 85,XX(K%),YY(K%):NEXT K%
 600 IF I%=M% THEN 620
 610 L%=J%+1:J%=J%+N%(I%+1)
 620 NEXT I%
 630 ENDPROC
 640 REM Plots a Rectangle
 650 DEF PROCBOX(XC,YC,C%)
 660 GCOL0,C%:MOVE XC,0:MOVE -XC,0
 670 PLOT 85,XC,YC:PLOT 85,-XC,YC
 680 ENDPROC
 690 REM Plots Welsh Caption
 700 DEF PROCTEXT1
 710 VDU5:MOVE 200,48
 720 PRINT"COFION O GYMRU":GCOL1,1
 730 MOVE 192,40:PRINT"COFION O GYMRU"
 740 ENDPROC
 750 REM Plots English Caption
 760 DEF PROCTEXT
 770 MOVE -632,512
 780 PRINT"GREETINGS FROM WALES"
 790 GCOL1,2:MOVE -640,504
 800 PRINT"GREETINGS FROM WALES";VDU4
 810 ENDPROC
 820 DATA 15,14,12,14,6,4,5,3,3,3,13,25
 830 DATA 5,5,3,15,4,15,9,15,5,7,9,14,3
 840 DATA 670,440,587,651,682,470,693,685
 850 DATA 730,478,731,692,762,505,765,708
 860 DATA 807,510,803,718,835,535,840,728
 870 DATA 861,545,860,730,905,549
 880 DATA 1030,785,860,730,965,741,868,700
 890 DATA 961,710,868,675,1009,708,875,651
 900 DATA 943,663,881,625,938,638,889,610
 910 DATA 970,618,890,590
 920 DATA 587,651,670,440,599,492,685,320
 930 DATA 547,461,566,294,515,448,498,296
 940 DATA 496,452,460,300,480,464,410,324
 950 DATA 410,324,480,464,368,427,482,502
 960 DATA 383,498,492,530,419,562,518,570
 970 DATA 400,623,534,602,401,660,539,632
 980 DATA 411,679,560,651
 990 DATA 475,662,555,687,521,652,558,673
1000 DATA 560,651,580,685
1010 DATA 401,660,318,668,400,623,320,630
1020 DATA 318,550,320,595,347,568,410,602
1030 DATA 419,562
1040 DATA 410,602,400,623,320,613
1050 DATA 320,613,270,622,280,630
1060 DATA 253,668,265,615,296,638
1070 DATA 685,320,670,440,760,345,750,469
1080 DATA 828,365,794,485,858,354,861,500
1090 DATA 945,332,920,485,970,382,970,450
1100 DATA 990,425
1110 DATA 920,485,970,450,975,500,1000,462
1120 DATA 1020,510,1040,470,1068,500,1070
1130 DATA 468,1095,493,1085,460,1115,472
1140 DATA 1095,445,1128,440,1098,430,1115
1150 DATA 400,1090,418,1082,380,1075,415
1160 DATA 1050,385,1060,423,1032,405,1060
1170 DATA 449,1028,435,1070,468,1040,470
1180 DATA 1068,500,1095,493,1100,524,1130
1190 DATA 518,1118,540
1200 DATA 1085,570,1118,540,1145,565,1172
1210 DATA 540,1205,590
1220 DATA 1118,540,1172,540,1145,475
1230 DATA 300,549,252,540,318,520,275,518
1240 DATA 310,495,254,482,308,465,250,450
1250 DATA 368,427,252,421,310,408,280,390
1260 DATA 312,380,251,380,295,360
1270 DATA 368,427,310,408,410,324,390,310
1280  DATA 370,208,372,241,395,188,396,255
1290 DATA 410,212,425,240,434,201,445,240
1300 DATA 460,192,465,238,495,200,480,250
1310 DATA 515,232,498,296,566,294
1320 DATA 515,232,495,200,532,228,540,198
1330 DATA 560,240,558,185,580,260,594,210
1340 DATA 605,235
1350 DATA 634,239,650,200,682,245,690,210
1360 DATA 718,243,728,205,740,249,750,201
1370 DATA 756,260,765,200,780,241,790,210
1380 DATA 800,238,810,200,820,228
1390 DATA 828,365,761,280,760,345,694,290
1400 DATA 685,320
1410 DATA 792,322,761,280,800,302,756,260
1420 DATA 825,295,780,241,815,265
1430 DATA 858,354,945,332,852,295,990,318
1440 DATA 875,280,990,285,935,265,965,230
1450 DATA 923,232
1460 DATA 831,232,843,200,860,248,870,210
1470 DATA 898,235,902,200,923,232,940,205
1480 DATA 965,230,979,201,1000,240,1000
1490 DATA 188,1020,242,1030,215
1500 DATA 421,652,449,643,435,629
```

JC's BACK

16 TO 48K SPECTRUM UPGRADE KIT

JC's BACK

YES WE'RE BACK, WITH AN INCREDIBLY NEW LOW PRICE

OF £19.50 INCL p&p

KIT OF IC's FOR ISSUE 2 SPECTRUMS, COMPLETE WITH FULL INSTRUCTIONS, OR WE INSTALL 32K OF RAM IN YOUR ISSUE 2 SPECTRUM FOR £24.50 INCL. P&P (DON'T SEND PWR SUPPLY)

FAST, SAME-DAY SERVICE
MONEY BACK IF NOT SATISFIED
(IF RETURNED UNDAMAGED WITHIN 14 DAYS)

J. C. BREWER
(Dept PCW)
7 ROSEBERRY TCE
KIRKCALDY
KY1 1DW

VALUE WITH SERVICE!

BRIDGE SOFTWARE

LYNCHMOB

(for Sinclair Spectrum 16k/ZX81 16k)

"Undoubtedly the best version of Hangman... we cannot recommend this program too highly"
(SOFTWORDS, Journal of the Micro Software Club)

Fed up with arcade games for loners?
Play the fun game that's all the rage at parties!

- "Fine graphics" *(Popular Computing Weekly)*
- "Sound and hi-res colour in Spectrum version"
- "A good game for adult parties" *(SOFTWORDS)*
- Educational for the children"

send £6.50(SPECTRUM)
or £4.95 (ZX81) for quality cassette.

send s.a.e. for our full list of games, statistics, graphics and scientific software!
Full money-back guarantee : Trade enquiries welcome

BRIDGE SOFTWARE

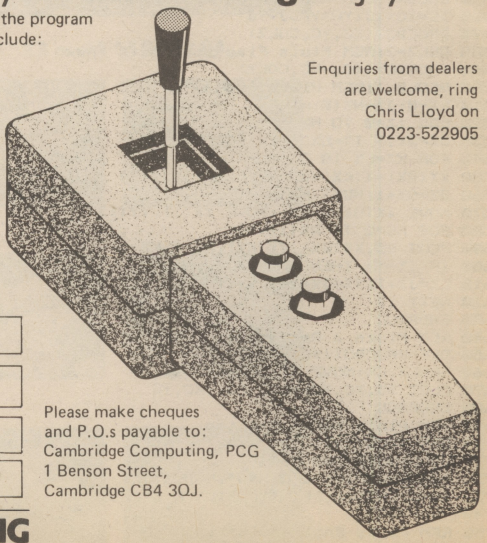
Dept POP, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE, England.

At last! A joystick that works!

Cambridge Computing bring you the first **intelligent** joystick.

Works on all existing software - regardless of which keys the program uses. No need for specially written software. Features include:

- Compatible with Spectrum, ZX81, Jupiter Ace
- 2 Independent Fire Buttons
- 8 Directional Microswitched action
- Plugs into edge connector
- Interface complete with edge connector
- Atari joystick compatible
- Joystick with Interface £29.90



Enquiries from dealers are welcome, ring Chris Lloyd on 0223-522905

Name.....

Address.....

.....

Please send me:

.....joystick, interface, and tape @ £29.90.... £ ☐

Spectrum☐ ZX81☐ Jupiter Ace☐

.....interface and tape @ £24.00..... £ ☐

Spectrum☐ ZX81☐ Jupiter Ace☐

.....joysticks @ £7.00..... £ ☐

Spectrum☐ ZX81☐ Jupiter Ace☐

Total including VAT..... £ ☐

Please make cheques and P.O.s payable to: Cambridge Computing, PCG 1 Benson Street, Cambridge CB4 3QJ.

CAMBRIDGE COMPUTING

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

Year Graph

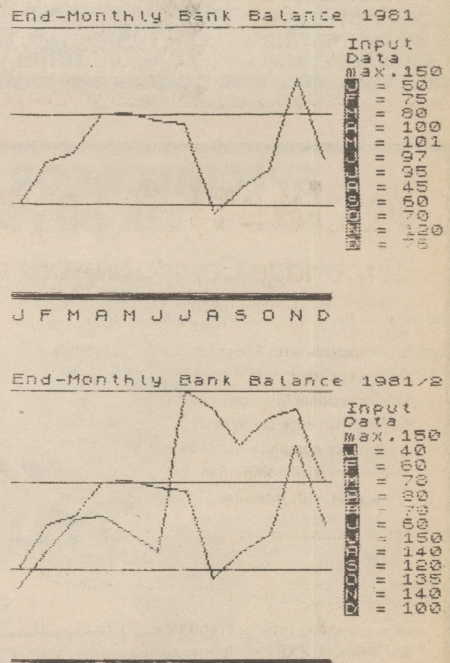
on Spectrum

A program which will construct a graph from a series of figures. An option is available to superimpose one graph on another.

Program notes

5 Sets default variable 's' (used in Line 110).
10 Sets up array 'y' one for each month of the year.
20 Inputs and checks for correct length the title of the graph.
30 Prints the title and erases any previous title.
40 Draws, in chunky graphics, the base line of the graph.
50 Sets a$ to the initial letters of the months of the year.
60 Prints the initial letters of the months of the year under the base line.
70 States the maximum input values allowed.
80 Prints an empty column for printing the inputed values to.
100 Starts a loop, one for each month of the year.
110 Inputs data. If no more data 's' defaults and *Goes to* 170.
120 Checks size and range of input and states if out of range and *Goes to* 110 to re-input correct data.
130 Prints data just input on the empty column opposite the now inverted initial letter of the corresponding month.
140 If data is for the first month then plots a point on the graph corresponding to the value of that data.
150 For the subsequent months draws the appropriate line.
160 Completes the loop.
170 Asks whether a scale is wanted. If not *Goes to* 200.
180 Draws requested scale.
200 Asks if printer copy is required.
210 *Copy*'s required graph.
300 Asks if another run is required.
310 *Stops* if no more runs are required.
320 Asks if next graph is to be superimposed on current display.
330 If superimposition is required *Goes to* line 10 without *Clearing* the Screen.
340 If no superimposition is required then *Clears* the Screen and *Goes to* line 10.

```
  5 LET s=PI↑50
 10 DIM y(12)
 20 INPUT INVERSE 1;" Name of G
raph .  "; INVERSE 0;" (32 chrs.m
ax.)"; LINE t$: IF LEN t$>32 THE
N GO TO 10
 30 PRINT AT 0,0;t$;: FOR m=LEN
 t$ TO 31: PRINT " ";: NEXT m
 40 FOR n=0 TO 22: PRINT AT 20,
n;"■";: NEXT n: PRINT
 50 LET a$="JFMAMJJASOND"
 60 FOR n=1 TO 12: PRINT a$(n);
" ";: NEXT n
 70 PRINT AT 2,24;"Input";AT 3,
24;"Data";AT 4,24;"max.150"
 80 FOR n=1 TO 12: PRINT AT n+4
,24;a$(n);" = ";y(n);"  ";: NEXT
 n
 100 FOR n=1 TO 12
 110 INPUT INVERSE 1;"Input Data
";" INVERSE 0;" (S=end) ";y(n): I
F y(n)=s THEN GO TO 170
 120 IF y(n)>150 OR y(n)<0 THEN
PRINT AT 18,24;"Input ";AT 19,24
;"out of";AT 20,24;"rang
e": PAUSE 100: FOR m=18 TO 20:
PRINT AT m,24;" ";: NEXT m: GO TO 110
 130 PRINT AT n+4,24;" ";INVERSE 1;
a$(n);" ";INVERSE 0;AT n+4,28;y(n)
 140 IF n=1 THEN PLOT 4,y(1)+15
 150 IF n>1 THEN DRAW 16*(n-1)-1
5*(n-2),y(n)-y(n-1)
 160 NEXT n
 170 INPUT "Scale Overlay ? "; L
INE g$: IF g$<>"y" THEN GO TO 20
0
 180 FOR y=0 TO 100 STEP 50: PLO
T 0,65+y: DRAW 184,0: NEXT y
 200 INPUT "Copy to printer ? "
 LINE p$
 210 IF p$="y" THEN COPY
 300 INPUT "Another Run ? "; LIN
E r$
 310 IF r$<>"y" THEN STOP
 320 INPUT "Superimposed on this
 ? "; LINE s$
 330 IF s$="y" THEN GO TO 10
 340 CLS : GO TO 10
```



Year Graph
by Stephen Lewis

Dragon Dungeon

BEST SELLING DRAGONWARE

GRIDRUNNER — (Salamander). Jeff Minter's chart topping m/c code hit is now available for the Dragon. **£7.95**

NINJA WARRIOR (Programmers' Guild). Best selling arcade game prior to the arrival of "GRIDRUNNER". Can you achieve black belt status in the Martial Arts? **£8.95**

MIND OUT (Quicksilva). Tricky mines (some with legs), damsels in distress, Bill the Worm — and more! The Andrews' best seller now Dragonised!

EVEREST (Salamander). A modern alpine-style attempt on the world's highest "weather window". **£7.95**

FRANKLIN'S TOMB (Salamander). Destined to become a classic in the "ZORK" league, the graphics for this epic adventure are presented in book format. **£9.95**



P.O. Box 4, Ashbourne, Derbyshire, DE6 1AQ. Tel: (0335) 44626

TOWN NATHAN

Dragon Byte

Home Computers Software and Games

51a Queen Street
Morley
Leeds
Tel: 0532 522690

ZX SPECTRUM now under £100

Ring for more information

Last Chance

10 Ash Road
Headingley
Leeds 6
Tel: 744235

Home computers, software board games, role-playing games and books

At Last's place we make you offers you can't refuse . . .

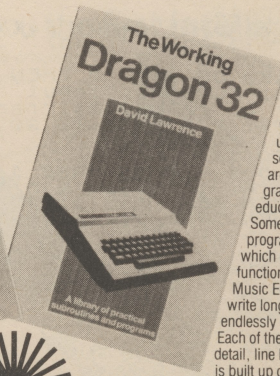
We're worth a visit because:

- ★ We've probably the best range of software in the North — and we're improving all the time.
- ★ We've a growing range of computers, peripherals, upgrades and books.
- ★ We've the biggest range of Citadel figures for leagues around.
- ★ We've board and adventure games for all ages from TSR, Games Workshop, Avalon Hill, Victory Games, GDW, Yaquinto, etc, etc.

PROGRAMMERS — Assassin Software needs your marketable programs. Give us a call

SPECIALLY FOR THE DRAGON USER
2 books from Sunshine





Dragon Games Master is a carefully structured book about writing games programs. All major aspects of interactive computer games are considered as you learn how to handle sound, colour, graphics, movement, mazes, detection, decisions, responses, consequences, scoring systems, status displays, economics, skill levels, title sequences and instructions. You will learn how to include these features in all your own games. The book takes you through each step line by line from writing the simplest games right through to the design and construction of first calls adventure programs which rival commercial software in their complexity and presentation. (160pp) **£5.95**

NEW RELEASE

Trade/Dealer enquiries welcome

The Working Dragon is the book for those of you who dream of putting your computer to some practical use. It is based on a collection of solid, sophisticated programs in areas such as data storage, finance, graphics, household management, education and games of skill. Some of the more advanced programs include a Text Editor, which can perform many of the functions of a word processor, and Music Editor, which will let you write long music programs without endlessly repeating similar routines. Each of the programs is explained in detail, line by line. And each of the programs is built up out of general purpose subroutines which, once understood, can form the basis of any other programs you need to write. Advanced programming skills spring out of the discussion explaining each subroutine. The collection also leaves you with a wide range of practical application programs which might otherwise only be available on cassette. (160pp) **£5.95**

SUNSHINE

(Also publishers of Popular Computing Weekly and Dragon User magazines)

Please send me

☐ **The Working Dragon 32** at £5.95 each

☐ **Dragon 32 Games Master** at £5.95 each

I enclose a cheque/postal order for £ _____ payable to **Sunshine Books**, 19 Whitcomb Street, London WC2H 7HF

Name _____

Address _____

_____ Signed _____

We can normally deliver in four to five days.

Caves of Worram

on Atari

This a game for the Atari 400 with 16K and Basic cartridge. The game is called Caves of Worram and is a one-player game in which a joystick is needed. This should be plugged into the left-hand socket. The aim of the game is to try and cross the screen from left to right as many times as possible following the instructions in the listing. There is full use of graphics and sound in this game.

Program notes

Lines

5-174 Initialise values and sets the shape of the starship at line 120.

180-310 Starship movement is done here using machine code for a smoother movement for the starship. Lines 230 and 240 check ship for a collision.

600-674 These lines are only used if a starship collides with an object, so that the game will be ready for restart.

800-815 Set graphics for the other shapes to be used

816-850 Draw initial set-up on screen

2000-2010 Set shape of the cave to be used throughout play

3000-3100 Landscape is caused to scroll from right to left

5000-5050 Control movement of Worram

9000-9110 Set up for initial instructions for playing this game

```
  0 REM *** CAVES OF WORRAM BY ***          ***
    SCOTT SMITH        ***          ***
  3 ***
  1 GOSUB 9000
  2 DIM P(86),Q(86)
  3 GOSUB 2000: RESTORE : GOTO 800
  4 RESTORE
  5 FOR I =  1536 TO 1575: READ A: POKE I,A: NEXT I
  6 DATA 104,104,133,95,104,133,94,160,1,177,94,136,
    145,94,200,200,192,127,200,245,96
  7 DATA 104,104,133,95,104,133,94,
    160,127,177,94,200,145,94,136,136,208,247,96
  8 UP = 1536:DOWN = 1557
 10 MEMTOP = 106
 11 PAGE = PEEK (MEMTOP)
 20 PAGE = PAGE - 8
 30 PMBASE = 54279: POKE PMBASE,PAGE
 40 MYPMBASE = PAGE * 256
 50 SDMCTL = 559: POKE SDMCTL,46
 60 GRACTL = 53277: POKE GRACTL,3
 70 FOR I = MYPMBASE + 512 TO MYPMBASE + 639
 80 POKE I,0
 90 NEXT I
 92 HITCLR = 53278:POPF = 53252
100 X = 100:Y = 50:PLAYER0 = MYPMBASE + 512
110 HPOSP0 = 53248: POKE HPOSP0,X
120 FOR I = MYPMBASE + 512 + Y TO MYPMBASE
    + 519 + Y
130 READ A: POKE I,A
140 NEXT I
150 DATA 0,0,28,15,28,0,0,0
160 PCOLR0 = 704: POKE PCOLR0,175
170 SIZEP0 = 53256: POKE SIZEP0,6
172 POSITION 0,1: PRINT #6;"SCORE": POSITION 0,0:
    PRINT #6; "HIGH SCORE"; HISCOR
174 J = - 1:DIS = 1:X3 = 20:X4 = 19:Y3 = 16:Y4 = 16:
    SCORE = 0
175 SOUND0,10,8,3
176 GOSUB 3000
178 FOR FLIGHT = 1 TO 3
180 A = STICK(0)
181 IF STRIG(0) = 0 THEN 600
185 PTS =  SCORE * 2 + INT (X / 2.5)
186 POSITION 5,1: PRINT #6;PTS
188 GOSUB 5000
190 IF A = 11 THEN X = X - 1
200 IF A = 7 THEN X = X + 1
202 IF X < 45 THEN X = 45
204 IF X > 200 THEN X = 45:Y =  (P(DIS) + Q(DIS) + 2)
    * 4.6:Y = INT (Y): SCORE = SCORE + 50
205 POKE HPOSP0 ,X
210 IF A = 13 THEN A = USR (DOWN,PLAYER0):Y =
    Y + 1
220 IF A = 14 THEN A = USR (UP,PLAYER0):Y = Y - 1
230 A = PEEK (P0PF): IF A = 0 THEN POKE PCOLR0,175
240 IF A < > 0 THEN 600
250 GOTO 310
260 IF A < > 14 THEN 310
270 FOR I = MYPMBASE +
    511 + Y TO MYPMBASE + 511 + Y + 9
280 POKE I, PEEK (I + 1)
290 NEXT I
300 Y = Y - 1
310 NEXT FLIGHT: GOTO 176
600 FOR BL = 0 TO 200 STEP 10
603 SOUND0,0,0,0
605 PTS = SCORE * 2 + INT (X / 2.5)
606 SOUND2,240,4,14
610 POKE PCOLR0,BL
620 FOR LIMIT = 1 TO 16: NEXT LIMIT
630 NEXT BL
632 IF PTS > HISCOR THEN HISCOR = PTS
635 GRAPHICS 0: SETCOLOR 4,9,4: POKE PCOLR0,148
636 SOUND0,0,0,0:SOUND2,0,0,0
640 PRINT "YOU SCORED";PTS; "POINTS ON
    THAT": PRINT "MISSION"
650 PRINT : PRINT "PRESS START OR TRIGGER":
    PRINT : PRINT " FOR NEW MISSION...":
    PRINT : PRINT "PRESS OPTION TO END..."
660 RG = PEEK (53279)
670 IF RG = 6 THEN 816
671 IF STRIG(0) = 0 THEN 816
672 IF RG = 3 THEN PRINT CHR$ (125): END
674 GOTO 660
800 DATA 0,0,0,0,0,0,0,0
801 DATA 255,255,255,255,255,255,255,255
802 FOR J = 0 TO 47: READ AS: NEXT J
803 DATA 255,126,60,0,0,0,0,0
804 DATA 0,0,0,0,0,60,126,255
806 DATA 0,0,0,28,0,0,0,0
808 DATA 0,0,24,60,60,24,0,0
810 FOR J = 0 TO 511: POKE 10240 + J,
    PEEK (57344 + J): NEXT J
815 FOR J = 0 TO 47: READ JK: POKE 10240 + J,JK:
    NEXT J
816 GRAPHICS 1 + 16: POKE 756,40
820 FOR J = 0 TO 19
830 COLOR 1: PLOT J,0: DRAWTO J,P(J)
832 COLOR 2: PLOT J,P(J) + 1
834 COLOR 3: PLOT J,P(J) + Q(J) + 1
836 COLOR 1: PLOT J,P(J) + Q(J) + 2: DRAWTO J,22
840 NEXT J
850 GOTO 4
900 DATA 3,17,4,16,4,16,5,14,5,14,5,12,6,11,6,11,6,10,7,
    8,8,7,9,5,10,4,10,4,10,4,10,4,11,4,11,5,11,6,11,7,12,6
910 DATA 12,7,12,5,12,4,11,4,11,3,10,4,10,3,9,3,9,4,9,7,10,
    5,12,2,11,3,10,5,9,6,9,7,8,9,8,9,7,10,7,10,7,10,6,11
920 DATA 6,11,6,11,5,11,4,11,3,10,2,9,2,6,2,5,3,5,4,6,4,7,
    5,7,6,7,6,9,6,10,7,10,8,10,9,9,9,9,10,9,10,9,10,8,11,7
930 DATA 11,7,12,5,10,7,9,9,10,8,12,7,14,5,15,5,14,5,13,
    6,12,6,11,6,11,5,10,5,9,6,8,8,7,11,6,12,5,14,4,16
2000 FOR J = 0 TO 95: READ AS: NEXT J
2001 FOR QW = 0 TO 85
2002 READ FLR,SPC
2004 P(QW) = FLR
2006 Q(QW) = SPC
2008 NEXT QW
2009 DIS = 1:J = - 1
2010 RETURN
3000 J = J + 1: IF J = 20 THEN J = 0:DIS = 1
3001 IF DIS = 68 THEN DIS = 0
3010 COLOR 32: PLOT J,2: DRAWTO J,22
3030 COLOR 1: PLOT J,2: DRAWTO J,P(J + DIS)
3040 COLOR 2: PLOT J,P(J + DIS) + 1
3050 COLOR 3: PLOT J,P(J + DIS) + Q(J + DIS) + 1
3060 COLOR 1: PLOT J,P(J + DIS) + Q(J + DIS) + 2:
    DRAWTO J,22
3100 RETURN
5000 X3 = X3 - 1: IF X3 = - 1 THEN X3 = 19
5010 Y3 = P(X3 + DIS) + ( INT (Q(X3 + DIS) / 2)) + 1
5020 COLOR 37: PLOT X3,Y3
5030 COLOR 32: PLOT X4,Y4
5040 X4 = X3:Y4 = Y3
5050 RETURN
9000 GRAPHICS 0: SETCOLORn4,10,4: SETCOLOR 2,10,4
9010 PRINT : PRINT : PRINT "WOULD YOU LIKE
    INSTRUCTIONS?": PRINT : PRINT "PRESS Y FOR
    YES, N FOR NO"
9020 IF PEEK (764) = 35 THEN 9100
9022 IF PEEK (764) = 43 THEN 9030
9024 GOTO 9020
9030 PRINT CHR$ (125): PRINT " INSTRUCTIONS":
    PRINT " ------------------------": PRINT
9040 PRINT " IN THIS GAME YOU GUIDE THE STARSHIP
    THROUGH THE CAVES OF WORRAM USING THE
    JOYSTICK." : PRINT
9050 PRINT " PRESSING THE TRIGGER DURING THE
    FLIGHT WILL CAUSE THE SHIP TO SELF
    DESTRUCT." : PRINT
9060 PRINT " ALSO, THERE IS A WORRAM WHICH DARTS
    THROUGH THE CAVES AND A COLLISION WITH
    THIS WILL PROVE TO BE FATAL."
9070 PRINT : PRINT " POINTS ARE AWARDED FOR THE
    AMOUNT OF TIMES YOU MANAGE TO CROSS THE
    SCREEN."
9080 PRINT : PRINT " PRESS START TO BEGIN."
9090 IF PEEK (53279) < > 6 THEN 9090
9100 PRINT CHR$ (125): PRINT : PRINT : PRINT :
    "PLEASE WAIT TILL I FIND YOUR SHIP"
9110 RETURN
```

Caves of Worram
by S. Smith

Edit

on Lynx

The Lynx editing commands allow you to edit a single line at a time. To copy a line you have to call it up using ctrl/e and the line number, delete the current line number and then type in the new one. To copy 50 lines repeat this 50 times. This is tedious, to say the least, and this article describes a machine code routine to perform multiple line copies.

It is necessary to understand how the Lynx stores a basic program. A line of a program is not stored in the same form as you type it in, but is encoded into a more efficient form before it is stored. This also means that the line must be decoded before it can be edited or listed which partly explains why the Lynx is slow in listing a program. This encoding can be illustrated by considering the one line program: 100 a = 1.

The Lynx stores information (data, programs etc.) as a series of bytes. If you use the monitor command h to look at memory you will see the contents displayed as pairs of characters. These characters, the numbers 0-9 and the letters a-f, are hexadecimal digits. Each digit represents four bits and a pair of hex digits makes up an eight bit byte. The one line program above would appear, using the monitor command h694d, as given in Figure 1.

The first line of your basic program starts at address 694d (all addresses are given in hex). Each line consists of five parts. The first five bytes are the line number, with bytes two to five holding the eight digits of the line number and byte one indicating where the decimal point should be placed. Byte one has the form cn where n means there are n + 1 digits to the left of the decimal point. (Of course, for integer line numbers the decimal point is not printed, but on the Lynx 325.07 would be a legitimate line number. This facility will be used in the program.) The next byte gives the length of the encoded line in hex and byte seven is a code indicating the type of command used in the line. The last byte of the line is 0d (return) and the other bytes are the encoded line. The length of that section varies depending on the command.

Note that the 1 in a = 1 is encoded as c0 10 00 00 00 using the same representation as the line number. The end of the program is indicated by the byte 80 immediately after the 0d of the last line in the program.

Now that you know how a basic line is stored, how can you find it? The Lynx has a non-standard command called lctn which returns the address of byte eight of the line. For example, lctn(100) would have the value 6955 hex. Hence lctn(s) – 7 is the first byte of line s and its length is stored in lctn(s) – 2. The other commands used are peek (x) which returns the value stored in memory address x, dpoke x,y which stores the two bytes of y in addresses x (least significant byte) and x + 1 (most significant byte), and call x which calls the machine code routine starting at address x.

A listing of the basic procedure is given in Figure 2. It simply stores the relevant addresses of the lines involved in the copy and calls up the machine code routine. Remarks have been omitted from the program to reduce the length as explained later.

Program notes

Lines	
10	Skip past procedure when running program
20	The parameters are: s — line number of first line to be copied e — line number of last line to be copied d — line after which the lines are copied
30	Error testing. The last line can not be less than the first line and the lines can not be copied into the procedure itself. A 'number out of range' message will appear if these conditions are not met.
40-70	Store addresses in memory for use by the machine code routine
40	First byte of s
50	First byte of line following line e
60	First byte of line following line d
70	First byte of line d
80	Call machine code routine
110-140	Reserve memory for the machine code routine and read it from tape. These lines are then deleted

The machine code routine

The machine code routine was written in Z80 assembler and hand converted into hex bytes. The code is stored in the upper part of memory reserved by the basic in line 110. The program starts at address &9f10 and the data is stored from &9f00. I used this method rather than the code command in basic for several reasons. First, I know where the data is and can load it directly; secondly, there is no limit to the number of bytes in a program as this is in a code line and also the code will remain after a new command.

Figure 3 gives a listing of the routine as it would appear using the monitor command h9f10. The first four digits in each line are the address of the first byte of that line. To enter the routine first type *Reserve* &9f00. Then enter the monitor and type m 9f10 and enter the bytes as given. Briefly, the routine performs the following:

FIGURE 1 ONE LINE PROGRAM.

```
694D  C2 10 00 00 00 12 00 41  B.....A
6956  3D 7D 7E C0 10 00 00 00  =  @....
695D  7F 0D 80                 ..
```

FIGURE 2 BASIC PROCEDURE

```
10 GO TO 100
20 DEFPROC C(s,e,d)
30 IF e<s OR d<100 OR e<=100 THEN ERROR 13
40 DPOKE &9F00,LCTN(s)-7
50 DPOKE &9F02,LCTN(e)-7+PEEK(LCTN(e)-2)
60 DPOKE &9F04,LCTN(d)-7+PEEK(LCTN(d)-2)
70 DPOKE &9F06,LCTN(d)-7
80 CALL &9F10
90 ENDPROC
100 REM : PROGRAM STARTS HERE
110 IF HIMEM>&9F00 THEN RESERVE &9F00
120 MLOAD "IT"
130 DEL 110,140
140 END
```

1. It determines the total number of bytes in the lines to be copied.
2. It moves the lines which follow line d higher in memory by that number of bytes.
3. It copies the lines into the space created in 2.
4. It updates the pointers to the last byte and the last byte + 1 (the byte containing 80).
5. It renumbers the copied lines. The new line numbers are formed as follows. The first three bytes are the same as the first three bytes of the line after which the copied lines appear. The last two bytes are bytes two and three of the original line. If you were to copy line 120 as part of a block of lines copied after line 250, it would be renumbered to 250.012, since the trailing zeros are not printed.

After entering both the basic and machine code routines save them to tape using the following three commands:

Save "ed",110

Mon

d 9f00 9fff 0 "it"

A fraction of a second of blank tape should be left between the save and the d commands. Now the two routines are automatically loaded by the single command, load "ed". Once "ed" is loaded it starts executing at line 110, and reserves memory, loads the machine code routine "it" and deletes the lines from the basic program.

To start a new program simply type auto. This will overwrite the remark in line 100. If you wish to edit an old program, assuming it starts with line 100, delete line 100 and then append "program name". This is why the procedure was kept to nine lines at the expense of remarks. Finally, if you wish to renumber your program use renum 10 to keep the first line of your program at line 100.

Using the routine

The routine is used directly from the keyboard rather than as part of a program. Taking advantage of the Lynx's ability to recognise p. as proc, to copy, for example, lines 200 to 250 after line 500 type p.c(200,250,500).

The prompt reappears almost immediately. Now lines 200 to 250 will appear as lines 500.02,500.021 .... 500.025. The original lines are still there, but by deleting those you have a multiple line move as well.

```
          FIGURE 3 MACHINE CODE ROUTINE
9F10  2A 02 9F ED 5B 00 9F 97   *..m[...
9F18  ED 52 4D 44 2A 04 9F ED   mRMD*..m
9F20  43 08 9F EB D9 2A 1F 62   C..kY*.b
9F28  ED 5B 04 9F 97 ED 52 00   m[....mR.
9F30  4D 44 ED 5B 1F 62 2A 08   MDm[.b*.
9F38  9F 19 22 1F 62 22 1F C2   ..".b".B
9F40  22 1F E2 2B 22 FC 61 22   ".b+" a"
9F48  FC C1 22 FC E1 EB 2B ED    A" ak+m
9F50  B8 D9 ED B0 2A 08 9F DD   8Ym0*..]
9F58  2A 06 9F FD 2A 06 9F 97   *.. *...
9F60  57 FD 5E 05 FD 19 FD 7E   w  . .
9F68  01 FD 77 03 FD 7E 02 FD   . w.  .
9F70  77 04 DD 7E 00 FD 77 00   w.] . w.
9F78  DD 7E 01 FD 77 01 DD 7E   ] . w.]
9F80  02 FD 77 02 97 ED 52 7C   . w..mR
9F88  B5 20 D4 C9               5 TI
>
```

Edit
by Kym Wilson

Bouncing Ball

on ZX81

Here is a program to show what can be done with the 1K of ZX81 memory, in Basic.

It displays the path of a bouncing ball moving from left to right, across the screen. By adding *Unplot* statements to lines 115 and 225 the ball, by itself, bounces along in real time.

By adding the following line:

```
145 If D = Val "64" Then run
```

the ball restarts after reaching the right-hand side.

All three lines will fit into memory, but the ball may 'miss' or might not appear at the place you expected.

Variables

H — Height of ball
G — Gravity (acceleration of 1kg per second)
D — Distance travelled (horizontally)
A — Speed of ball

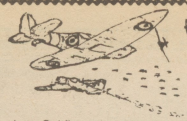
Program notes

Lines	
110-160	Routine for ball going down
220-270	Routine for ball going up
100	Balances line 210
210	Increases G so ball slows up quicker (to simulate the energy lost through sound and heat)

```
  5 CLS
 10 LET H=CODE "E"
 20 LET G=VAL ".9"
 30 LET D=CODE " "
 40 LET A=CODE " "
100 LET G=G/VAL "1.1"
110 PLOT D,H
120 LET A=A+G
130 LET H=H-A
140 LET D=D+CODE "■"
150 IF H<CODE " " THEN GOTO COD
E "COS "
160 GOTO 110
200 LET H=-H
210 LET G=G*VAL "1.1"
220 PLOT D,H
230 LET A=A-G
240 LET H=H+A
250 LET D=D+CODE "■"
260 IF INT A=CODE " " THEN GOTO
VAL "300"
270 GOTO 220
300 LET H=H-CODE "■"
310 GOTO VAL "100"
```

Bouncing Ball
by Mark Colson

DRAGON 32
ACE HIGH



Summer 1940. You are at the controls of a lone Spitfire unleashing its eight machine-guns on a squadron of Heinkel bombers. Dodge the Heinkels' guns. Look out behind for Messerschmitt fighters (rear mirror feature). Eyes peeled for sweeping frontal attacks — and shoot down that brave German who tries to take you head-on!

Features:

High resolution graphics, 3-dimensional action, cockpit view, realistic sounds, reward system, detailed scorecard.

The keys allow choice of colour or B and W, also joysticks or cursors.

This game exploits the Dragon's facilities to the full, using all 32K.

Not available in or to libraries or club system. **£7.95** includes P&P.

TUDOR WILLIAMS

15 SUMMERHILL ROAD, BILSTON WV14 8RD

M & J SOFTWARE

fig-FORTH FOR THE DRAGON **£10**

This cassette-based package represents fantastic value for money. It consists of the FORTH language, the standard editor, and our 6809 macro assembler. Documentation consists of the fig-FORTH Installation manual plus lots of example programs, memory map, etc.

DRAGON COMPANION BOOK **£4.95**

The DRAGON COMPANION has been well received by thousands of DRAGON users throughout Europe. It was written by M. Jarvis who has an honours degree in computer science from Keele University. Packed full of useful information — including a listing of a full 6809 disassembler.

ASSEMBLY SOURCE LISTINGS OF fig-FORTH ..... **£7 each**

These standard fig-FORTH assembly listings are available for the following processors: 6502, Z80, 6809, 8080, 1802, 9900, 6800, 68000, 8086-8088 and PDP-11.

fig-FORTH INSTALLATION MANUAL **£5**

This is a complete guide to implementing FORTH from the above listings.

6809 and 6502 MACRO ASSEMBLERS ..... **£5 each**

These programs are structured one-pass assemblers which will work on any fig-FORTH implementation with the minimum of alteration. They are provided in listing form together with instructions on use and an example program. Cassette recordings can be provided for DRAGON or MICROTAN users at £1 extra.

ALL ABOUT FORTY by HAYDON **£7.95**

An annotated glossary of FORTH with cross references to fig-FORTH, Starting FORTH and the FORTH-79 Standard. Invaluable as a work of reference.

Cheques and POs to: **M & J SOFTWARE, 34 GRAY'S CLOSE, SCHOLAR GREEN, STOKE-on-TRENT ST7 3LU. Tel: (0782) 517876.**

ANGLIA HOME COMPUTER BARGAINS

Dragon 32	@ £167.99	Vic20 pack	@ £137.99
Spectrum 48K	@ £127.99	Osborne D/D	@ £1,375.35
Commodore 64	@ £264.99	Epson HX-20	@ £425.45
Oric 48K	@ £158.99	Epson FX-80	@ £448.45
Lynx 48K	@ £218.99	Epson RX-80	@ £310.45

Price inc. VAT

Excess HP-85 stock at half price

Add £5 p&p Access and Barclaycard welcome

CALL. **Heather Ruffles**
Anglia Home Computer Bargains
88a St Benedict's Street
Norwich, NR2 4AB

TEL. **(0603) 667036/7 TELEX: 975201**

Self Adhesive Cassette Labels

★ **CASSETTE LABELS ON ROLLS** - Complete with tractor feed perforations to allow them to be printed in most modern computer printers. Now you can have 'Instant' labels, exactly when you need them! Minimum order 500 labels - £11
Cassette labels on sheets - 15 labels per sheet. These labels are suitable for rapid application by hand to cassettes and can easily be printed by any local instant print shop. They are also ideal for use in typewriters or word processors.
Minimum order 100 labels - £3.50

★ **SMALL COMPUTER LABELS** - Many micro computer users are finding that they are able to provide a unique and profitable service to businesses in their locality. We manufacture a wide range of small computer labels at very attractive prices. They are used for so many purposes that it is difficult to list them, but price changing, tagging, coding and marking are some examples.

NEW - Sampler pack of all of our different types of label - £20.

All the above prices include VAT & carriage. Excellent quantity discounts.
PLEASE SEND 16p STAMP FOR PRICE LISTS AND SAMPLE LABELS.

Industrial Process SELF ADHESIVE LABELS Superfast

Unit A4
Smeed Dean Centre
Eurolink Ind. Estate
Sittingbourne
Kent ME10 3RN
Sittingbourne (0795) 28425 (24 Hrs.)

CAMEL PRODUCTS ★ CAMEL PACK

DREAM 81 ★ CRAMIC-81 ★ PI0 SP

£19.95 OH, BLOW IT! £14.95

PI0-81 ★ MEMIC-81

PROMER-81 blows your programs into Eproms from ZX81. TWO or 4K Eproms 2516/32, 2716/32.
Software on tape, with easy user notes assembled and tested £19.95+VAT.

ROM-81 is an Eprom reader with two 24-pin sockets for above Eprom Types. Up to 8K (2 x 2732) program sits in 8K-16K area. User notes give a small transfer routine for loading Basic programs using RAND USR . . . £14.95 + VAT.

CAMEL PRODUCTS

UK P&P Free
Europe + 5% Overseas + 10%
Dealer enquiries welcomed

Cambridge Microelectronics Ltd., One Milton Rd., Cambridge. CB4 1UY Tel (0223) 314814

ROM 81 ★ PROMER-81 ★ BLO PROM 81

DRAGON SOFTWARE all machine code

BONKA
ADDICTIVE Arcade-style game in full colour. Climb the ladders and dig holes to trap the "Meanies" before they kill you. Four selectable speeds and choice of one to nine meanies to start.
NO JOYSTICKS NEEDED
SUPPLIED ON CASSETTE **£7.95**

DGT2
THREE fast-moving Arcade-style games in full colour, with hi-res graphics and sound. "Very addictive . . . any single one of these is worth a fiver, so £6.95 for all three is a bargain" (from *PCW* review). SNAKES, LANDER AND INVADERS (no joysticks).
THREE ON ONE CASSETTE **£6.95**

Cheques/POs payable to:
J. MORRISON (MICROS) LTD
Dept (PCW5), 2 Glensdale Street
Leeds LS9 9JJ. Tel: (0532) 480987
ALL ORDERS DESPATCHED BY RETURN FIRST-CLASS POST
Callers and Trade enquiries welcome

DROIDS — *NEW* (OPTIONAL JOYSTICK)
Stop the Droids removing lead shields to release the bombs which will destroy the world. Very fast game. Excellent hi-res colour graphics and sound.
SUPPLIED ON CASSETTE **£6.95**

CHESS
Hi-res display of board and piece. Eight selectable levels of skill. CURSOR control move selection (no numbers/letters to enter). Supports CASTLING AND EN PASSANT.
SUPPLIED ON CASSETTE **£7.95**

VULTURES — NEW (uses one joystick)
FAST-MOVING GALAXIAN-TYPE GAME in full colour with hi-res graphics and sound. A flock of vultures guard their eggs. As they swoop towards you try to kill them, but watch out. Just when you think you have killed them all, the eggs hatch!
SUPPLIED ON CASSETTE **£6.95**

J. MORRISON (MICROS)

MONSTER SOFTWARE CLUB

SOFTWARE LIBRARY FOR THE DRAGON 32

★ Software for hire from 11 manufacturers.
★ Over 90 titles to choose from, and growing.
★ TWO YEARS membership for only £8.
★ Same day service.

Send for details of FREE three months trial membership enclosing sae to:

32 Lennox Drive
Lupset Park, Wakefield WF2 8LU

ZX81, SPECTRUM, DRAGON BBC AND VIC

SOFTWARE LENDING LIBRARY

We have for hire from **50p** (including postage) programmes for your computer.

£5 for life membership (less than the cost of a single game) brings you the Software Lending Library membership kit including catalogue, news letter.

All tapes lent with full manufacturers permission.

Send a cheque or postal order for **£5** to **Software Lending Library,** PO Box 3, Castleford, West Yorks stating name, address, and computer type.

VIC20 OWNERS

Two quality programs for your Vic20 from the National Association of Vic20 Owners.

Hangman (Unexpanded) £5

Excellent use of colour, sound and graphics facilities with a vocabulary of 1,000 words combine to make this old favourite an entertaining program at a realistic price.

Data Base (16K) £7

A truly flexible tool to help you create your own filing system, search, sort, delete and create features, fully menu driven.

With each purchase you receive a copy of the NAVOs latest newsletter and full details about this user group. Send your cheque/PO payable to NAVO to:

The NAVO, 20 Milner Road, Sherwood Nottingham

NB. All orders come with full documentation

DRAGON USERS

YOU NEED OUR MENU-DRIVEN

PROFESSIONAL FILE HANDLER

PRO-FILE© only £9.95

Create, edit, delete, update, etc, your own personal files if you need to keep records then Pro-file© will do it for you. If you don't understand files then Pro-file© will teach you. Not just a cassette but a complete learning package for the amateur who wants to be professional.

EDUCATIONAL SOFTWARE only £4.95 each

Spelling (Improver 9/99 yrs)
Arithmetic (Practice 7/11 yrs)
Reasoning (11+ revision)
Physics (O Level revision)
Tables (Practice 7/11 yrs)
Knowledge (Quiz 9/99 yrs)
Maths (CSE revision)
Biology (O Level revision)

MICRO-DE-BUG CONSULTANCY 60 Sir Johns Road, Selly Park
OVERSEAS ORDERS WELCOME Birmingham B29 7ER

FREE COMMODORE CARTRIDGE . . .

WORTH UP TO **£24.95**

FOR YOUR VIC20

When you buy our switchable

32K RAM PACK at £69.95 + £1 p&p

Choose from Sargon Chess II, Gorf, Alien, Avenger, Mole Attack or Road Race.

Offer lasts while stocks last

Why not ring us with your Access or Visacard number, for speedy delivery, or send your cheque or P/O to:

Dept (PCW)

RAM ELECTRONICS (FLEET) LTD
106 FLEET ROAD, FLEET
HAMPSHIRE GU13 8PA
Tel: (02 514) 5858

THE VERY NEWEST VIC20 GAME NEUTRON ZAPPER

★ £3 OFF WITH THIS VOUCHER TILL JULY 31st

You are the pilot of the fastest starship in the galaxy FREEDOM FIGHTER. It has dual anti-gravity thrusters and a laser cannon that will ZAP any of the enemy craft this side of BETELGEUSE. You have been chosen to fight for the rebel forces against the enemy. Your life expectancy is only a few minutes — first you have to manoeuvre through a radio-active asteroid belt avoiding the exploding fragments. Because of the high radio-activity in this area your forward thrusters have run out of control and so the ship is constantly accelerating until you finish the phase. Once you are near the enemy's base planet you have to ZAP the Imperial Star Destroyers. If you can survive them, then you are confronted with the most terrifying of all, the menacing Maniac Mutants from the high gravity planet of DARG II. They swarm around like slugs but zillions of times faster.

The game includes:

- ★ 100% Machine code for incredibly fast arcade action
- ★ High Resolution multi-colour graphics — realistic movement!
- ★ On-screen score and high score
- ★ Ultra Froody sound will blow your mind
- ★ Hypnotically moving aliens threaten your deteriorating sanity
- ★ Increasing difficulty for continuous challenge
- ★ Unexpanded VIC20, Keyboard or Joystick Control
- ★ Colours that range from infra dead to ultra violent

If you, a mere mortal, can take on the challenge of NEUTRON ZAPPER then you know the terms . . .

RECOMMENDED RETAIL PRICE £9.95
WITH VOUCHER £6.95

The best game ever developed for the VIC20 including full money-back guarantee, mind eroding fun and super-fast delivery.

Limit of one voucher per order

Send Cheque, PO or Access number to:

Galactic Software

Lambrook Road, Shepton Beauchamp, Somerset TA19 0LZ. Tel: 0460 40744

ANCO SOFTWARE

FIFTY PROGRAMS FOR YOUR MICRO

FOR A LIMITED PERIOD WE ARE OFFERING 50 FIRST-CLASS GAMES FOR THE FOLLOWING MICROS AT A SPECIAL PRICE

SPECTRUM	£8.99
DRAGON 32	£8.99
ORIC 1	£8.99
ZX81	£6.99

ALL TAPES POST FREE

10% REDUCTION FOR THE UNEMPLOYED
SEND YOUR UB40 OR A PHOTOCOPY, TO OBTAIN A FURTHER 10% OFF OUR LOW PRICES

SEND CHEQUES OR POs TO:

ANCO SOFTWARE
25 CORSEWALL STREET, COATBRIDGE, ML5 1PX

NEW FROM ASN
FOR THE COMMODORE 64

NECKED

AVAILABLE IN SIX LANGUAGES

Necked is based on the pen and paper game of Hangman but requires only one person to play it. The program has a dictionary of 200 words. The Foreign Language versions display the English words on Side 1 which you must translate. On Side 2 you must translate the words back into English.

AVILABLE IN
ENGLISH, FRENCH, GERMAN, SPANISH, SWEDISH, ITALIAN

Price £7.95 INC VAT Dealer Enquiries Welcome

Send to:

ASN COMPUTER SERVICES LTD
DEPT PCW, 89 STATION CRESCENT
ASHFORD, MIDDX TW15 3HN

★ ★ Software Authors wanted. Top royalties paid for all popular micros

---

SALE P.&R. COMPUTER SHOP SALE

IBM GOLFBALL PRINTERS from £70 EACH + V.A.T.

INTERFACE FOR IBM GOLFBALL £40 + V.A.T.
*BRAND-NEW LA36 DEC WRITERS — SALE £200 EACH + V.A.T.
CENTRONIC 779 PRINTERS — £325 + V.A.T.
CENTRONIC 781 PRINTER — £350 + V.A.T.
POWER UNITS, 5-VOLT 6-AMP — £20 EACH
FANS, PCBs, KEYBOARDS AND LOTS MORE
8-INCH IBM FLOPPY DISC DRIVES

COME AND LOOK AROUND

SALCOTT MILL, GOLDHANGER ROAD
HEYBRIDGE, MALDON, ESSEX
PHONE MALDON (0621) 57440

SPECTRUM SOFTWARE

BEETLEMANIA: Quick fingers and quicker thinking are needed in this original machine code maze game **£4.95**
HELLS BELLS: Go through Hell to recover the treasure but beware of Zombies, Demons and Dragons **£4.95**
REVERSI: A superb machine code implementation of the classic board game. Levels 1-8, large graphics, fast response **£4.95**
RENUMBER/DELETE: A full machine code renumber for 16/48K Spectrum. Renumbers GOTO GOSUB etc. Also block delete etc. **£3.95**

FREE C15 CASSETTE

● Don't just read about these programs, see excerpts from them on your computer screen! Send 50p DEDUCTABLE FROM FIRST ORDER for TOP QUALITY C15 tape containing complete software review (48K only) ●

FREE C15 CASSETTE

AWA Software, 50 Dundonald Road
Didsbury, Manchester M20 0RU

★ PROGRAMMERS ★

ORIC, BBC, LYNX

SPECTRUM, DRAGON, VIC20

PROCOM PAYS 30 PER CENT

ROYALTIES FOR

OUTSTANDING PROGRAMS

PROCOM

309 HIGH ROAD, LOUGHTON, ESSEX

01-508 1216

ALPHA-NUM

(SPECTRUM 48K/MODIFIED VERSION FOR 16K)

Nine feature menu includes alphabetical and numerical sorting, indexing, review, update and copy (for printer)
An invaluable for writers, teachers (registers, marks, etc), small traders and hobbyists of all kinds.

HOME INVESTOR

(SPECTRUM 16K/48K)

An essential program for the private investor. Menu driven program enables user to ascertain future value of investment, actual rate of growth, present values, period required to amass specific sum; mortgage and annuity calculations; flat and redemption yields; net of tax returns . . . and still more!

Each £4.95 : Both for £8.95 (post free)

AVAILABLE ONLY FROM

R. G. WINFIELD BSc (ECON) FIB
DEPT 1, 7 GORE LANE, RAYNE, ESSEX CM7 8RL

GOOD ROYALTIES PAID FOR USEFUL PROGRAMS

POPULAR Computing WEEKLY **Back Issues**

Almost all the copies of **PCW** that you missed can still be bought as back issues for only 50p, including postage and packing.
An **index** of the contents of the 36 issues published in 1982 is now available from the Publishers for only £1.20. It includes full details of all the programs, routines, reviews and news that you might have missed.

Please send me the following back issues at 50p each:

Total £

Please send me a copy of the 1982 PCW Index at £1.20 ☐
I enclose a cheque postal order for £

Name

Address

Please return to Back Issues, PCW, Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.

FRIENDLY SOFTWARE HIRE

NEW

JOIN OUR NEW LIBRARY FOR: SPECTRUM:

GAMES: TAPES:
BUSINESS: TAPES:
EDUCATIONAL: TAPES:
GRAPHIC:
HOME UTILITIES:

Hire as many tapes as you like, all hired with manufacturer's permission, royalties paid. Reasonable hire fee, library subscription just **£8.00** per year, **£2.00** extra overseas.

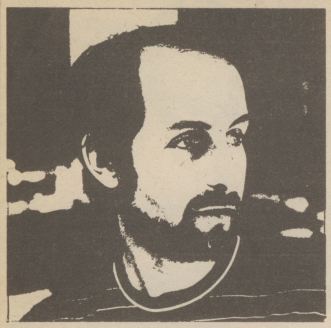
SPECIAL OPENING OFFER UNTIL END OF AUGUST, 1983. JUST £5.00 FIRST YEAR

(30 days money back guarantee)

SPECTRUM: Coming soon, library for Dragon, BBC, Commodore. Write, tell us which computer you have, which cassettes you would be interested in:

Send your subscription to:

FRIENDLY SOFTWARE HIRE
27 CONIFER CLOSE, WHITEHILL, BURDON, HANTS GUJ5 9DH



Energy barrier

Have you ever noticed the many different ways that people stub out their cigarettes? Some crush them with great force, and then blow the ash dismissingly from their fingertips (the grosser smokers actually lick their fingers clean! Yuk!), whilst others meekly hold the cigarette at arm's length and gently fold it against the edge of the ashtray, as if afraid to wake it up!

Yet others grind the end round and round until the poor thing finally succumbs. You can tell these easily — they are usually jumping up and down, blowing on their fingers!

There are those smokers who allow the surrounding company to participate in their activities — that is, everyone rushes to stem the acrid cloud of smoke as the butt burns merrily away in a heap of ash and filters. Sounds disgusting, doesn't it? And what on earth, you may ask, has this to do with adventure games?

Well, it occurs to me that people play adventure in the same way that they might put out a cigarette. Some approach the game cautiously, whilst others charge in recklessly, throwing all aside in their impatience. A number of people believe in the committees and rope in friends, neighbours and the cat to help them in their quest!

There's probably a middle way that is the best — all will achieve their purpose in the end, but caution spiced with a bit of daring and leavened with an ability to accept advice and help will result in a better game.

All you'll need to play Crystal Computing's latest adventure, *Halls of the Things*, is an itchy trigger finger! One of the best arcade games I've yet seen for the 48K Spectrum, *HOTT* has a decided bias to the Dungeons and Dragons sort of scenario.

A huge tower, surrounded by an acid-filled moat, boasts a stairway which links its eight storeys. At each level is an energy barrier and behind each one you catch glimpses of *The Things*, terrifying humanoid incarnations trained many T-states ago by the three Evil Lords of the Halls and imprisoned for all eternity. I don't know what it all means either, but it makes for a sensational game!

Your mission is to brave these awful *Things* and collect the seven spectral rings. Only when in possession of these can you then find the key in the lowest level and escape. Of course, these *Things* aren't going to let you get away with it easily — they are out to get you.

The mechanics of the game are superb, finely-balanced between simplicity and addictiveness. The game is quick to play, or at least quick to lose . . . if you're winning, the game will last a long time.

There are, as we've seen, eight levels. The bottom one is impenetrable until you have all seven rings, but the others may be entered or left at will. They do, however, get harder as you progress towards the bottom of the tower. Each level consists of a maze, either more or less complicated, which is guarded by *Things*. These *Things* come in several shapes, and these each have their own characteristics. They're all completely deadly!

To combat them, you have a certain amount of magic, which you can use to loose off highly accurate fireballs, or lay down blanket fire with lightning bolts. You also have a large amount of unmagical, but no less effective, arrows. These are useful when your magic runs low. Bottles of elixir are scattered throughout the halls which replenish your magic, along with little piles of treasure. Take care, though, these little goodies may be *Things* in disguise which, as soon as you round the corner, will come after you.

Moving around is very easy and the graphics and colour are superb. If you are using a monochrome set, you may adjust the contrast from within the program. A nice touch.

A high score is included, by one Kickaha (all Philip Jose Farmer fans will understand this reference), of 100 points and, for all I know, a blaze of trumpets and singing angels if you beat this! I've only scored 35 so far, though in my defence I've only had the game for a couple of weeks (and I haven't found a ring yet, but I will, I will!).

It's not often that you see the authors of a game glued to it, as I saw happen at the Earl's Court Fair recently. And even they have only completed the game once!

If you enjoy sitting up until 4 am having "just one more go to beat this thing", you'll love this game — I can't recommend it highly enough. ■

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Are you stuck in an adventure? Are you faced by a problem that seems insurmountable? *Adventure Helpline* may be the answer.

Adventure Helpline is, quite simply, designed to put adventurers in touch with one another. Where you may be stumped by a baffling puzzle, a fellow adventurer may be able to help. By the same token, you may be able to help other people with their problems.

If you are having difficulties with an adventure, fill in the accompanying coupon and send it to:

Adventure Helpline
Popular Computing Weekly
Hobhouse Court
19 Whitcomb Street
London WC2

We shall publish *Adventure Helpline* entries each week in their own special column.

Adventure Helpline

Micro .....

Adventure .....

Problem .....

.....

.....

Name .....

Address .....

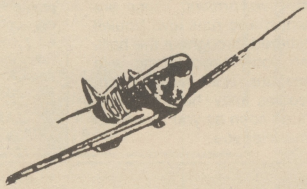
.....

.....

BATTLE OF



FOR EVERY CASSETTE SOLD £1.00 WILL BE DONATED TO THE ROYAL AIR FORCE ASSOCIATION



BRITAIN

LATEST: BATTLE OF BRITAIN SIMULATION WAR GAME BY PAUL MEDLAND TAKES SCENE BY STORM. USE YOUR 12 FIGHTER BASES, 280 AIRCRAFT, SUPPLY OF FUEL, FOOD, AMMO TO DEFEND TERRITORY. YOUR MORALE IS AFFECTED BY EXTENT OF BOMBING BY GERMAN LUFTWAFFE: PREPARE TO ATTACK. A GAME OF SKILL, CUNNING AND WITS TO RUN ON 16K VIC20. COST £9.95 (INC. VAT) + 50P P&P FROM: MAINCOMP LTD, 1/2 CAMBRIDGE GATE, REGENTS PARK, LONDON NW1. TEL: 01-487 5435/6

Maincomp Limited

VIC 20

Please send me the following:

☐ Battle of Britain ☐ Free information

I enclose a cheque/PO for £..... (Inc. 50p p&p)

Name .....

Address.....

DEPT (PCWK)



A GOOD BUY?

Andrew Raksey of Lawson Crescent, Banchory, Scotland, writes:

Q I am a Dragon owner, and I am looking for a reasonably priced printer. I have considered CGP 115, but it is too expensive. I am now looking at a ZX printer as it is cheap and can produce graphics. Do you know if it is compatible with the Dragon, and would it be a good buy?

A Given that the CGP is four colour, I do not feel that it is fair to call it overpriced. Printers are one area where generally the more you pay, the better quality and performance you will get. The ZX printer could be made compatible, but it would take some re-coding, and a specially-built interface. Microtanic used to do a series of interfaces for 6502-based computer, so they could be used with the ZX printer, and, of course, the 6502 is a relation to the Dragons 6809. But at around £30 a time it in effect put the price of the printer up to the £80 bracket. It would be possible to build your own, but I do not have sufficent knowledge to tell you how difficult it is.

The only thing I can suggest is that you take a look at the Amber, which should work out at a little under £90 inclusive. This is a dot matrix printer, but it is small and cheap. However the paper is ordinary till roll paper and only two and a-half inches wide. It does provide a clear hard copy, and has the options for graphics and double-size characters, but with only 24 characters per line. If you want cheap, clear printouts of programs, then this is probably the best bet, as long as you accept its limitations. A modified form of Centronics interface will be needed, but full and further details can be obtained from Lethaby Numbering Systems Ltd, Central Way, Walworth Industrial Estate, Andover, Hampshire SP10 5AL.

FLASHING COLOURS

Robert Stacey of Ranleigh Drive, Edgware, Middlesex, writes:

Q When using my Spectrum, I always make the keyboard beep by typing *Poke* 23609,50. However, by accident, I typed *Poke* 22609,50. This produced a pale coloured square in the top left-hand corner of the television screen. By *Poke*ing in different numbers I got light and dark colours (I use a black and white television). For example, if you *Poke* in 255 you get a bright square and 230 will give a colour flashing on a bright surface. I would be grateful if you could tell me what is happening, as I would like to experiment.

A What you are doing is *Poke*ing into the attributes file, which extends from 22528 to 23295. Each address stores the detail of one 8 x 8 square, starting in the top left-hand corner, and working along the first line, then returning to the start of the second line working along that line and so on. The number held in the address is converted into binary which in turn controls the attribute. Bit 7 controls *Flash*, (1 = *Flash*, 0 = *Steady*), bit 6 controls *Bright*, (1 = *Bright*). *Paper* is controlled by bits 5,4,3, and *Ink* by the remaining three bits. A table which shows in more detail how the *Paper* and *Ink* attributes are made up is given in *The Sinclair Spectrum In Focus* by Mark Harrison, and published by Sigma. In the meantime to give yourself some idea of how this works, try this:

```
10 LET a = 22528
20 LET b = 0
30 POKE a,b
40 LET a=a+2
50 LET b=b+1
60 IF b> 255 THEN STOP
70 GO TO 30
```

This will run through all the 256 possibilities that can be *Poke*d into the attributes. The only reason that I have incremented the addresses by plus two, is to provide a bit of visual clarity.

In point of fact you are unlikely to need to attribute file a lot because you have the *Attr* command, which in effect *Peek*s the attribute file, and returns the values stored at a specific address.

ON/OFF SWITCH

D. L. George of Victoria Road, Shoreham-by-Sea, West Sussex, writes:

Q One of the most frustrating aspects of working with a home micro must be the pushing/pulling of jack plugs, and fiddling with the volume controls. I've noticed some leads offered complete with selector switch and on/off switch.

Would it be worth taking this to its logical conclusions and soldering the computer leads direct to the cassette players' circuit board? How about dedicating the cassette play completely and removing all the unnecessary bits.

My micro is a Dragon 32, and the player I have in mind for surgery is an Hitachi TRQ 289. The circuitry seems straight forward, and I think my soldering skills are adequate. Do you think this would be a wise course of action?

A Not really, unless you think it will genuinely improve the performance of your tape player when it comes to *Load*ing and *Save*ing. I do not know the model you mention, but if it doesn't have a tone control then a project for wiring in such a control might be useful. Tone control is one of the important aspects of the whole gamut of *Load*/*Save* problems.

If you have confidence in your ability you might well find it easier to alter the azimuth of the tape head to the tape. This can be an important influence on your cassette's performance and would probably be easier to do, than the hard wiring you suggest.

The other side of this question is one of convenience, and assuming you wired in an on/off switch, and the whole system worked well, it would stop leads pulling out when you get carried away playing Space Invaders. It would also offer you the option on keeping your computer on a piece of board that would be easier to store. If you do go ahead and modify, then you could wire the volume and tone controls to a special panel, which would make it easier to get to.

WHICH ISSUE?

Michael Lee of Hill Road, Barnsley, writes:

Q Even though it will cause me problems with the guarantee, I am going to purchase a Spectrum up-grade, to make my machine 48K. How do I find out though if my Spectrum is issue one or issue two?

I would also like to add that I think it is bad of Sinclair not to bring out their own up-grade as promised.

A There are two ways of telling the two issues apart, on 16K Spectrums. On the underside, a little off-centre, you will see a recessed hole, at the bottom of which is a very small brass screw. This is, in fact, a variable capacitor, and enables the user to tune the Spectrum in a little more easily. This only appears on the issue one Spectrums. Also, if you look at the port at the back the width of the contact fingers are more or less the same as the gap between them. On issue two Spectrums, these contact fingers are very much wider, and the gap between them correspondingly smaller.

As for Sinclair failing to bring out their own memory extension, I feel it is another case of a British manufacturer failing to get his marketing together — by now it would not be worth them bringing their own expansion out.

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

CLASSIFIED

Semi-display — £5 per single cc
Trade lineage — 20p per word
Private lineage — 10p per word

CALL *DIANE DAVIS* ON *01-839 2476* FOR SEMI-DISPLAY ADVERTISING

GAMES SOFTWARE

QUALITY ORIC SOFTWARE

THE WORD
Up-market Hangman, with colour and sound

DEATH TRAP
Moving graphics game with facility to design your own graphics

MASTERMYNDE
The fully expanded classic 1-4 players + multi-skill levels + timer!

Tapes + instructions £4.95 each.
SAE for full range and price list.
Cheque/PO to: Headfield Technology
Lock Street, Savile Town, Dewsbury
West Yorkshire WF12 9BW

CHRISTINE COMPUTING

T99 4A SOFTWARE
NORTH SEA, CODE BREAK
ASTRO-FIGHTER

£3.50 each, **£6.60** for two
£9 for all three

SAE for Hardware/Software Catalogue to:
Dept PCWK, 6 Florence Close, Watford, Herts.

HIGH-RESOLUTION ZX81 games without hardware! Invaders £4.95. Swarm £3.95, Zorf (5 sheets) £5.95. Odyssey Computing, 28 Bingham Road, Sherwood, Nottingham.

ZX81 KEYBOARDS
Second-hand touch sensitive keyboards in as-new condition, guaranteed three months.
£5 each inclusive.
TELFORD ELECTRONICS
26a Bradford Street
Shifnal, Shropshire
Tel: Telford 460008

16K MANAGING DIRECTOR ZX81
A GAME OF STRATEGY
Run Your Own Electronics Firm
Compete against 'Phirrips'
New Products, New Technology
Shares, Strikes, Wage Claims
Profit/loss Accounts, Exports
7 Levels **£3.50** Cassette
S-CAPE, 65 LANGDALE GARDENS
READING, BERKS RG6 2TU

SPECTRUM 16K "RAQUEL" presents her game for age 16 and over only (state age when ordering), still only £2.95.

UTILITIES

SPECTRUM KOPYCAT £4.95
SIMPLY THE BEST. So simple to use. Any type of ZX SPECTRUM program can be backed-up on to a fresh tape, even programs that cannot be stopped can now be copied. Programs over 41.5K (8K for 16K machines) are easily duplicated. 100% machine code. Plus. FREE Tape-header Reader program. IMMEDIATE DESPATCH. Send cheque/PO to:
MEDSOFT
61 Ardeen Road, Doncaster DN2 5ER
IT CAN EVEN COPY ITSELF

TELETEXT ON YOUR SPECTRUM: "Zxtext" lets you create your own personal Teletext system. Similar to Ceefax and Oracle. Capacity 900 pages, full colour, graphic flashing, inverse video, 24-hour clock with alarm, even the engineering test pages — it's all here! Cassette £4.95, complete with sample system, full instructions and 12-month guarantee. Send cheque/PO (or SAE for details) to: Iain Stewart, 17 Torry Drive, Alva, Scotland FK12 5NQ.

TAPE COPIER for Spectrum (16/48K) — money back guarantee. Copies virtually all programs (Basic/machine/data in one go), verifies, abort, multiple copies — no program area used. £3.75. L. Evans, 16 Stonepit Drive, Cottingham, Market Harborough, Leics.

SPECTRUM REFLEX 48K. Makes back-up tapes of virtually any C16/48K program. Written in 100% machine code. Uses no program area. Will even copy itself. Together with machine code tape header reader. Only £3.95. From JN Software, 11 Latton Close, Chilton, Didcot, Oxon OX11 0SU.

SPECTRUM 64 PRINT, amazing software that gives 64 characters per line instead of 32, prints anything from your Basic program, cassette, 48K or 16K, £2.90. K. Ahmed, 28 Magpie Hall Lane, Bromley, Kent.

SPECTRUM COPIER for any Spectrum. Copies any program quickly and automatically, easy to use. Cassette £2.50. Tel: Downham Market 383412.

SPECTRUM "M/CODER". Instantly translates basic programs into machine code. Easily used. Full instructions. £8.60. P&P free. A. P. Berry, 11 Ravensdale, Basildon, Essex SS16 5HS.

MAGAZINES

ORIC USER
PROGRAMS NEWS VIEWS
£10 for a year's sub
To: 20 Wynford House,
Wynford Road, London N1

DRAGON USER

To make the most of your Dragon you need **Dragon User** — the independent magazine for Dragon owners. To make sure that you receive a copy of Dragon User regularly subscribe direct to us. A year's subscription costs £8 for 12 issues or subscribe for two years for £14.40 and receive a free copy of either **The Working Dragon** or **Dragon Gamesmaster** (overseas rates available on application). Send a cheque or postal order made payable to Dragon User, and accompanied by your name and address, to Dragon User, Subscriptions Department, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH.

SOFTWARE

LOCK-KEEPER for 48K Spectrum. A Basic Program to encourage reasoning skills for age 10+, with teaching and testing modes. Send cheque/PO for £4.95 to: J. J. Donoher, 33 Upton Drive, Chester, CH2 1BY.

SCEPTRE SOFTWARE. Programs for TI99/4A, Dragon, Spectrum and Vic Home computers. Send SAE for details to 59 Norbury Grove, Walker, Newcastle.

TREBLE CHANCE POOLS Forecast Program for ZX81 16K. Proven winner. Cassette with full instructions, £2.95. M. A. George, 12 Donne Avenue, Spital, Bebington Wirral L63 9YH.

DRAGONEERS!
Practical Programmes from MB for Dragon 32
WORPES. Basic text-processor. Up to 250 lines of 80-character text can be entered, edited, stored on tape and printed with single or double spacing in part or full. Why pay £50 for a word-processor when Worpes will do all necessary for **£9.80** incl.
TELIST. Stores, alphabetises, saves on tape and gives immediate access up to 500 names with telephone number. If printer available prints telephone directory. A highly disciplined use of Dragon's 32K memory for **£8.80** incl.
QUIZZER. Set your own quizzes. Up to 50 questions with choice of 6 answers. Correct is jumbled among other five. Can be saved on tape. **£5.80** incl.
SPECIAL OFFER: All 3 for £21.00
Cheques/PO to: **MB PROGRAMMES (CW), 3/112 Oxford Gardens, London W10 6NG**

DRAGON WORD PROCESSOR. Full features, cassette based, 20K text buffer, includes full manual. Stop playing games! £10 from R. J. Crowther, 141 Hollyfield, Harlow, Essex.

ZX81 16K ROUTINES, machine screen handling routines. Also Alien Adventure on same tape plus other routines and games, £2.75. D. Stone, 49 Arncliffe Drive, Knottingley, West Yorkshire.

THE VOICE OF THE FUTURE
S&GnSoftware
SPEECH PROGRAMES FOR THE "SPECTRUM" WITH VOICE SYNTHESISERS.
KEYSPEAKER — Speaks all different key entries as you program, including mode changes, keywords and colours. Write, run, load and save BASIC or MACHINE CODE with KEYSPEAKER running. **£6.95.**
SPEAK AND SPELL — Reads plain English from strings. Your SPECTRUM talks to you like an old friend. Add speech output to your programs without using phonetic code. **£5.95.**
NOW AVAILABLE FOR:
Stuart "CHATTERBOX"
Fuller "ORATOR"
Computer Add Ons "SSI"
STATE WHICH WHEN ORDERING.
S&G SOFTWARE, 4 ALPHA STREET
DARWEN, LANCS BB3 2BX

CLASSIFIED ADVERTISING RATES:

Line by line: For private individuals, 10p per word, minimum 10 words.
For companies, traders, and all commercial bodies, 20p per word, minimum 20 words.

Semi-display: £5 per single column centemetre, minimum length 2 cm. (Please supply A/W as PMT. Or supply rough setting instructions.)

Conditions: All copy for Classified section must be pre-paid. Cheques and postal orders should arrive at least two weeks before the publication date.

If you wish to discuss your ad, please ring Diane Davis 01-839 2476.

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

			Please continue on a separate sheet of paper

I make this ..... words, at ..... per word so I owe you £ .....

Name .....

Address .....

.....

.....

Telephone .....

Please cut out and send this form to: Classified Department, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2

DIET AND WEIGHT CONTROL program. The first and best, now for 48K Spectrum, £4. E. Frangoulis, 54 Holland Road, London W14.

5D SOFTWARE FOR ZX81

- ★ ZX Owners — July Software list now available.
- ★ Programmers — our Software Writer's Co-op Scheme can earn royalties up to 70%.
- ★ Dealer enquiries welcome.

Hempland Cottage, Lopham, Diss, Norfolk. Tel: 037-988 640.

FOOTBALL POOLS FORECASTER, ZX Spectrum programme uses league tables and recent trends to forecast results. League tables are updated from match results. Last seasons tables included for demonstration, £5.95. C. Tilbury, 95 The Marles, Exmouth, Devon.

COMMODORE 64 Database program £10 or SAE for details. K. Hulston, 14 Bispham Avenue, North Reddish, Stockport, Cheshire SK5 6NT.

FED-UP with expensive feeble software? Quality low-cost Spectrum games. Interested? SAE for details: Eclipse Software, 6 Rossness Drive, Kinghorn, Fife.

ZX81 — FLIPSIDES

Buy both of the following cassettes and a free! stick-on keyboard is yours. Each cassette cost **£6.25** inc p&p

FS/1 (A) side — House of Cards
Flipside — Spelling Time Bomb
FS/2 (A) side — Semaphore Tutor
Flipside — Morse Code Tutor (with sound)

All customers are to be entered in a free! draw. The draw is for a ZX Speech Synthesiser and will take place on September 6, 1983

Don't delay — send today! Cheques/POs to: VII Soft Computer Systems, 3 Moreton Way, Mottram Hyde, Cheshire SK14 6RG

SWAP SPECTRUM SOFTWARE. Please ring John on Ramsden 249 anytime.

SPECTRUM EDUCATIONAL SOFTWARE. SAE for free details. 18 Rayhall Lane, Great Barr, Birmingham.

SPECTRUM SOFTWARE. Books to sell or exchange for BBC software. 02407 5340 (Bucks).

RECRUITMENT

IF YOU

have written or are writing an original Machine Code Program for the VIC20 or the Spectrum

WE HAVE AN IDEA

which could make your program the best seller in Europe

INTERESTED???

Then telephone: 01-868 5332

NOW!!!

PROGRAMS AND PROGRAMMERS
Wanted for UK and USA Market. Spectrum Vic20/64
Send tapes to:
ENFIELD COMMUNICATIONS, 135 HIGH STREET, PONDERS END, MIDDX. Tel: 01-805 7434.

DEALERS

A RETAILER for Sinclair accessories in the North of England. We are situated near the M1 and M62 motorways. As well as a complete range of hard and software, our service department can repair, modify or fit a wide range of accessories. Hours of business 10 am — 8 pm Tuesday to Saturday inclusive.

TELEPHONE PHILIP COPLEY ON 0924 272545
6 WESTLEY ST, OSSETT, W. YORKS

PLEASE RING FOR DETAILS OF OUR MAIL ORDER SERVICE

SOFT MACHINE
A selection of the very best Software, Books and Accessories available for ZX81, Spectrum, BBC, Dragon, Vic20 and Commodore 64 Microcomputers.
At 3 Station Crescent Westcombe Park London SE3
Tel: 01-305 0521
or send SAE for free catalogue (state which computer)

Vic20 starter pack £139.99
Commodore 64 Rams £39.95
plus other hardware from
NOLANSCO ELECTRONICS
Large selection of software, business, educational and games.
COMMODORE 64 + Vic20
SOFTWARE AND HARDWARE FROM
Phone Karen Biggleswade (0767) 316702 (24 hrs)

PHOENIX COMMUNICATIONS DIGITAL DIVISION
Apple 2 compatible peripherals, including:
Language card
Disk drive controller
Z80 card — 80 column card
PAL colour card — and many more
Check this price:
Disk Controller card **£28.00** + VAT
For more details send SAE for catalogue to:
16 Theobald Street, Borehamwood, Herts WD6 4SE. Tel: 01-207 5950

RAWLINGS
ATARI
19/21 ST JAMES ROAD SOUTHAMPTON SO1 5FB Tel: (0703) 772700

400 Computer + 410 TP Rec + Basic MM LS + Joystick + C game	800 Computer + 410 TP Rec + Basic MM LS + Joystick + CTG game
£200.00 Inc.	**£355.00** Inc.

LANCASHIRE MICROS
KEMPSTON JOYSTICK CONVERSION TAPE £4.95. Converts 3D-Tanx, Frenzy, Escape, Hungry Horace, Painter, Spawn of Evil and Flight Simulation for use with Kempston joystick. **SPECTRUM GOLF £3.95.** 18 hole graphic golf game for the 48K Spectrum. **ZOMBIES FOR UNEXPANDED VIC £3.95.** Game of strategy — lure the zombies to their doom!! AVAILABLE FROM **LANCASHIRE MICROS, 51 QUEEN ST., MORECAMBE, LANCS. Tel: (0524) 411435.** DEALER ENQUIRIES WELCOME

ACCESSORIES

COMPUTER CASSETTE LEADS, Din to Din plus remote (BBC/Oric/Lynx) £2.45. Din to three jacks (BBC/Oric/Lynx) £2.45. Dragon lead (Din to Din or Din to three jacks) £2.45. Texas TI99/4A (single recorder) £4.75. Send cheque/PO to: Loophole Software, Arkright House, Alexandra Road, Llandrindod Wells, Powys.

AMPLIFY YOUR SPECTRUM SOUND. Convert your tape recorder into a powerful amplifier for only £3.99. No modification required to your Spectrum or tape recorder. For further details contact HAM Computing, 84 Windsor Place, Conon Bridge, Dingwall, Ross-shire IV7 8BY.

ASSEMBLER/DISSEMBLER for Oric labels, symbol table, trace facility, forward references, £6.95. Philip Rice, Department PC1, Woodroyd, Harefield Lane, Pateley Bridge. Tel: 0423 711609.

CLUBS

FREE MEMBERSHIP. Reliable software exchange service covering most machines. SAE for details. KLS Computing (PCW), 13 Nelson Street, Plymouth, Devon.

SOFTWARE CITY SOFTWARE CLUB
Massive list of games, tapes and discount card
For Spectrum, Dragon 32, Vic20, BBC, Sharp, Apple
TRY BEFORE YOU BUY
SAE FOR LIST
16 THEOBALD STREET BOREHAMWOOD, HERTS

THE "BEST SOFTWARE PRICES in the Known Universes" Club. Good discount, low membership. SAE to 23 King Street, Heywood, Lancashire.

SOFTWARE EXCHANGE. Swap your used software via our club. Free membership. £1 per swap. Most computers included. SAE for details. UKSEC, 15 Turnwell Greave, Sheffield, S5 9GB.

HARDWARE

PRINTER BARGAINS
EPSOM RX80 only **£289**
EPSOM RX80 only **£429**
RS232 Interface **£40**
Prices include VAT UK carriage free
CORNIX-MICRO
16 Kneesworth Street Royston, Herts
Tel: Royston (0763) 46065

EXCHANGE

SWAP ATARI 400 + basic + manuals. £65 of software, tape recorder and tapes + money difference + joysticks for BBC B. Tel: 01-840 5278 after 4 pm weekdays.

ATARI 400, 16K, guarantee, basic cartridge, tape recorder, joysticks, books, many excellent games, £249. Tel: Stoke-on-Trent 543319.

ATARI VCS. 11 cartridges, brand new adapter, sell for £130 or swap for Dragon 32 or Spectrum. Tel: 061-3396121.

ATARI 800. 6 months old Atari 410 recorder. Atari VCS, 2 cartridges, joysticks and paddles. £385. Tel: 01-450 3833.

VIC 20, C2N cassette recorder, + 11 tapes, 2 cartridges, joystick, + book. £150. Tel: Telford 47995.

VIC 20 12K plus cassette deck, 6 cartridges plus software, 3 books + magazines all boxed. £280. Tel: 01-449 5359 after 6 pm.

VIC 20, + 8K, + cassette drive, m/c monitor, 2 cartridges, 3 cassettes, joysticks, books, original packaging, £200. Tel: 0924-365299.

VIC 20. C2N unit joystick, s/w 1 cartridge boxed and guaranteed, £140 ono. Tel: 051-7227065.

VIC 20 C2N cassette deck, switchable 16K Ram joystick, £70 s/w books and magazines etc, £215 ono. Tel: 051-7220596.

ZX81, 16K original loads of s/w, keyboard manual and cassette leads, £70 ono. Tel: Bristol (0272) 676194.

16K ZX81, 20 computer tapes, and 5 books, £70+. Tel: 01-561 5981.

ZX81, + 16K, + Dean keyboard, + cassette recorder, 2 m/c books, and cassettes and lots of s/w and magazines, all leads and instruction manual, £150 ono. Tel: 0424-425094 after 6.30 pm.

ZX81, + typewriter keyboard leads and manual, good condition print and plotter pad and 2 games cassettes, £50. Tel: Rayleigh 775859.

16K ZX81 plus one book, over 30 tapes, manuals and leads worth over £225, will sell for £85 ono. Tel: 021-449 0684 after 5 pm.

SPECTRUM joystick compatible with games written for Kempston, £15. Tel: 01-992 7210.

SPECTRUM 16K, new boxed, all leads and manuals + over £50, s/w, £80 ono. Tel: 01-310 7852.

SPECTRUM 48K with Fuller keyboard and sound amplifier books etc. Best offer over £100.

FULLER KEYBOARD, amplifier, AGS program, joystick, all in very good condition. £50 ono. Tel: 01-804 8659.

16K SPECTRUM hardly used + £20 of programs and cassette recorder, £90 ono also b/w TV £15 (buyer collects). Tel: 01-558 2512.

EDUCATIONAL SOFTWARE

AS EASY AS a b c ?
YES! Help your 3- to 6-year-old to read and count. Big, properly designed letters and numbers in a multi-choice program. Free keyboard overlay. "CHARACTERS" for any Spectrum — **£5.**
LOWER-CASE KEYBOARD OVERLAY available separately (keywords not shown), only **50p each** + 25p postage per order.
EDUCAT SOFTWARE, 83 Lynwood Avenue, Clayton-le-Moors, Accrington BB5 5RS

COMPLETE 'O' LEVEL REVISION aid for: Chemistry, Physics, Biology and Maths. For BBC/Spectrum Computers. Price £4.95 each or all for £14.95. Send cheque/PO to: R. Battacharya, 3 Wensley Close, Harpenden, Herts AL5 1RZ.

FOR HIRE

TO HIRE A COMPUTER from ZX81 upwards, ring or write to: Business and Computer Services, 292 Caledonian Road, London N1 1BA. Tel: 01-607 0157.

FOR SALE

TEXAS SOFTWARE. Cassettes and cartridges. Cheap. Tel: 01-836 2351 after 8 pm.

ZX81 16K, DK'Tronics Graphics board, ZONX81 sound generator and £120 of software, all worth £250, sell for only £130. Tel: David on 01-930 2400.

MUST "SELL" PC1 plus £400 worth accessories. Need cash, £200. Offers. SW19 543 4583 evenings/weekends.

COMMODORE 64 + cassette + joysticks + manual etc, as new. £250. Tel: Cardiff 843406.

ATARI 400 16K, basic cartridge, manuals, £105. Tel: Bourenmouth 0202 517342.

ZX81 16K, books, magazines. £20 worth of cassettes and cassette recorder worth £30. Cost £75. Tel: Oxford 68037.

LYNX 48K SOFTWARE

LABYRINTH — 3D Maze Game.
OTHELLO — Our version of popular board game in fast machine code.
CHANCELLOR — Run UK Economy.
SPACE TREK — Zap the Klingons.

£4.75 each including p&p
Cheques/POs to:

QUAZAR COMPUTING DEPT, PCW, 17 Teg Close, Portslade, Sussex.

OTHER PROGRAMS AVAILABLE – SEND FOR DETAILS.

DK'TRONICS 4K graphics Rom with manual, £15. Contact Bishop's Stortford (0279) 57746.

MATTEL Intellivision console plus 6 cartridges, boxed, as new, £109. Tel: 01-346 7080.

TRS-80, Model 1, 48K, disc monitor, compiler, assembler, books, software, £325. Tel: 04747 4068.

SHARP MZ80A, 5 tapes, 48K, £400. Tel: Coventry 503836.

48K SPECTRUM with £350 of software (50 games), total value new £480, want £240. Tel: 061-437 1876.

VIC20 + cassette recorder + Avenger cartridge + £40 of cassette software + joystick, 6 months old, ace condition, only £110 ono. Tel: Leeds 862739, ask for Richard, or send to: R. Latham, 3 Ash Grove Croft, Kippax, Leeds, W. Yorks.

ATOM 13K + 16K utility Eprom via printer and business buffers, 4A cased, psu leads, manuals, Forth, Invaders, Asteroids, 747, Chess, many more, 2 books, £210. To collect tel: 0385 780925.

DRAGON 32 joystick software, excellent condition, £130. Tel: Kidlington 3738.

ATARI 400 computer 48K, moving keyboard, recorder, software, books, £270. Tel: Reading 345119.

ACORN ATOM 16K + 12K programmers' toolbox, Rom, psu, leads, books, 14 cassettes, £95. Tel: 0387 63336.

DRAGON 32 SOFTWARE. Hi-res, Demon/Dasm cartridges, £18 each; Planet Invasion, Android Attack, Donkey King, Madness and Minotaur, El Diablero cassettes, £5 each. Tel: Luton (0582) 27573. Private sale.

VIC20, 8K Ram for sale, £25 or exchange for Sargon 2 Chess. Tel: 031-657 1310.

BBC MODEL B, hardly used, disc drive, Dollamore graphics, digitizer, cassette player leads, full instructions, 12 months Acorn mags, £750 ono. 01-346 5720 evenings (not weekends).

48K SPECTRUM, £100; ZX printer + 4 rolls of paper, £36; Kemp joystick, £18; DK keyboard, £35; 24-line I/O port, £10; sound generator, £15; Digitracer, £40; various books. Phone for details. Tel: 01-561 8963.

COMMODORE 3016. As new, with cassette deck, toolkit, manuals, cover, £250. Tel: Lancashire 0257 792571.

ACETRONIC MPU 1000: Console plus 12 cartridges. Recently serviced. £100. Tel: 550 6065.

DRAGON 32, six months old, very good condition, joysticks, £70, software, books, £160. Tirley 547.

SPECTRUM 16K, £50, 48K £70, many games: Penetrator, Time-Gate, Jet-Pac, Blind-Alley, Froggy, 3D VU, £2.50 each or £9.95 for any five and many more. Send sae for list. PO/cheque to: R. Habermacher, 32 Langley Road, Small Heath, Birmingham. Tel: 021-771 1383 (Private sale).

VIC20 SOFTWARE, sell £2.50 each. Amok, Alien Blitz, Asteroids, Krazy Kong or swap two for expanded cassette. Swap Pirate Cove for cartridge. Tel: Orpington 37249.

ATARI 400. Basic, recorder, joystick, assembler editor, Mcssile Command, Star Raiders, mint condition, £240. Tel: 01-422 8174.

SANWA SM6 channel 35 MgHz remote control OS max engine and model aircraft kit, swap for Sinclair Spectrum, Dragon 32 or similar. Tel: 550 4560.

COMPUTER CASSETTE LEADS, Din to Din plus remote (BBC/Oric/Lynx) £2.45. Din to three jacks (BBC/Oric/Lynx) £2.45. Dragon lead (Din to Din or Din to three jacks) £2.45. Texas TI99/4A (single recorder) £4.75. Send cheque/PO to: Loophole Software, Tynwedd, Cae Castell, North Wales. Tel: 0982 552185.

SECOND-HAND TAPES OFFER

Top quality tapes at incredibly low prices. Games and educational for the Vic20, Spectrum, Dragon 32, etc, ie, 10 x C12 — £5.50 (+ 50p p&p). Also second-hand add-ons (eg, joysticks and Rampacks). SAE for details or tel: 0691-652626, **Heath Microware, 4 Gateacre Avenue, Oswestry, Shrops.**

ATARI 400 with Basic, recorder, amber printer, joysticks and £150 software, all for £300. M. Grayham, 32 Langden Crescent, Bamber Bridge, Preston.

SINCLAIR 16K Ram pack, £20. Tel: 01-992 7210.

ORIC 1 48K, under three weeks old, six program cassettes, Fortral, £140. Tel: 521 5865.

BBC MODEL A Memory 8 chips to make your 16K BBC a 32K BBC, £12. Tel: 01-363 6075.

GENIE + 48K Expander, serial + parallel, output, hi-res graphics unit, nine-inch monitor, £300.

VIDEO GENIE 16K, parallel printer interface, sound, manuals, books + magazines all worth £300, will accept £170 ono. Tel: 0865 55686.

BRAND NEW Lynx, very good condition, unwanted prize, manual, intro tape, £185 ono. Tel: Nottingham 256062.

APPLE II, 48K, 16K card, 80 column card, super serial interface card, 12-inch green B+C screen, 2 disc drives + controller card, £900. Tel: Bath (0225) 313012.

COMMODORE 64
£264.00 (excl VAT)
64 Programmers Ref Manual **£15.95**
+ **£16.95 p&p**
Tel Chris Gurney, Dave Walsh or Floyd Paterson
Tel: 01-969 4658 or send SAE
Image Science Micro Computers Ltd
189 Freston Rd, London W10 6TH
or cheques P/P (add 15% VAT) and £8 for p&p Securicor delivery
Prestel Frame 4820000 (a) for latest software and hardware information and prices.

PHILIPS VIDEOPAC + two cartridges, as new, still under guarantee, £60. Tel: Newark 71411.

SHARP MZ-80 FB. Twin disk drives, brand new, still unpacked, £390. Tel: Leicester 673536.

INTELLIVISION, plus 18 cartridges, excellent condition, worth £450, only £220 ono. Tel: 653 7086.

WANTED

CBM DISK DRIVES for 4032's wanted by school, working or faulty. Also Qume "Sprints" service manual. Cash purchases. Tel: 0491-38348.

SUNSHINE

is seeking authors for new titles to add to its highly original and successful book range.
Experienced and first time authors are invited to submit manuscripts, ideas or fields of interest.
Full details of what we can offer from **David Lawrence, Book Editor, Sunshine, Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.**
Sunshine: Publishers of Popular Computing and Dragon User.

COMMODORE 64 PROGRAMMER wanted to help translate an original Spectrum program for USA sale. Contact: John Morrison 0342-313469 (East Grinstead).

WANTED. WORKING ATARI, 810 disc drive, willing to pay £180+. Tel: 01-994 5446 after 6 pm.

WANTED: QUALITY SOFTWARE, for Spectrum Microcomputer, up to 60% Royalties paid. Send tapes for evaluation to: Loophole Software, Tynwedd, Cae Castell, North Wales. Tel: 0982 552185.

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer. Ring 01-930 3266 and give us the details.

Spectrums for sale

SINCLAIR SPECTRUM 48K, as new, £100. Tel: John 060884 234.

SINCLAIR SPECTRUM 48K, under guarantee with two books, six software cassettes, ZX printer, chatter box speech synthesizer, Kempston joystick and software, £230 or would consider swapping for BBC Acorn issue SSSD disc-drive (must be in good condition). Tel: Bridgend 0656 55839 (after 6 pm).

SPECTRUM 48K, eight months old plus printer, paper, £100 of best software and books. Total cost £320, sell for £220. Tel: 0278 732355 (after 4 pm).

ZX81 16K plus tape recorder, £30 software with magazines. A bargain at only £65 — no offers please. Tel: Uckfield 2177 (after 6 pm).

SPECTRUM 48K, £250 software. Total worth £450, want only £190 — no offers. Tel: 574 4122.

SPECTRUM 16K, all leads and manuals, £65 for quick sale. Tel: Accrington 392278.

SPECTRUM 48K plus over £150 software. Offers over £100. Tel: 01-863 6207 (after 7, pm).

ZX81s for sale

ZX81 16K, £60 software, £70. Tel: 01-647 8227.

ZX81 16K, Kempston keyboard, Zoni sound unit, Spectrum expansion board, £20-£30 software, all leads and manual. Reasonable offers considered. Tel: 01-660 6007.

ZX81, 16K Ram, Deans keyboard and case, £50 software, £100 ono. Tel: 01-788 1553 (between 6—8 pm).

ZX81 16K, compatible tape recorder — four months guarantee, manual, nine cassettes, £75 ono. Tel: 01-462 7234.

ZX81 16K, File 60 keyboard, keyboard bleeper, Q Save loading aid, over £60 of software, £70. Tel: 01-540 7860.

ZX81 1K, £15 or swap for Spectrum software. Tel: 0709 548050.

ZX81 16K, including DK'Tronics keyboard plus graphics Rom, leads, manuals, magazines including £100 software. All popular arcade games. Will consider splitting. Selling for £90 ono. Tel: Staines 50522.

ZX81 16K, all leads etc. Only six months old. Some magazines and software. Offers. Tel: Medway 77328.

ZX81 16K, DK'Tronics keyboard, 4K of Rom, £200 software. Cost £330, yours for £150 ono. Tel: Ipswich 79925.

ZX81 16K plus printer, external keyboard, software, books worth over £100. £125. Tel: 0280 703557.

ZX81 16K plus books, manual, box, all leads, 17ft adaptor lead, £50. Tel: Chesterfield 450374.

ZX81 plus leads etc, 16K Ram and Fill 60 keyboard plus DK'Tronics Forth Graphics Rom, 10 tapes, £50 of magazines. Worth over £200. Offers please. Tel: Denny 822362 between 6 pm—7pm.

Ataris for sale

ATARI 400, 16K including Basic tape recorder, cartridge and games, 2 joysticks, all manuals, £195. Tel: 0773 833394.

ATARI 400, 16K, 2 games, cassette recorder + Basic + joystick, £190. Tel: 01-422 6375.

ATARI VCS, mint condition, boxed as new + 3 cartridges, £65. Tel: 348 5668 after 5 pm.

ATARI + 4 cartridges, £100. Tel: 0698 423936.

ATARI 400, Atari 410 program recorder, Basic cartridge + 2 manuals, various cartridges + 2 joysticks, £200. Tel: 01-435 7336.

ATARI 800, 410 tape recorder, £90 software, Introduction to Sound and Graphics, £350. Tel: 736 3889 anytime.

ATARI 400, £75 of software, Basic, manuals, joysticks + cash to swap for 48K Atari 800. Tel: 01-840 5278 (after 4 pm).

ATARI 400, 32K, 410 recorder, Basic cartridge, manuals, joystick, games, £280 ono. Tel: 0983 297205 (Cowes, Isle of Wight).

ATARI VCS + 5 cartridges, £100 negotiable. Tel: home 638 4141 ext 388, daytime 800 1574.

Dragons for sale

DRAGON 32 + joysticks + £60 software + tape recorder, £175 ono. Tel: 01-998 3602.

DRAGON 32 + joysticks + 3 cartridge games, boxed as new, £180. Tel: 01-739 7102.

DRAGON 32, excellent condition + dust cover, software and books, £150 ono. Tel: Haywards Heath (0444) 452904, after 7 pm.

Tandys for sale

TANDY COLOUR COMPUTER, 16K, CCR 81 tape recorder, pair of joysticks, manuals, magazines and software, including cartridge software, worth £440 sell for £320, only 7 months old, university entrance reason for sale. Tel: Brown Hills 371254.

TANDY TRS 80, Model I, level II, 48K + VDU cassettes, disc, matrix printer + software, cost £1,668, bargain £650. Tel: Brighton 721809.

VIDEO GENIE, EG 3003 + manuals + software, £175 ono. Tel: Skipton (0756) 5721.

TRS 80, Model I, level 2, 48K, internal mod, lower case mod, parallel printer interface, including much software, £450. Tel: 0795 534170.

Commodores for sale

VIC20 + cassette deck, 3K, 16K, 24K and 32K Ram pack, £300 of software, Pointmaster, joystick and 10in b/w TV, £350 ono. Tel: 051-489 3353, after 6 pm.

VIC20 C2N, joystick, motherboard, 16K super expander, programmer's aid, Oregon Race, £400 software, £225. Tel: 0242 513450, after 6 pm.

VIC20 + C2N cassette + joystick + £30 software, hardly used, £140 ono. Tel: Dave, Stanford-le-Hope 675570, after 4 pm.

COMMODORE Pet 32K 3008 cassette deck + sound box + tons of software, cost £1,000, accept £500 ono. Tel: 01-803 4733.

VIC20 + cassette recorder, 7 months old, insured for 2 years + C2N cassette + software, paid £179, accept £80. Tel: 01-691 0118.

VIC20 compatible cassette recorder, 1 cartridge, 1 joystick and 1 cassette, for £100. Tel: Liverpool 7228906.

VIC20 + 8-column display + wp system + monitor, £700 ono. Tel: Leon, 01-455 0052.

VIC20 + 16K Ram + printer + cassette deck carrying case + £50 of cassette software, £270. Tel: (daytime) 01-821 8011, ext. 32.

VIC20, five months guarantee, boxed, cassette unit and joysticks, £150. Tel: Loucas, 444 0624.

VIC20 UNEXPANDED, cassette deck and software, £250 or swap 48K Spectrum. Tel: 553 3571.

COMMODORE 64, brand new, still boxed, £190. Tel: 0344 886178.

VIC20, cassette unit, 16K Ram pack, joystick, £150 of software, 70 magazines and books, £150. Tel: Fareham (Hampshire) 282432.

COMMODORE 64, one month old, still guaranteed and boxed with cassette deck plus games, £220 ono. Tel: 0279 37550.

VIC20 plus books, £65; cassette unit, £25; Arfon expansion unit with TV shelf, £45; 15 cassette games, £20 the lot; six cartridge games, £30 the lot. Tel: 01-573 8935 (after 6 pm).

DRAGON CARTRIDGES: Berserk, Starship and Chameleon, £12 each Tel: 021-326 9501.

VIC20 plus cassette deck, £20 software, manuals, leads, all boxed, £100. Tel: 061-941 2553 anytime.

VIC20 plus cassette recorder, 10 tapes, one cartridge and tons of books, £200 ono. Tel: 0420 85155.

VIC20 plus cassette deck, software, expansion, Chess plus Jelly Monsters cartridge and other tapes, software, joystick plus VIC reasonable, £170 ono. Tel: 0245 329852.

ZX81 16K, kayde keyboard, six software packages, books and magazines (worth £140), sell for £65 ono. Tel: 09904 2045 (after 4.30 pm, ask for Rick).

ZX81 16K plus £100-worth of software. Offers. Tel: Derby 550915.

VIC20 plus cassette unit and £500 of software, £220 ono. (Will only sell complete.) Tel: 881 2525.

COMMODORE 64 plus cassette, software, joystick and magazines, £280. Tel: 01-251 3769 (after 5.30 pm).

COMMODORE 64. Brand new in sealed box £280. Tel: 0284 58771.

VIC20, cassette recorder and 23 programs, £140. Tel: Burgh Heath 51121.

VIC20, switchboard 16K, Commodore 8K, cassette unit, £1000 of quality software, over £300 cartridges, books, Introduction to Basic Part 2, joystick and dustcover. Under a year, £350 ono. Tel: 0442 58200.

VIC20 with switchable 16K, Commodore 8K, cassette recorder, Introduction to Basic, Part II, over £1,000 software, over 20 cartridges, joystick, dust cover and books, under 1 year old, £385 ono. Tel: 0442 58200.

VIC DISC DRIVE with owner's manual + some software, cost £300 sell for £225. Tel: Stubbington 5238.

VIC20 + cassette + 16K Ram, Introduction to Basic, 2 books, 2 cartridges, many games and magazines, £150. Tel: 01-205 2834.

COMMODORE PET 2001, 8K with built-in cassette and monitor, also with sound box and software, just serviced, £160 ono. Tel: 0262 850570.

VIC20 C2N cassette deck, 16K, hi-res + 3K, joystick, 6 months old, nearly 100 games, offers accepted. Tel: 01-948 0507.

Acorns for sale

ACORN ATOM, 12K, floating point Rom, power supply unit, books + programs, excellent condition, £125. Tel: Billericay 51428.

BBC MODEL B, 1.2 operating system with tons of software including Wordwise, £495. Tel: 0482 849517.

BBC MODEL A, 32K plus VIA, much software including Acornsoft, cassette, leads, manuals, original packing, very good condition, £285 ono. Tel: Billericay 51428.

BBC MODEL B, 1.2 operating system, paddles, lots of software, in mint condition, cassette and leads, £350. Tel: Maidstone 861800.

For sale

DRAGON GAMES for sale or swap. Mircodeal. Sale £6 each. Tel: 051-263 8351, Paul after 5.30 pm.

GOLFBALL PRINTER/TYPEWRITER, with senal interface (135 bode, 15 characters per second), 12-pitch correspondence quality, £190 ono. Z80 software supplied (bode rate generator for Nascom available). Tel: Mike 01-874 6244.

MY ENTIRE SPECTRUM software collection, well over 50 tapes including Hobbit, Frenzy, Horace and Spiders, Galaxians and many, many more. Sale price £75 the lot. Tel: Harpenden 69152.

SHARP MZ80A. Basic and Pascall unit, £400. Tel: Orton 283.

VIC CARTRIDGES amplifier, £15, Cloud Burst £12, 8K Ram £25. Tel: Johnstone 21027.

FOUR ACORNSOFT, £6 each or the lot for £20. Arcadians, Planetoid, Rockraid and Snapper. Tel: Saddleworth 2518.

SHARP MZ 80K — 48K MANUAL. Basic tape and various games, £230. Tel: Burn 210 after 5 pm.

VIC20 16K Ram + software, £50+. Tel: 01-574 4122.

PCS DIGITISAL SYSTEM for BBC, including software, hardly used, £95 ono. Tel: 01-203 5355.

DATA DYNAMICS Teletype 33 RS232 interface, good working order, £40. Tel: 445 0921 (after 6.30 pm).

ASTRONOMICAL/TERRESTRIAL telescope, full size, wooden field tripod, accessories, including 3 eye pieces, 6mm, 15mm, 25mm, accessory tray, a correcting prism, extension tube, S*25 finders scope, 710 focal lens, 16mm object lens, swap for ZX Spectrum. Tel: Sheffield 322496.

INTELLIVISION + nine cartridges, boxed, guaranteed, £135. Tel: 01-310 8109, after 5 pm.

SPEECH SYNTHESISER for Vic20, £45 ono. Tel: 05432 53344.

TRS 80, Model 1, level 2, 48K, internal mod, lower case mod, parallel printer interface, including much software, £450. Tel: 0795 534170.

DRAGON DATA JOYSTICKS, £15, or swap for chess cartridge; also Dragon cassettes for sale. Tel: Darlington (0325) 283898.

SWAP GRANDSTAND ASTROWARS for ZX81. Tel: (Ivan) Wigan 58719.

NORTH STAR HORIZON, 10 megabyte Winchester disc, Epson printer with 2K buffer, £3,000 ono. Tel: 435 5466. Bergin.

TRANSTEC BC5 word processing system, Wordstar based, £1,000. Tel: 051-644 7989.

FIVE ROLLS OF ZX PRINTER PAPER, £7. Tel: Basildon 553963.

VIC20 Arfon expansion unit, 7 cartridge slots, complete with lid and cables, excellent condition, £59. Tel: Dudley 57360.

MATEL INTELLIVISION + 13 cartridges and voice synthesiser + 3 voice cartridges, £140 ono. Tel: Derby 764595.

TANGENIC MICROTRAN, 65 full keyboard, 10K Basic toolkit, 5K Ram, can be expanded, complete documentation, £150. Tel: 0480 66086.

APPLE 3 SYSTEM + profile storage, 5 megabyte Winchester, protected backup facility, Pascall and Visicalc, 128K memory board, 2 years old, reason for sale moving on to larger system, Orbit system for software, £3,600. Tel: 242 0431 (Manhatten Faning Collyer).

BBC JOYSTICK INTERFACE, compatible with Atari and Vic joysticks, £10 for 2 sockets. Tel: 01-571 2870.

FULL SET OF *Popular Computing Weekly,* £12. 01-947 6953, evenings.

NASCOM 1, 48K Ram, Super Mum with PSU, Rom Basic, 5000 Baud cassette system. Emigrating, must sell by July 18. Bargain at £200. Tel: Stevenage 66355.

APPLE DISC DRIVE + disc controller + DOS, £140 ono. Tel: 0204 41459 (Bolton).

SHARP MZ 80K, 48K memory Basic + Basic + Pascall, Forth and machine code, Apollo word processor, 100 program library, £350. Tel: Tewkesbury 297579.

VIDEO GENIE 3003, damaged but working, £60 ono. Tel: 021-550 4609.

ONE 48K for sale, still in box, £120. Tel: Rotherham 0709 530336.

MATEL INTELLIVISION, excellent condition, six months old, 10 cartridges, £190 ono. Stevenage 0438 55583 (anytime).

PHILIPS G7000 + five cartridges, five months guarantee, £85 ono. Tel: Crayford 526502, after 6 pm.

C2N CASSETTE DECK for Vic20, £35 ono. Tel: New Mills 42496, evenings.

MATEL INTELLIVISION + voice synthesiser, 21 cartridges, including two voice ones, £220 ono. Tel: Southampton (0703) 464186, after 6.30 pm.

SHARP COMPUTER with own TV monitor, 1200 bit/sec cassette recorder and full 48K Ram, good graphics + software and manuals, £270. Tel: 03564 7220.

CENTRONICS 306 PRINTER, 80 column, upper case only, complete with manual, can be seen working, £65. Tel: 090-66 5483 (Sussex).

LYNX 48K, boxed, five months old, excellent condition, reason for sale: upgrading to Apple, accept £150 for quick sale, no offers. Tel: 0224 820940 (Neil).

JUPITER ACE, full leads, manual and five programs, still boxed and in mint condition for only £65. Tel: Conway 2345.

INTELLIVISION + three cartridges, £75. Tel: Nottingham 292205 (Paul).

SHARP MZ 80A, 48K Ram, excellent condition, with £75 software, manuals, dust cover, built-in monitor and cassette deck, still under guarantee, £530. Tel: Maidstone (0622) 65589.

MATEL INTELLIVISION with 17 cartridges including D&D, Pit Fall and Night Stalker, £230. Tel: 0726 63501, evenings.

48K LYNX, excellent condition with tapes, £200 ono. Tel: Swansea 0792 891578, after 6 pm.

LYNX 48K, £185 for quick sale. Boxed as new, also books, manuals + software, etc. Tel: 01-399 4321.

JUPITER ACE + power supply + all leads, £70. Tel: Leigh 0942 674698.

SHARP MZ80, 48K computer, immaculate condition, dust cover, manuals, magazines, etc, over £120 programs, guaranteed September, accept £295 the lot. Tel: Chester 675717.

INTELLIVISION + nine cartridges, boxed + guaranteed, £135. Tel: 01-310 8109, after 5 pm.

Wanted

BBC MODEL A OR B waried. Tel: 01-897 6274.

WANTED: BBC MODEL B. Tel: Rotherham 525913.

WANTED: DRAGON 32 — will swap for 48K Spectrum + all leads + software. Tel: Mountain Ash (Mid-Glamorgan) 475921, evenings.

WANTED: ANY COMPUTER but ZX81 in exchange for trumpet + case + mute, worth £90 ono. R. Ackbrough, 13 Sunny Hill, Sea Mills, Bristol BS9 2NG.

SWAP A RADIO CONTROLLED 1/8th scale model car + all accessories, worth £450 for a BBC Model B. Cash adjustment in buyer's favour. Tel: 01-600 0818, ext. 268, Mr. Young (10 am—5 pm only).

WANTED: VIC20 INTRODUCTION TO BASIC, Part 1 or 2. Tel: 01-574 4122 (anytime).

WANTED: VIC PROGRAMMERS REF GUIDE, £7. Tel: 0902 893084.

WANTED: COMPUTER PEN PAL owning a 48K ZX Spectrum to exchange programs and swap tips, 10 to 14 age group preferred. Write to Paul Phillips, 13 Mountain Road, Conway, Gwnedd, North Wales (enclosing age and address).

WANTED: 16K SPECTRUM and cassette recorder. Cosham 387158 (Chris).

WANTED: 16K RAM PACK for Vic20. Tel: 04862 70318.

TANDY COLOUR + Dragon users wanted to swap ideas and information. Tel: Mark Davies (0922) 691618.

SPECTRUM 48K WANTED. Call 01-529 4718 in the evenings.

WANTED KARGA 12-inch monochrome monitor for BBC micro, exchange for Wordwise chip and software. Tel: Hull 849517.

COMMODORE 8K WANTED for Vic20, any reasonable price considered. Tel: 0442 67150 (after 6 pm).

DRAGON USER seeks experienced Dragon user, North London area. Tel: (Mario) 01-809 3032 (evenings).

WANTED. ZX printer paper, will pay cash or swap for cassettes. Tel: 0302 722669 (ask for Nick Mottram).

WANTED: BBC Model A. Will pay £200. Tel: York 797766, evenings.

WANTED. Intellivoice module, pay £25. Tel: 01-274 9010 (5 pm to 7 pm).

SPECIALLY FOR THE DRAGON USER
2 books from Sunshine



Dragon Games Master is a carefully structured book about writing games programs. All major aspects of interactive computer games are considered as you learn how to handle sound, colour, graphics, movement, mazes, detection, decisions, responses, consequences, scoring systems, status displays, economics, skill levels, title sequences and instructions. You will learn how to include these features in all your own games. The book takes you through each step line by line from writing the simplest games right through to the design and construction of first calls adventure programs which rival commercial software in their complexity and presentation. (160pp) **£5.95**

NEW RELEASE



The Working Dragon is the book for those of you who dream of putting your computer to some practical use. It is based on a collection of solid, sophisticated programs in areas such as data storage, finance, graphics, household management, education and games of skill. Some of the more advanced programs include a Text Editor, which can perform many of the functions of a word processor, and Music Editor, which will let you write long music programs without endlessly repeating similar routines. Each of the programs is explained in detail, line by line. And each of the programs is built up out of general purpose subroutines which, once understood, can form the basis of any other programs you need to write. Advanced programming skills spring out of the discussion explaining each subroutine. The collection also leaves you with a wide range of practical application programs which might otherwise only be available on cassette. (160pp) **£5.95**

Trade/Dealer enquiries welcome

SUNSHINE

(Also publishers of Popular Computing Weekly and Dragon User magazines)

Please send me ☐ **The Working Dragon 32** at £5.95 each ☐ **Dragon 32 Games Master** at £5.95 each

I enclose a cheque/postal order for £

payable to **Sunshine Books**, 19 Whitcomb Street, London WC2H 7HF

Name _____

Address _____

_____ Signed _____

We can normally deliver in four to five days.

DATA DUPLICATION

At Kiltdale, we provide the professional data duplication service.

More and more companies are turning to us to provide the quality of reproduction and speed of service that cannot be matched. Come and join the growing number of satisfied clients – from individuals, to hardware manufacturers such as Commodore and Dragon, to software specialists such as Imagine – who have discovered the benefit of working with professionals.

Kiltdale Ltd, Liddington Industrial Estate
Leckhampton, Cheltenham, Glos.
Tel: (0242) 25458
(0242) 583638



Kiltdale QUITE SIMPLY THE BEST

FUN PALACE



Captain Lasersound has invited me to join him on a journey to the Fun Palace of the Universe.

He has a sensational collection of mind warping games available, created to stretch the barriers of human endeavour.

One of these is *Learn to Play Guitar*. This program uses the Spectrum's sound and graphics to teach the rudiments of guitar playing.

So that's what's happening in the electronic wonderland where only the ultimate warriors survive — I had wondered.

Program *Learn to Play Guitar*
Price *£6.00*
Micro *Spectrum 16/48K*
Supplier *Lasersound*
Stratford Workshops
Burford Road
London E15

LIGHT PEN

It seemed as though Psion had pretty much sewn up the 3D graphics program package with its *Vu-3D*. However, Emsoft evidently don't agree.

To design your figure, you need to know the co-ordinates of each vertex. Once created, the figure can be turned through any of three axis.

Although this program doesn't have the fill-in command of the Psion program, the 48K version does have an interesting feature — simple designs may be stored in the form of 15 screen images which can then be displayed in rapid sequence to give the illusion of movement.

Emsoft intends to produce versions of the tape for use with the RD Digital Tracer and the DK'Tronics light pen. Anyone who buys the current version will be able to get one of the extended ones free of charge at a later date.

Program *3D Graphics*
Price *£5.95*
Micro *Spectrum 16/48K*
Supplier *Emsoft*
37 Lennox Drive
Wakefield
West Yorkshire

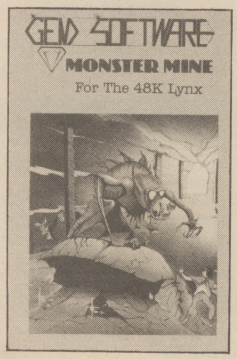
MURDER!

Worm Software has a number of programs available for the BBC. Despite the Automatalike title, the company specialises in fairly serious educational software.

Forensic uses the format of "murder cases" to test your knowledge of chemicals and their behaviour — your knowledge of chemistry and biology will enable you to eliminate suspects and find the murderer.

Program *Forensic*
Price *£5*
Micro *BBC 32K*
Supplier *Worm Software*
76 Hurstwood Road
New Oscott
Birmingham B23 5BY

GOLD FEVER



Gem Software is a company well known for its Dragon games. The company has entered the, as yet, untapped Lynx market with two arcade style games — *Monster Mine* and *Sultan's Maze*.

Monster Mine sets you the task of finding gold in a monster inhabited mine. The game is a mixture of machine code and Basic. You can save the high score table, so that your successes will be recorded for posterity.

Program *Monster Mine*
Price *£7.95*
Micro *Lynx 48K*
Supplier *Gem Software*
Unit D
The Maltings
Station Road
Sawbridgeworth
Herts

DIVIDED

Educational software for the Spectrum is booming, but very often it takes the form of teachers with limited programming knowledge creating daft programs to do what could be done better with pencil and paper.

Glendale Software has released a package entitled *Junior Maths* which teaches addition, subtraction, multiplication and division. It claims that the computer is used to the full, with high-resolution and sound, used to convey the educational message.

Program *Junior Maths*
Price *£4.50*
Micro *Spectrum 16/48K*
Supplier *Glendale Software*
27 Glendale Avenue
Eastbourne
East Sussex BN21 1UT

DOOMED!

The Sharp machines don't get much of a mention in these pages — mainly because we are never sent anything.

To prove that we have nothing against Japanese machines, we shall examine *Encounter* from Solo Software, a company offering nothing but software for the Sharp MZ80K or MZ80A.

Encounter is an adventure game that sets you the task of rescuing a young maiden who has been held captive in the house of Doom. To achieve your task you will have to deal with vicious thugs, guard dogs and the alarm system.

Program *Encounter*
Price *£9.95*
Micro *MZ80K/A*
Supplier *Solo Software*
51 Broad Street
Worcester WR1 3LR

REAL TIME



Moonlander is a fairly comprehensive version of *Lunar Lander* for the ZX81. Each landing will be slightly different, depending on factors like orbit height, fuel, etc.

Orion says that its program is based on realtime algorithms, so that it is a genuine test of pilot skill. Spectacular graphics are promised if you fail and crash.

Program *Moonlander*
Price *£4.95*
Micro *ZX81 16K*
Supplier *Orion*
Pippbrook Mill
London Road
Dorking
Surrey RH14 1JE

HUNTED ALIEN

Micromega may be a familiar name because of a recent spate of colour Spectrum advertisements from this company.

However, it also produces a range of ZX81 programs which run in 1K. Its *Arcade Action* pack contains four games all in 1K and all written in machine code.

Games include *Greedy Gobbler*, *Overtaker* and *Extra Terrestrial* in which you are the hunted alien.

Program *Arcade Action*
Price *£4.95*
Micro *ZX81*
Supplier *Micromega*
Quantec Systems & Software
230-236 Lavender Hill
London SW11 1LE

HI-RES



Another version of *Space Invaders*, are these people kidding? Well no — Odyssey has another version of *Space Invaders* for the ZX81, but it is different.

The program uses a software only technique to create a high resolution 224 by 248 pixel display, which means that the *Invaders* look more like strange intergalactic creatures and less like "*K*"s or "*O*"s.

The machine code program has all the usual features, including a two-player option in which two people play at the same time — the perfect recipe for bruised fingers and broken friendships I should think.

Program *Invaders*
Price *£4.95*
Micro *ZX81 (16K)*
Supplier *Odyssey Computing*
28 Bingham Road
Sherwood
Nottingham
NG5 2EP

OVERCOME

Empire is a game of world domination in which you try to defend the world from the Dragon Empire

The world is divided up into 39 territories. You choose the 13 you want to control and distribute your armies amongst the territories — the computer will do the same. Battle then commences as you attempt to gain territory and rule the world.

The game features hi-res graphic displays and machine code. Pessimists will find themselves well catered for since, if you do nothing, the blurb invites you to "sit back and watch the world being overwhelmed". Oh well, it beats breakfast TV anyway.

Program *Empire*
Price *£6.95*
Micro *Dragon 32*
Supplier *Shards Software*
189 Eton Road
Ilford
Essex 1G1 2UG

FUN GAME

Headfield Technology is a new software house intending to specialise on the Oric.

It's first release is *Mastermynde* — this is very much true to tradition, since it has been the first release of something like 10,000 different software houses.

The game is for 1 to 4 players and there is an optional timer facility so that you have to decide quickly.

What do you mean "What's the game like?" Look, I'm not going to explain mastermind again. No. Definitely not.

In *Mastermynde* you have to guess a sequence of colours. The computer will tell you after each guess how many colours you have right and how many places — it's a fun game for all the family. Was that all right?

Program *Mastermynde*
Price *£4.95*
Micro *Oric 16/48K*
Supplier *Headfield Technology*
Lock Street
Saville Town
Dewsbury
WF17 9BW

HYPNOTIC

I've always thought that *Life* was a pretty pretentious title for a computer simulation that should really be called "pretty blobs making patterns". Versions of *Life* abound, but *Life-plus* is the first I've seen for the BBC.

The makers of this version have obviously recognised that the appeal of the game lies in the hypnotic patterns that are formed by the dying and living cells (or whatever they are supposed to be), rather than its spurious educational content. Thus, *Life-plus* features animation and turtle graphics, as well as eight colour screens.

Program *Life-plus*
Price *£4.49*
Micro *BBC A or B*
Supplier *Mayday Software*
181 Portland Crescent
Stanmore
Middx HA7 1LR

INVADED

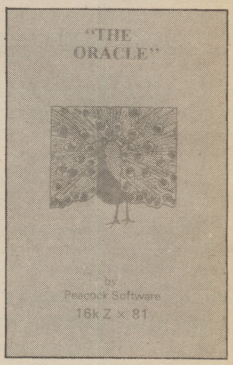
It is possible that there are three or four people in the world who own a Vic20, but do not own a copy of *Space Invaders*. Those people have now had the number of different software houses from which they can buy a copy increased by one.

Swift Software has begun its career as a software house by releasing two programs, *Invaders From Outer Space* and *Disasteroids*; ie, *Space Invaders* and *Asteroids*.

Both games are for the unexpanded machine and are available together at £8.95.

Program *Invaders From Outer Space*
Price *£4.95*
Micro *Vic20*
Supplier *Swift Software*
75 Broadgate Lane
Horsforth
Leeds

STARRED

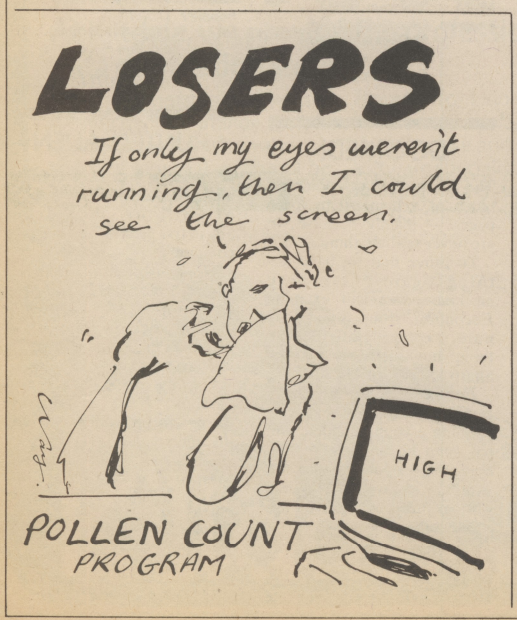


Peacock Software has found a market area that no one else seems to have tapped — using your computer to tell your fortune.

The Oracle for the ZX81 does exactly that, thanks to Valerie Graham, a palmist who helped develop the program.

A Spectrum version is expected soon.

Program *The Oracle*
Price *£5.50*
Micro *ZX81*
Supplier *Peacock Software*
32 Redfern Avenue
Kenilworth
Warwickshire
CV8 2NA



Ziggurat



Full of fables

It is very true — and will receive universal acclaim — that most microcomputer software (and especially games) is well nigh fabulous.

Dr Samuel Johnston, in his Dictionary published in 1755, gives the following definition of fabulous: feigned; full of fables, or invented tales.

And this is the sense in which I use the term.

Most computer games bear little relationship to either their packaging, or their verbal description.

I used to recommend people to buy computer software from shops, and to steer clear —as much as possible — of software by post.

Having been told, and having found out for myself by asking, that many so-called computer shops will not allow users to try out software before they buy it — the "Sorry, we have to sell the package unopened" excuse — the game has changed.

The reason I used to recommend the buying of software from shops, rather than by post, was because it was always possible to try out the software prior to purchase. Any shop worthy of the name should enable the potential purchaser to try out software before expecting the poor person to buy it.

When you buy merchandise from one of the chain stores (such as M&S or BHS) you can be reasonably sure that the description which is associated with the merchandise is fairly accurate. For how many games is that true? How many times have games been bought which promise one thing, often with magnificent graphics, yet turn out to be something else altogether more mundane?

The reason why software stores do not offer a 'trial' period after purchase during which unsatisfactory — or unsatisfying — programs can be returned and exchanged for others is piracy. Such a system would allow programs to be continually copied and exchanged for others.

It is interesting to consider why software piracy is so rife — are computer users really that despicable? Or is it that the prices charged for software are unreasonable?

There seems to be an assumption that if a person is interested in computing, they are legitimate targets for a rip-off. Many (well, not all that many) are making their fortunes by selling software at prices with a mark-up into the 1000s of percent.

Would people be so keen to copy software wholesale if all the prices were more reasonable? After all, it still costs the price of a blank tape to take even an audio copy, and often the copy is poor and prone to fail.

In no way am I suggesting that illegal copying of programs is admissible, but I do suggest that the problem is largely one which could be lessened by prices coming down. If a program was sold at £2, would it not then be less trouble to pay the £1.50 more than the cost of a blank cassette than going through the hassle of making a home copy?

In my view, software prices should be substantially reduced.

And the over-pricing does not end with software. It runs through the whole industry. To the machines themselves — look at the price-cutting now taking place in the US — to those selling add-ons, books and all manner of support. Even to inflated attendance fees at conferences and workshops and club membership fees.

So, back to software. I don't think it is fair for many software suppliers to complain of piracy when they do not act fairly themselves.

More often than not it is the users who are getting ripped-off — not the software houses. We should hear less about piracy and more about the rights of the user.

Ever since it was found that some people were willing to wait amazing (fabulous, even) numbers of months for their mail-order computers, the user has been regarded as easy prey. The law of copyright may not be too clear, but neither is the fair trading legislation concerning the promises made about programs.

Have *you* ever played a four-dimensional computer game as an android on an alien planet. And if you did, was it a duel of life-and-death with your pulse trembling and your palms unpleasantly sweaty on the controls? ■

Boris Allan

Puzzle

Royal visit

Puzzle No 64

There was great excitement at the prospect of the Royal Visit to Winsorville, South Carolina.

It had been arranged for all the schools in the town to combine to form a marching display, followed by a tour of inspection by the Royal Party.

For this, the children were to be arranged in a 'square' formation, with as many children to the rows as there were rows. And (coincidentally!) it so happened that there was exactly the right number present for this to be possible.

When the day of the Visit arrived it was found that no one had taken account of the 312 teachers and ancillary staff, who, of course, should also take a place. To the surprise of all, except readers of this puzzle, it was possible to incorporate these extras without affecting the 'square' arrangement — though, of course, the resulting square was a little larger in size.

How many children were there and what were the dimensions of the square (in people) before and after the addition of the extra teachers? There may be more than one possible answer but one seems the more likely.

Solution to Puzzle No 59

The following program does the trick:

```
10 LET N = INT ((50500 * 0.99) ÷ 0.5)
20 FOR X = 1 TO N/157
30 LET Y=(N-X*157)/187
40 IF Y = INT (Y + 0.5) THEN PRINT "No of standard
Wotzits:" X, "No of de-luxe Wotzits:" Y
50 NEXT X
```

Line 10 finds the number of screws actually used, *N*. *X* is the number of standard Wotzits and *Y* is the number of de-luxe Wotzits. For each number of standard Wotzits from $X=1$ upwards until all the screws are used up ($X=N/157$) the number of remaining screws is tested to see if it makes a complete number, *Y*, of de-luxe Wotzits. If it does then Line 40 prints the solution.

There are two solutions: 110 Standard/175 De-luxe and 297 Standard/18 De-luxe.

Winner of Puzzle No 59

The winner is: C E Deer, Gainsborough Road, Felixstowe, Suffolk, who receives £10.

Top 10

Dragon 32

1	(1)	The King	(Microdeal)
2	(2)	Talking Android Attack	(Microdeal)
3	(5)	Ace War	(Microdeal)
4	(3)	Night Flight	(Salamander)
5	(4)	Dragon Trek	(Wintersoft)
6	(6)	Graphics System	(Salamander)
7	(7)	Katerpiller Attack	(Microdeal)
8	(—)	Planet Invasion	(Microdeal)
9	(—)	Dragon Trek	(Salamander)
10	(9)	Mined Out	(Quicksilva)

(Figures compiled by Boots & Co, London)

Spectrum

1	(1)	Penetrator	(Melbourne House)*
2	(2)	Flight Simulation	(Psion)*
3	(4)	Jet Pac	(Ultimate)
4	(3)	Transylvanian Tower	(Richard Shepherd)
5	(5)	The Hobbit	(Melbourne House)*
6	(6)	3D Tanxx	(DK'Tronics)
7	(7)	Ah Diddums	(Imagine)
8	(8)	Horace Goes Skiing	(Psion/Melbourne House)
9	(9)	Hungry Horace	(Psion/Melbourne House)
10	(10)	Chess	(Psion)*

*Requires 48K.

(Figures compiled by W H Smith & Son Ltd)

Atari

1	(3)	Miner 2049er	(Big Five)*
2	(1)	Zaxxon	(Datasoft)
3	(7)	Stone of Sisyphus	(Adventure International)§
4	(—)	Repton	(Sirius)¶
5	(—)	Castle Wolfenstein	(Muse)§
6	(—)	Hellcat Ace	(Microprose)†
7	(6)	Air Strike	(English Software)
8	(—)	Shamus II	(Synapse)
9	(10)	Mountain King	(CBS)†
10	(—)	Preppie 2	(Adventure International)

*Cartridge. †32K cassette. ¶32K disc. §48K disc.

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

Vic20

1	(1)	Arcadia	(Imagine)
2	(4)	Asteroids	(Bug-Byte)
3	(2)	Wacky Waiters	(Imagine)
4	(5)	Panic	(Bug-Byte)
5	(6)	Cosmiads	(Bug-Byte)
6	(8)	Hoppit	(Commodore)
7	(7)	Kaktus	(Audiogenic)
8	(10)	Amok	(Audiogenic)
9	(—)	Alien Blitz	(Audiogenic)
10	(—)	Mangrove	(Audiogenic)

(Figures compiled by Boots & Co, London)

BBC•

1	(1)	Killer Gorilla	(Program Power)
2	(3)	Rocket Raid	(Acornsoft)
3	(4)	Inheritance	(Simon W Hessel)
4	(5)	Painter	(A+F)
5	(—)	Beeb Calc	(Computer Concepts)†
6	(2)	Planetoid	(Acornsoft)
7	(7)	Sphinx Adventure	(Acornsoft)
8	(10)	Landfall	(Virgin Games)
9	(—)	Fruit Machine	(Bug-Byte)
10	(—)	Chess	(Computer Concepts)

*All Model B only. †Rom.

(Figures compiled by Micro Management, Ipswich 0473 59181)

ZX81*

1	(1)	3D Monster Maze	(New Generation)
2	(2)	Flight Simulation	(Psion)
3	(3)	QS Scramble	(Quicksilva)
4	(4)	Alien Dropout	(Silversoft)
5	(5)	Galaxians	(Artic)
6	(6)	Chess	(Psion)
7	(7)	10 Games for 1K	(JK Greye)†
8	(8)	Asteroids	(Asteroids)
9	(9)	Avenger	(Abacus)
10	(10)	Night Gunner	(Digital Integration)

*All 16K except where shown. †Runs in 1K.

(Figures compiled by W H Smith & Son Ltd)

Books

1	(3)	Structured Programming with BBC Basic, *Atherton*	(Horwood)
2	(2)	Vic Programmer's Reference Guide, *Commodore*	(Commodore)
3	(—)	Spectrum Rom Disassembly, *Logan*	(Melbourne House)
4	(6)	Commodore 64 Programmer's Reference Guide, *Commodore*	(Commodore)
5	(—)	Spectrum Machine-code for the Absolute Beginner, *Tang*	(Melbourne House)
6	(1)	Programming the BBC Micro, *Williams*	(Newnes)
7	(—)	Z80 Assembly Language Sub-routines, *Leventhal*	(Osbourne)
8	(—)	Forth on the BBC Microcomputer, *De Grandis-Harrison*	(Acornsoft)
9	(8)	6809 Assembly Language Programming, *Leventhal*	(Osbourne)
10	(9)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)

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

(Last week's position in brackets)

DEAR AUTOMATA, DESPITE YOUR VERY SILLY ADVERTISING, I AM ORDERING THE FOLLOWING COMPUTER SOFTWARE FROM YOU.....

~~AUTOMONOPOLI~~ GO TO JAIL (Spectrum 48K) @£6.oop ☐ tick

PIMANIA (Dragon32) @£10.oop ☐

PIMANIA (BBC Micro 32K) @£10.oop ☐

PIMANIA (ZX81 16K) @£5.oop ☐

I enclose the right money, TOTAL £ ☐

or please charge my ACCESS/EUROCARD/MASTER CARD.

CARD NUMBER ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

my signature.....

my name.....

my address.....

.....

.....Post Code.....

send to: AUTOMATA U.K. LTD., 65 OSBORNE ROAD, PORTSMOUTH, HANTS., PO5 3LR, ENGLAND.

all prices include VAT, packing & postage within the U.K. please add 10% to total price for overseas orders. Trade enquiries are welcomed.

please leave blank:
DESPATCH NUMBER....

snip

snip

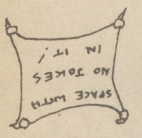
Automonopoli mystery! Why has the name changed to GO TO JAIL



READ "THE PIMAN DIARIES"...

ON NEXT WEEK'S BACK PAGE,

FOR THE (HIC) apalling truth!



SPOT THE DIFFERENCE COMPETITION

THE CORRECT ANSWERS WERE

DIFFERENCE		IMPORTANCE
A	Giving back to our public as much as we can. (Yes that's a free jazz band on our stand. Wow a saxophone is this a clue)	2
B	Automata is committed to non-violent games. No killing, no conquering, no bombing.....just First Class entertainment.	1
C	These back-page advertisements are rather silly, and may well get sillier. Don't we care about making pots of money?	4
D	There are eleven-thousand red ourang outangs in Balkan dance costumes, just outside of camera range. Honest there are.	8
E	There are no computers on our exhibition stand. Our games' reputations and their reviews seem to be all that's needed.	7
F	We rather enjoy dressing up in bright pink combinations and Groucho Marx outfits, and then go exposing ourselves.	6
G	There are a great many happy people with smiling faces in the photograph. This makes us happy too.	3
H	We are pleased to meet our public face to face. We don't want to lose contact with our most important clients: you.	5

PATHETIC RESPONSE !

ONLY 21 ENTRIES ... BAH! HIC! LURCH... GET 'EM!! HEH HEH HEH HEH...

Well folks, three weeks ago we set you a wee competition where you had to put in order of importance why AUTOMATA is different from all other software bods. The response was ABYSMAL!!! Not one of you got it right. In fact, Brian White of Sittingbourne in Kent was nearest, with 4 wrong!! Mind you, at least his slogan "HI MUM, LOVE BRIAN" made us larf: so a free copy of ~~AUTOMONOPOLI~~ whoops, GO TO JAIL is on its way, Brian. Here we are, spreading joy across the planet, and you won't even join in a crummy competition! And another thing, you're not buying any of our games either! We know there's a recession on & it's nice weather for swimming (hic) in effluent, but honestly, dear people, if you don't buy our stuff, we'll send Lurch The Office Parrot, (at least we think he's a parrot,) around to sort you out.....No offence, pal. (honest)

meet the piman! we put some ting in computing

