POPULAR Computing WEEKLY

35p 16-22 June 1983 Vol 2 No 24

This Week

Graphics software

Graham Taylor weaves his way through a tapestry of graphics programs including *Psst*, *Mutant Herd* and *Artist's Designer*. See page 14.

I robot

David Kelly talks to John Reekie of Colne Robotics about the upsurge of interest in personal robots. See page 13.

Spectrum moon

Maurice Gavin presents a program to show all the phases of the moon's orbit around the earth on page 20.

New releases

All the latest games for the popular micros including *Joust* from Softek, and *Confuse the Cat* from EF Computing. See page 45.

★STAR GAME
Connect 4 on BBC.
See page 10.

News Desk

Busy time for the Commodore

THIS year's International Commodore Computer Show, held last weekend at the Cunard Hotel in London, really belonged to the Commodore 64 machine.

Two new machines were shown based on it — the range of SX64 portable computers, with built-in black-and-white or colour monitors and twin disc drives, priced between £650 and £995, and a 64K colour machine in an old-style Pet housing for the education market.

A range of low-cost printers were unveiled for the Commodore 64 — the 1520 four-colour printer/plotter at £169.99, the 1525 tractor-feed dot-matrix printer at £230 and the 1526 bi-directional letter-quality printer at £345.

Also announced for the 64 was a 14-inch colour monitor which will sell for £230 and a speech synthesiser unit for under £50, available in September.

Continued on page 5

Arise, Sir Micro-chip!

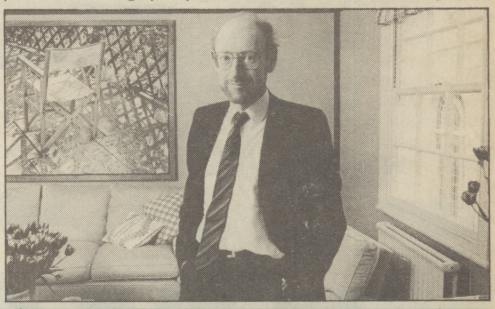
CLIVE Marles Sinclair has been awarded a knighthood in the Queen's Birthday Honours List.

He said of the news: "It was completely unexpected and a wonderful surprise — more than ever I find myself committed to achieving success here in, and for, Britain."

At 42, he is the founder of a company which has become the world's largest volume manufacturer of personal computers, and is largely responsible — with the ZX80, ZX81 and most recently the Spectrum — for making the microcomputer a household item in the UK.

After leaving school at 17, he worked for four years as a technical journalist before founding Sinclair Radionics in 1962. This company produced the Executive pocket calculator at the then revolutionary price of £79. In the late 1970s, he joined forces with the

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.

MISSILE defend your cities from the deadly onslaught. Graphics game for the BBC microcomputer (32K), only £5 inclusive, to: Paul Stevens, 11 Woodhurst Close, Cuxton, Rochester, Kent ME2 1LU.

ESCAPE. New graphics game for 16K Atari. Five levels cassette £5. Coulter, 56 Grosvenor Road, Epsom Downs, Surrey.

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

BBC ADVENTURE SWORD OF DESTINY for BBC model B microcomputer, full 32K, over 100 locations, can you crack the cryptic clues? maim the maurading monsters? Only £6.99 from Paul Furlong, 50 Malvern Avenue, Bexleyheath, Kent.

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

JUPITER ACE software cassette JA1, three games for the unexpanded Ace, £3.00; cassette JA2, a 19K graphic adventure, £6.00. From Richard Roberts, 52 Whalesmead Road, Bishopstoke, Eastleigh, Hampshire SO5 6HL.

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.

ZX81 16K. Avoid colliding as you race around the maze while the other car tries to intercept. Fast machine code action plus Hangman, £3.50. J. Riley, 322 Bramhall Lane South, Stockport, Cheshire.

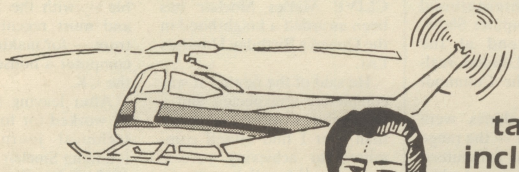
Continued on page 4

★ ★ CHICAGO FAIR EXCLUSIVE — PAGE 4 ★ ★

NOW AVAILABLE FROM W.H. SMITH

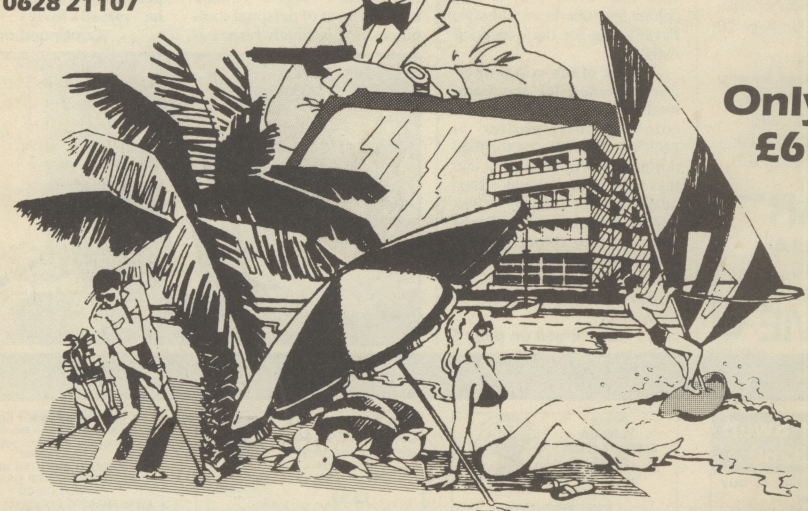
SUPER SPY 48K Spectrum

Locate the secret island hideaway of the mysterious meglomaniac Dr. Death. Follow his trail across continents, through complex puzzles, coded messages and 3-D mazes. Discover the entrance to his underground lair — but beware — even with your death-defying gadgets his evil henchmen may still win the day!



Saving the world may take some time—so we've included a 'save' routine for part-time secret agents!

Credit Card Hotline
0628 21107



Only £6.50

DEALER ENQUIRIES WELCOME — GENEROUS DISCOUNTS

Adventurous Programs always wanted. Please send sample — generous cash payments!

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

POPULAR Computing WEEKLY

16-22 June 1983 Vol 2 No 24

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

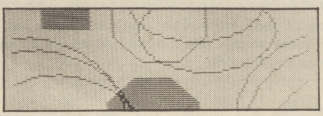
News 5
Commodore Show

Letters 7
Pac-Man champion?

Star Game 10
Connect 4 on BBC by M Kendrick

Street Life 13
David Kelly visits Colne Robotics

Reviews 14
Graham Taylor looks at graphics



Programming 17
Designing an interactive program

Spectrum 20
Phases of the moon

Dragon 22
Guide to graphic commands

BBC in education 27
Part 2 of our series on turtle graphics

Open Forum 29
Five pages of your programs

Adventure 37
Tony Bridge's corner

Peek and poke 39
Your questions answered

New releases 46
Latest software programs

Competitions 47
Puzzle, Top 10, Ziggurat

Editorial

Arise Sir Microchip! Clive Sinclair, the driving force behind the world's most prolific microcomputer company, has been awarded a knighthood.

This honour reflects Sinclair's position as the man who, more than anyone else, has transformed Britain from a nation of shopkeepers to a nation of micro users. Three years ago, few people outside the electronics industry were familiar with either Sinclair or micros. Now, the two are almost synonymous.

Yet, for a man who has single-mindedly devoted himself to building up his own business, Sinclair's interests are very wide-ranging. He is an athlete and he has completed a number of marathons including the New York.

His other pursuits tend, not surprisingly for a chairman of Mensa, to be of a more intellectual nature. He is a keen reader of poetry and has been known to attend the opera. He also takes a more than passing interest in the world of publishing, both through his sponsorship of the Sinclair Prize for Fiction and his partnership in the Sinclair Browne publishing firm.

Clive Sinclair has done more than most to deserve a knighthood and few will begrudge him the award. However, I suspect that to the thousands of Sinclair owners, both here and overseas, Sir Clive will always remain Uncle Clive.

Next Thursday

Funfair for the 16K Spectrum is an original arcade type game where you as a clown's face have to catch bubbles in your mouth from the bubble blower across the stream! Funfair — next week's Star Game by Jack Knight.

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 .....

.....

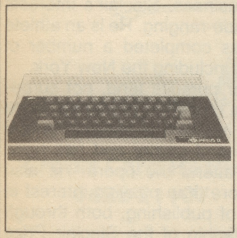
.....

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

Commodore announced another dramatic price drop for the Commodore 64 machine and surprised many by deciding to discontinue sales to dealers of the Vic20 in August. The company clearly wishes to drop the Vic in favour of the 64 and, to that end, the 64 now sells for only $199, with a special offer of a further $100 off the price in part exchange for a used Vic.

Prices of Rom software were also slashed — coming down to only $9.95.

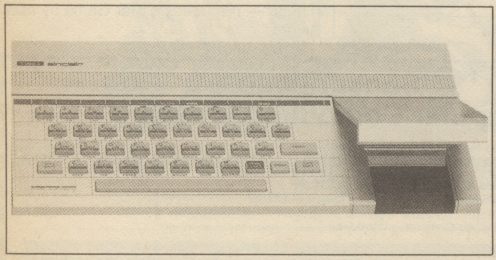
Mattel showed a new computer, the Aquarius II. With 20K Ram, expandable up to 64K, full-travel keyboard, Extended Basic, 16 colours and a high-resolution graphics mode of 320 x 192 resolution, the machine should be available in the US this winter.



Other Mattel products on show for the first time were a 40/80 column, four-colour, printer and the Master Expansion Module with CP/M compatible disc drives for the Aquarius and Aquarius II.

Texas Instruments confirmed the demise of its new 99/2 mute black-and-white computer. Instead the company has repackaged the 99/4A and cut its cost drastically to around $130.

Timex provided perhaps the most of interest to a British visitor, presenting three new computers based on Sinclair technology — the TS2048/TS2068 and the TS1500.

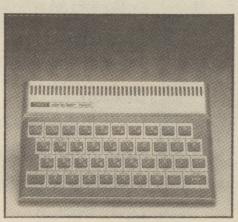


Both the TS2048 and the TS2068 are drastically altered Spectrums. The TS2048 has 24K Ram and 16K Rom selling for $149.95 and the TS2068 has 48K Ram and 24K Rom. Looking completely different from their UK equivalent in a silver livery the TS2000s have a number of additional features.

The keys have a more positive feel and a space-bar has been added. Both models feature a built-in Rom cartridge slot and joystick port. Extra commands include *On-Error, Stick, Free* (to determine the memory remaining) and *Sound* giving access to a three-channel synthesiser. The TS2068 also features a second 64 character width 256 x 192 high-resolution display mode.

The TS1500 is a ZX81 equivalent with 16K built-in packaged in a Spectrum-like case with moving keys. This will sell for $80. An interface, which can be connected to the back of the TS1500, enables it to run Rom cartridge software.

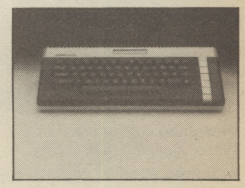
Finally, Timex are now selling the 2K ZX81 equivalent, the TS1000, for $29.95, about £19.



Atari, who is heading for increased second-quarter financial losses, hit back by launching an almost entirely new product range. Of particular interest were four new computers, two of which are aimed firmly at the home computer market.

The 600XL is 6502-based with 24K Rom, 16K Ram (expandable to 64K) and a full-size keyboard. It has 256 colours, four voices and a 40 x 24 character display. There are five text display modes and 11 graphics display modes with a maximum resolution of 320 x 192. The 600XL is seen as a competitor for the Vic20 and TI99/4A, and will sell for $199.

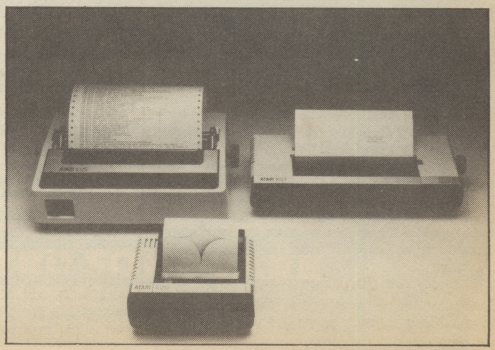
The 800XL machine is the same as the 600XL, but with a built-in memory of 64K. The other two machines are the 1400XL with 64K, built-in modem and four programmable function keys and the 1450XL with 64K Ram, function keys, built-in modem,



speech synthesiser and dual-density, double-sided disc drives.

Among the other products on show from Atari were a new 1010 cassette unit ($99.95), a four-colour printer/plotter, the 1020 ($299.95), an 80-column dot-matrix printer, the 1025 ($549), and a letter-quality printer, the 1027 ($349.95). A modem, the 1030 was shown, as was a new 1050 disc drive ($450), touch tablet controller, trak-ball controller, new joysticks and a CP/M module.

CBS announced what became the star attraction of the show — the Colecovision Adam computer. The Adam comes with separate keyboard and processor unit, a pair of joysticks, a daisy-wheel printer and two stringy floppy drives, all for $600.



Tim Hartnell reports from the CES Consumer Electronics Show



THE CES Consumer Electronics Show held at the McCormick Center in Chicago last week is one of the key trade shows in the US.

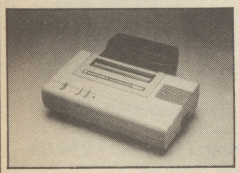
By British standards its size is awesome. The attendance over the four-day show topped 80,000 – and that is only members of the trade, the public were not allowed to visit. The actual display area was more than five times the size of our own Personal Computer World *show – buses were laid on just to ferry visitors around the exhibition area.*

Busy time for the Commodore

Continued from page 1

Software for the 64 is now coming through in a flood, both from Commodore itself and from the independent suppliers.

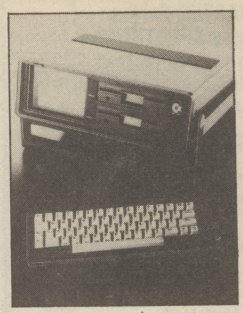
The most outstanding games program was *Soccer*, previewed by Commodore for release on Rom later in the summer. Commodore showed ten new titles that are available immediately: *Radar Rat Race*, *Sea Wolf*, *Clowns*, *Jupiter Lander* and *Music Composer* on cartridge and *Sooper Froot*, *Stellar Wars*, *Depth Charge*, *Labyrinth* and *Super Blitz* on cassette.



Education material was also strong from Commodore. Two impressive series of animated graphics programs with words and speech using the speech synthesiser unit were shown. Called *The Magic Garden* and *The Magic Workshop*, both should be available for around £15 on cartridge at the same time as the synthesiser in September.

Other languages being demonstrated for the 64 included Logo on disc for around £25 and Comal on disc or cartridge — both scheduled for the autumn.

The independent houses tended to concentrate on games software for the 64. Interceptor Micros showed six new titles including *Frogger*, *Scramble*, *Krazy Kong* and *Star Trek*, Supersoft showed *Stix*, Llamasoft exhibited *Attack of the Mutant Camels*, Bubble Bus showed *Hustler* and Rabbit displayed a range of titles including *Anhilator* and *Centropods*.



Atari takes on founder

ATARI has resolved the dispute with its founder, Nolan Bushnell, by re-employing him.

The company had been taking legal action against its founder, who sold the company to Warner Communications for $15m in 1976, to stop him from competing with them (see *Popular Computing Weekly*, April 21).

Now, under an agreement between Atari and Bushnell's new arcade game company, Sente Technologies, Atari gains the video game and home computer rights to the new coin-operated games — games developed by Sente.

Raymond Kaffer, Atari's chairman commented: "We are pleased to have Nolan Bushnell back with us — he is an acknowledged innovator in the video game business."

The agreement forms part of a campaign by Atari to regain a major share of the video games market. Warner's Consumer Electronics Division, which includes Atari, announced dismal 1982 financial results, with income less than 1 percent of the previous year's total.

● Sente Technologies is only one of several ventures started by Bushnell since leaving Atari. His most recent venture has been Androbot Inc, a bid to get in first into what promises to be the next big boom industry — personal robots.

Sir Micro-chip

Continued from page 1

National Enterprise Board to produce the first pocket tv, the Microvision. And, in 1979, he established his present company, Sinclair Research.

In January this year a share placement valued the company at £135.9m, with Sinclair's personal holding being worth £129.1m.

Clive is now concentrating on the new flat-screen tv project, other research investigations — an electric car and a personal robot — and a joint publishing venture, Sinclair Browne.

He is the current chairman of Mensa and his interests include running, poetry and opera.

Computer fair

THE Earl's Court Computer Fair which begins this Thursday, June 16, should offer much of interest.

It seems likely that Sinclair Research will demonstrate — although probably not sell — its overdue Microdrive storage system for the Spectrum, together with the RS232 and networking interface.

Memotech will show its new microcomputer for the first time. It is a low-cost machine in the under-£300 price range.

Mattel will show its Aquarius micro and Camputers will exhibit a 96K version of its Lynx.

Dragon Data will launch its 5¼ inch disc drive system at the show, running a Dragon Data operating system.

It is also just possible that Acorn could launch its long awaited 'Tube' interface and second processors for the BBC machine.

Lynx links up

A SELECTION of interfaces will soon be available from Camputers for the Lynx.

The Lynx joystick interface pack will enable up to two Atari-compatible joysticks to be connected. The interface plugs into the expansion port at the rear of the computer and also includes its own follow-on expansion port so it is still possible to connect discs or a parallel printer. The joystick interface is £14.95.

To connect a serial RS232 printer a lead costing £3.99 is required. The 96K Lynx contains the necessary software to interface the RS232 printer but the 48K machine does not. Consequently the software will be supplied on a free cassette included with the lead to 48K owners.

To connect a parallel printer a Centronics interface is needed. This will be available from August, priced at £49.95.

Expansion options for BBC

TWO companies have come up with altogether different expansion options for the BBC micro.

Advanced Memory Systems has produced a disc pack using the new Hitachi 3-inch drives. The double-sided discs have a storage capacity of 100K per side and the system costs £225 or £399, for either a single or double drive arrangement.

Contol Universal has produced Beeb-Ex, a low cost interface card which plugs into the 1MHz bus. In its simplest configuration, up to four application cards can be connected allowing up to 1M of additional data storage memory to be addressed in page mode or either an 8- or 12-channel analog interface to be connected. The rack-mounted system is also compatible with Acorn Eurocards. A four-card interface costs £49, a/d convertors are from £120, 64K DRam cards are from £148 and a *Star I/O* Eprom gives the interface access to Basic filing commands.



Details of both systems can be obtained from: Advanced Memory Services, Woodside Technology Centre, Green Lane, Appleton, Warrington, and Control Universal, Unit 2, Anderson's Court, Newnham Road, Cambridge.

Dragon launch delayed

THE UK launch date of the 64K Dragon 64 machine has been put back.

The expanded machine, together with the OS9 disc operating system will not now be available until September.

Dragon's own disc operating system and 5¼-inch disc drives should go on sale in July.

CHILDREN'S EDUCATIONAL SOFTWARE

The MICRO MASTER Series for 7-13 years (any SPECTRUM)

RESEARCHED, DESIGNED AND TESTED by teachers with just one aim — TEACHING. Easy to use — just RUN.

THE FOUR RULES OF NUMBER. (A package of five programs.)
This package promotes FAST and ACCURATE calculation ability at increasingly difficult levels. It is very EFFECTIVE as can be seen by consulting the enclosed grading tables for assessments of pupil's performance (given his age).

LANGUAGE DEVELOPMENT SERIES (10 programs on each cassette).
To develop VOCABULARY, SPELLING, CONCEPT ATTAINMENT, VERBAL REASONING and KNOWLEDGE OF THE ENGLISH LANGUAGE.
A complete series tailored to each age group. Used for remediation and, at the highest levels, for COMMON ENTRANCE, etc.

THE FOUR RULES PACKAGE **£11.70**
LANGUAGE DEVELOPMENT CASSETTE ..... **£ 7.90**
(State pupil's age)
BOTH CASSETTES **£14.00**

Cheques to **MICRO MASTER, Dept. PCWK**
94 Airedale Avenue, Chiswick,
London W4 2NN
For further details phone 01-747 1373

EXPERIENCED SINCLAIR/COMMODORE PROGRAMMERS REQUIRED IN WEST LONDON

SPECTRUM
Business Software

Before you buy an Apple or a Pet try one of our business programs. Our programs mean that you can now run sophisticated ledger accounting systems on your Spectrum, similar to those running on £500+ micros and sometimes costing hundreds of pounds.
Our quality programs meet all accounting and auditing requirements including full audit trail. They have the speed (maximum record search time of two seconds), the capacity (up to 1,300 entries per month) and the facilities to solve your book-keeping problems.

"On a large computer system a file of this nature would cost between £150 to £700."

Wholesalers report on our stock ledger.

48K Sales Ledger **£14.95**
48K Purchase Ledger **£14.95**
48K Stock Ledger and Control **£14.95**
Each including manual

KEMP LTD
43 Muswell Hill, London N10

Q.E.D. Systems

experts in business systems now bringing professionalism into the home market for SPECTRUM, ORIC and DRAGON microcomputers.

NEW

THE VARIETY PACK

for the

less than 20p/program!

ORIC
DRAGON
SPECTRUM

INCREDIBLE VALUE!

25 specially selected programs to realise the potential of your new micro

THE BEST VALUE AROUND TODAY! ONLY £4.95

ALL ORDERS ARE DISPATCHED WITHIN 48 HOURS

NEW

DRAGON 6809 ASSEMBLER/EDITOR

With this powerful software realise the full potential of this splendid micro by writing your own machine code programs and routines.

FULL OPERATING INSTRUCTIONS ARE INCLUDED £6.95

NEW

DRAGON VIDEO CHALLENGE

QED quality action-packed programs

PHOTON, LINK-FOUR, MICROTHELLO and PHANTOMS £5.95

Please send me on cassette .....
for my ..... micro with ..... memory
I enclose my cheque/postal order for £ .....
Name .....
Address .....

QED SYSTEMS, 2 SEFTON GARDENS, AUGHTON, Nr ORMSKIRK, LANCS L39 6RZ

Accidental error

Whilst trying to draw a semi-circle in a program that I was writing, I accidently mis-typed the *Draw* statement. To my utter amazement, the Spectrum started to draw some triangles, rotating them until a solid block of colour was produced.

The following six programs draw a variety of different shapes.

```
Graphics
  10 PLOT 100,100
  20 DRAW 60,30,PI+20

  10 PLOT 100,100
  20 DRAW 60,30,99*PI

  10 PLOT 100,100
  20 DRAW 60,30,255*PI

  10 PLOT 100,100
  20 DRAW 60,30,55*PI

  10 PLOT 100,100
  20 DRAW 60,30,PI+5

  10 PLOT 100,100
  20 DRAW 60,30,PI+15
These Programs all use the
 DRAW command to draw
straight lines... which when
run draw interesting
patterns on the screen.
© Goodman Ass.
```

David Goodman
46 Melwood House
Watney Market
London E1 2QX

Out of reach

Could you please explain the position as regards the continuing debate on copyright with reference to the forthcoming teletext receiver for the BBC computer.

As the cost of this receiver has now risen to over £200, I feel that it is out of the reach of most private users. However, I am quite prepared to contribute my share with four friends to get a teletext receiver between us.

Unfortunately, the copyright notice in Rem (the telesoftware newsletter on Ceefax 700) only permits two copies of any program to be made. While not wishing to infringe on copyright, this legally prohibits my friends and I from using the service as we would wish.

I would welcome your comments/advice on this situation.

S Parker
23 Thorneycroft St
Birkenhead
Merseyside

This is a moot point. Personally, I can see no good reason why the five of you should not benefit from clubbing together to buy a teletext receiver. However, the law is extremely murky where computer copyright is concerned.

Your best course of action is probably to write to the BBC, explain the situation, and ask for permission to make five copies of each program (for your personal use only).

Please let us know the results of your enquiries.

Pac-Man champion?

I recently scored 3,256,400 points on the Commodore cartridge *Jelly Monsters*. It took me over five hours. Am I the world *Pac-Man* champion, or is there someone out there who can better this score?

Terence Wilkins
21 Cheriton Field
Fulwood
Preston
Lancashire PR2 3WH

Not representative

Has anyone else noticed? It's changed! The Top 10 chart for the Spectrum, that is. It was with great regret that I saw that you have followed the example set by the other computer magazines and used the chart compiled by W H Smith & Son Ltd. Since Smiths only stock a narrow and very limited range of Spectrum programs, their figures can patently not be representative of the number of programs sold for the Spectrum over the country as a whole.

Obviously it is difficult to obtain a really accurate assessment of which programs are selling best in any one week, but using a chart produced by a chain store is not the best way. It is interesting to note that the last figures shown produced by the Buffer Micro shop in London (19-25 May) bear practically no relationship to those shown the following week produced by W H Smith. A close examination will reveal that only two of the programs in the Buffer Micro Top 10 are currently even stocked by Smiths.

Due to the charts influence, the effect of using figures produced by Smiths is to give them overwhelming power in relation to buying programs from any software company. In short, it enables them to demand a quite monstrous proportion of the selling price of any program. I wonder how many of your readers know that this is typically 60 percent or more (one of the real reasons for the high price of computer software). In addition, Smiths also provide very limited facilities to view a program in action before its purchase.

Such a situation is extremely damaging and unhealthy to the industry as a whole. It provides no opportunity to the smaller software houses that often produce the best programs. A magazine such as yours should be bringing these to people's attention.

Perhaps the best way of compiling a fair and representative chart is to follow the example set by the music charts. Select a number of specialist computer stores that stock a large range of software for the Spectrum and collate the figures from these yourselves. It would be desirable to keep the actual shops chosen a secret, and to only use figures from some of them every week. Such a system would itself be open to some criticism. For instance, it would take no account of the large volume of sales made through mail order. Nevertheless, it would be infinitely preferable to the present system.

So, to summarise, please change and improve the way the Top 10 Spectrum chart is compiled (and the charts for the other computers as well, for that matter). Let's see *PCW* be the magazine to lead the way and make the changes.

David Hughes
40 Beechwood Mount
Burley
Leeds LS4 2NQ

Unfortunately, the point you make about the Smiths chart being unrepresentative also applies to the Buffer Micro chart, as it does to any chart compiled from a single source. We are actively looking at ways of making the charts more representative and will keep you informed of our progress.

Off the market

I have been buying your excellent magazine for almost a year and read with interest the recent headlines about the new Buy 'n Try service. I think that the software companies have a valid point about it encouraging tape copying, and yet in the classified pages of the same magazine there were several advertisements for programs such as 'The Key'. In the words of the manufacturer, Keysoft: "First of all you have to back-up programs by making tape-to-tape copies. Now Keysoft present 'The Key'."

Quite obviously, 99 percent of programs sold of this kind will be bought solely to make copies of software, thus breaking the copyright acts. The only warning given to purchasers in this particular case was that "Keysoft advise people not to infringe the copyright acts." What else are they going to do with it?

I believe that these programs pose just as much of a threat as the Buy 'n Try scheme and I personally think that steps should be taken to attempt to take them off the market.

PS. Thanks for *Foxbat* and *Space Panic*, both of which were excellent.

Andrew Ratter
39 Cramond Terrace
Edinburgh EH4 6PW

This is clearly an issue which needs to be aired. Once again, the law fails to provide any clear guidelines.

We would be interested to know what our readers think of the issue and also the views of the software industry.

Hour of need

Please allow me to appeal to the readers of *Popular Computing Weekly* for help in my hour of need. I badly need a program (Vic20) for selecting *r* items from *n*. I have needed such a program for a long time, but have been unable to write one (puzzle number 53 uses one (or could use one).

Might it not be possible to set up a column in your paper where the likes of me can ask for help?

J P Mensink
98 Acomb Crescent
Newcastle-upon-Tyne
NE3 2RD

Sinclair ZX Spect



The growing range of Spectrum Software



You'll know already that the Spectrum has generated an enormous range of peripherals and independent software. Our own range is growing very fast and is shown in the Sinclair Software Catalogue – *free* with every ZX Spectrum.

rum-news!

16K now £99·95

Previously £125.

48K now £129·95

Previously £175.



ZX Printer now £39.95

Previously £59.95

How to order your ZX Spectrum
Access, Barclaycard or Trustcard holders – call 01-200 0200 24 hours a day, every day. By FREEPOST – use the coupon below. Please allow up to 28 days for delivery. 14-day money-back option.

sinclair
ZX Spectrum

Sinclair Research Ltd., Stanhope Road, Camberley, Surrey, GU15 3PS.
Tel: 0276 685311. Reg. no: 1135105.

At last, a 16K colour computer with graphics for under £100!

Why have we done it?

Partly because the sheer volume of Spectrums sold (over 300,000 so far) has brought down unit production costs.

And partly, of course, because we hope you'll buy a Sinclair computer – and not some competitor's promise! We've all heard about colour computers breaking the £100 barrier. Here's the computer that's done it. A colour computer with advanced graphics that's fully supported, and widely available.

Right now, you can order a Sinclair Spectrum at these prices direct from Sinclair on the order form below. And to make it even easier to handle high-level computing at the lowest possible price, we've cut the cost of the printer, too. At £39.95, it's almost unbelievable!

At prices like these, there's really no reason to wait.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	3000	99.95	
	Sinclair ZX Spectrum – 48K RAM version	3002	129.95	
	Sinclair ZX Printer	1014	39.95	
	Printer paper (pack of 5 rolls)	1008	11.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			Total £	

Please tick if you require a VAT receipt

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable.

Signature PLEASE PRINT

Name: Mr/Mrs/Miss

Address

POC 906

FREEPOST – no stamp needed. **Prices apply to UK only.** **Export prices on application.**

Connect 4

A new game for the BBC by M Kendrick

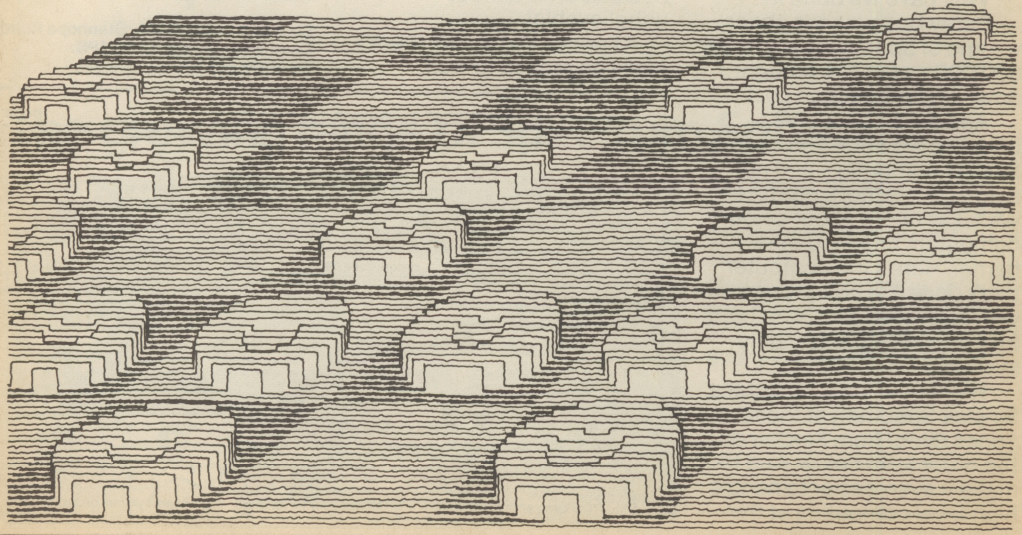
This program is a computerised version of the game Connect 4. It is written on a model B BBC micro, but can be used on a model A by modifying the mode/colour commands. The object of the game is to form a line of 4 counters horizontally, vertically or diagonally. The board fills from the bottom upwards.

The controls are as follows:

4 — moves cursor left
6 — moves cursor right
Space bar — places counter in column under cursor.

Using this program on a colour tv produces an unusual effect with one of the user-defined characters. ■

```
>LIST
   10  REM ************************
   20  REM **     Connect 4       **
   30  REM **     M.Kendrick      **
   40  REM **       1983          **
   50  REM ************************
   60  MODE1
   70  S1%=0:S2%=0:S3%=0
   80  MM=0:G=0:VDU23;8202;0;0;0;
   90  FLAG =0
  100  VDU 23,255,255,255,255,255,255,255,255,255,255:VDU23,254,170,85,170,85,170,85
,170,85:VDU19,2,2,0,0,0,19,3,3,0,0,0
  110  CLS:PRINT "          Connect 4  "
  120 PRINT"       =========="
  130 PRINT:COLOUR1:PRINT" 1.The object is to get a line of 4 "
  140 PRINT:COLOUR2:PRINT" 2.The board is a 6 by 7grid .A line may be horizontal
,vertical or diagonal ."
  150 PRINT:COLOUR1:PRINT" 3. Columns are filled from the base upward."
  160 PRINT:COLOUR2:PRINT" 4. The following keys are used :-"
  170 COLOUR1:PRINT"     6 ";:COLOUR3:PRINT"Move right."
  180 COLOUR1:PRINT"     4 ";:COLOUR3:PRINT"Move left."
  190 PRINT:COLOUR3:PRINT" The space bar drops your counter to the foot of the c
olumn"
  200  DIM S(44),T(11),N(7)
  210   FOR LOOP=1TO 4000:NEXT
  220 M$="HIT ANY KEY TO CONTINUE":GOSUB1110
  230  A$=GET$:IF A$="" THEN230
  240  CLS:PRINTTAB(14) "Connect 4"
  250  F=0:G=0:H=0:FOR A=0 TO 42 :S(A)=0:NEXT
  260 COLOUR2:PRINTTAB(13)"==========":COLOUR3
  270 COLOUR1
  280  PRINT:PRINT"Scores :-"
```



```
 290  PRINT"           ¦   ¦   ¦   ¦   ¦   ¦   ¦   ¦"
 300  FOR T=1 TO 5
 310    PRINT"           ¦   ¦   ¦   ¦   ¦   ¦   ¦   ¦"
 320   PRINT"          ¦   ¦   ¦   ¦   ¦   ¦   ¦   ¦"
 330   PRINT"          +   +   +   +   +   +   +   +"
 340    NEXT
 350 PRINT"          ¦   ¦   ¦   ¦   ¦   ¦   ¦   ¦"
 360 PRINT"          ¦   ¦   ¦   ¦   ¦   ¦   ¦   ¦"
 370 PRINT"          ============================"
 380  COLOUR2
 390  PRINTCHR$(30);TAB(1,7)"YOU   ";S1%:PRINTTAB(1,9)"ME  ";S2%:PRINTTAB(1,11)
"DRAWN ";S3%
 400  WHITE$=CHR$255+CHR$255+CHR$255:BLACK$=CHR$254+CHR$254+CHR$254:CUR$="<"+CH
R$254+CHR$254+">"
 410  N%=36:FOR C=1TO7:N(C)=N%:N%=N%+1:NEXT
 420  C=4
 430 COLOUR3
 440   S=S1%+S2%+S3%:IF S/2 <>INT(S/2) THEN710
 450  M$="  My Move   ":GOSUB 1090
 460  V=0:X=0:Y=0:Z=0
 470   FOR LOOP=1 TO 7:C=C+1:IF C>7 THENC=1
 480   X1=7+4*C:IF N(C)>0 THEN GOSUB 840
 490   IF F THEN 670
 500   NEXT
 510  IF X THEN C=X:GOTO670
 520 IF Y THEN C=Y:GOTO560
 530 IF Z THEN C=Z:GOTO560
 540  C=RND(7):IF N(C)<1 THEN540
 550 V=V+1:IF C<>4 AND V<5 THEN540
 560 IF N(C)<8 THEN F=0:GOTO 670
 570 IF V<10 THEN630
 580 IF V/3 = INT(V/3) THEN MM=1 : M$="Now what do i do??":GOSUB 1110
 590 IF V<21 THEN630
 600  FOR LOOP= 1 TO 500:Q=RND(1000)+&7C00
 610   J=RND(256):?Q=J
 620   NEXT:GOTO820
 630 N(C)=N(C)-7:Z=0:GOSUB840:N(C)=N(C)+7
 640 IF F THENF=0 :IF V<9 THEN 540
 650 IF Z THENZ=0 :IF V<6 THEN 540
 660 IF X THENX=0 :GOTO540
 670 X1=7+4*C:X2=5+3*(N(C)-C)/7
 680 PRINT CHR$30TAB(X1,X2)WHITE$;TAB(X1,X2+1)WHITE$
 690 S(N(C))=5:N(C)=N(C)-7
 700  IF F THEN M$="I WIN !!":MM=1:GOSUB 1110:S2%=S2%+1:GOTO210
 710  M$="   Your Move   ":GOSUB1090
 720 X1=7+4*C:PRINTCHR$30TAB(X1,3)CUR$
 730 Z$=GET$:IF Z$="" THEN730
 740 IF Z$="6" THEN IF C<7 THEN C=C+1
 750 IF Z$="4" THEN IF C>1THEN C=C-1
 760 IF Z$=" " THEN780
 770 PRINT CHR$30TAB(X1,3)"    ":GOTO720
 780 L=(N(C)-C)/7:IF L<0 THEN720
 790 X1=7+4*C:X2=5+3*L
 800 PRINTCHR$30TAB(X1,X2)BLACK$;TAB(X1,X2+1)BLACK$
 810 S(N(C))=1:E=0:GOSUB 840
 820  IF E THEN M$=" YOU WIN !!":GOSUB 1090:S1%=S1%+1:GOTO 210
 830 N(C)=N(C)-7:GOTO450
 840 PRINTCHR$30TAB(X1,3)CUR$
 850 A=0:REPEAT T(A)=0:A=A+1: UNTIL A=12
 860 I=0:M=N(C)
 870 FOR U=M TO M+21 STEP 7:IF U>42 THEN890
 880   T(I)=T(I)+S(U)
 890   NEXT:I=I+1
 900 FOR A= C-3 TO C+3 :IF A<1 THEN A=1
 910   IF A>4 OR A>C THEN 950
 920   FOR B=A TO A+3:T(I)=T(I)+S(M-C+B):NEXT:I=I+1
 930   N%=M-(C-A)*8:IF N%<1 OR N%>18 THEN 950
 940   FOR D=0 TO 3:T(I)=T(I)+S(N%):N%=N%+8:NEXT:I=I+1
 950   IF A>7 THEN990
 960   IF A<4 OR A<C THEN 990
 970   N%=M+(C-A)*6:IF N%<4 OR N%>21 THEN990
 980   FOR D=0 TO 3:T(I)=T(I)+S(N%):N%=N%+6:NEXT:I=I+1
 990   NEXT
1000 FOR H=0 TO I :D=T(H):IF D=4 THEN E=1
1010   IF D=15 THENF=C
1020   IF D=10 THENZ=C
1030   IF D=3 THENX=C
1040   IF H AND D=2 THEN Y=C
1050   NEXT
1060 PRINT CHR$30 TAB(X1,3)"    "
1070 RETURN
1080 STOP
1090  FORA =1 TO 7:IF S(A)=0 THEN FLAG=1
1100    NEXT:IF FLAG=1 THEN FLAG=0 ELSE M$="It's a Draw":G=1
1110 PRINTTAB(20-LEN(M$)/2,23)M$
1120  IF MM=0 THEN1140
1130  FOR D= 1TO 1000:NEXT:MM=0:M$="":GOTO1110
1140   IF G THENG=0:S3%=S3%+1:GOTO210
1150  RETURN
```

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 manuel
- ★ £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

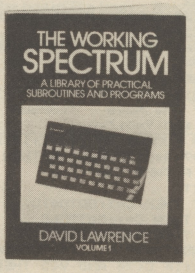
STILL AVAILABLE
The ONLY Spectrum FORTH to run in 16K, at the same LOW, LOW price. Powerful integer arithmetic, graphics, colour, 21 UDGs, over 70 predefined words, 2K available to user, complete tutorial user manual.
Order code SP16T ..... Price £5.95

BUY NOW

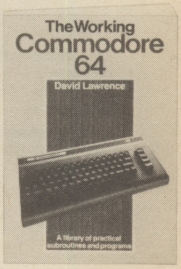
WHILE SPECIAL OFFER LASTS

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

Better books from Sunshine



A collection of sophisticated Basic programs and subroutines including Unifile, Renumber (handles Gotos and Gosubs) education, accounts, games and scores of essential routines. Put your Spectrum to work with what must be the most comprehensive Spectrum book. 248pp **£5.95***



Some of the more advanced programs in this collection include a word processor and text editor, a music and sound synthesiser, a sprite editor and a program which allows you to enter high resolution graphics mode. This is not available in the standard Basic. 160pp **£5.95***



This computer has capabilities far beyond most other computers in this price bracket. With this collection of Basic programs and routines David Lawrence introduces word processing, music and shows you how to mix text and high resolution graphics. As with the other books in this series, each program is built up out of re-useable subroutines. 160pp **£5.95***

*Available through W H. Smith's and computer dealers.

Trade/dealer enquiries welcome.

SUNSHINE

Please send me

☐ The Working Spectrum at £5.95 each
☐ The Working Commodore 64 at £5.95 each
☐ The Working Dragon 32 at £5.95 each

I enclose a cheque/ postal order for £_____
payable to **Sunshine Books** 19 Whitcomb Street, London WC2 7HF.

Name _____

Address _____

_____

Signed _____

We can normally deliver in four to five days.

Arms and the man!

***David Kelly** talks to John Reekie about a new high technology industry – robotics*

There is a growing feeling that the next big boom industry after microcomputers will be personal robots.

Imagine a radio-controlled, self-propelled robot, about four feet tall. It can find its way about, remember what it has learnt and where it has been. When asked, it will answer the front door and bring back the evening paper. Or maybe it will do a spot of Hoovering in the lounge.

Sounds far fetched? Not at all. We have, as they say, the technology. The only problem is price — until recently such a being would have cost tens of thousands of pounds.

In the US, however, there are now a number of manufacturers producing simple low-cost personal robots. 'Hero' from Heathkit/Zenith costs around £1,500, and is about 18 inches tall with a single gripping arm. Heathkit are now selling around 140 robots a month.

'Topo' is a £630 robot produced by a company called Androbot. The man behind Androbot is Nolan Bushnell — founder of Atari — who now has his eye on a new growth market.

A mechanical claw . . .

One British company, working along the same lines, is Colne Robotics, based in Twickenham, Middlesex. "These machines are the first signs of the robot summer — it is going to be an enormous industry," says Colne's founder John Reekie.

John set up the company in August 1981. Prior to that he had spent 10 years designing medical instrumentation, mainly for use in university research laboratories. Unusually, John had a previous career as an investment analyst. "I greatly regretted all that time talking investment rubbish, so I changed and taught myself electronics."

The aim of the new company is to develop a range of equipment which permits external control techniques to be applied to microcomputers. "Once a person has achieved a degree of computer literacy," explains John, "one of the first things they want to do is to externalise their control outside of the computer."

There is another reason why John chose robotics. Products which involve only one discipline — ie, purely electronic — are open to rapid competition from Japan and the far east. "With Colne we are combining expertise in several areas — mechanical engineering, electronic hardware and electronic software — and reckon we have a better chance of keeping foreign competition at bay. The software side is our best defence."

The first product designed and manufactured by Colne Robotics was Armdroid I in September 1981. It is a low-cost — about £400 — robot arm which can swivel, twist, bend, pick up and stack objects using its mechanical claw.

Armdroid I's are now being manufactured at a rate of about 50 a week, Over 2,000 have been delivered — 90 percent overseas. The Armdroid I will interface to most home micros — ZX81, Spectrum, Vic20, Pet, BBC, RM 380Z, Apple and Tandy — and is available with extensive software back-up.

Since the Armdroid I, Colne has produced two other products — the Zeaker micro-turtle and the Colvis computer vision system.

Zeaker is a small two-wheeled device, driven from the computer, with sensors that can detect obstructions. It has a horn and lights and, with a pen underneath, it can leave a trail. Yet it costs only £79.

There is now a range of software to go with it, and it is easily programmable in Logo — the turtle's language. Again the unit will run from any of the popular home micros.

Colvis vision system costs £400 and will work from any micro and can be connected to any robot. A 'camera' designed by Colne sends information to the computer, which can be programmed to learn and recognise objects and shapes.

In September, Colne Robotics will launch its fourth product — Armdroid II — a heavy-duty version of Armdroid I, for use mainly in industry. It will be capable of a 2kg lift and will cost around £3,000 — a tenth of the cost of the competition.

John sees its great potential as a satellite robot for larger robots: "Imagine — a big robot on a car assembly line offering up car wheels on to cars really requires a satellite robot to position the nuts."

Also, this summer, Colne will announce a computer-controlled lathe and mill which will sell for around £750. With a five-inch chuck and 22-inch bed it will sell mainly to colleges of further and higher education. "The government has just announced a £5m scheme for colleges to buy computer-controlled machine tools. Like the micros in schools scheme, it is a fifty-fifty grants arrangement, but the scheme makes no recommendations of particular equipment because there isn't any yet — there will be in six weeks!"

A little further in the future is perhaps John's most ambitious project — a low-cost personal robot. It is a wheeled, stepper-motor driven, four foot high device with a carrying platform, one five-axis arm and a moveable head. It will be radio-controlled from any home micro and be capable of voice recogntion and generation, infra-red sensing of people and ultra-sonic sensing of distance. Its own on-board microprocessor will give it some intelligence, but the learning control will come from the computer.

"Designed for the home market — your own personal robot — it will build up in a series of modules," explains John.

"You will start off with the basic device — the wheeled platform with power supply controlled by radio from your home computer — for about £150. Then you will be able to add extra facilities with a rack that will take a range of standard printed-circuit boards."

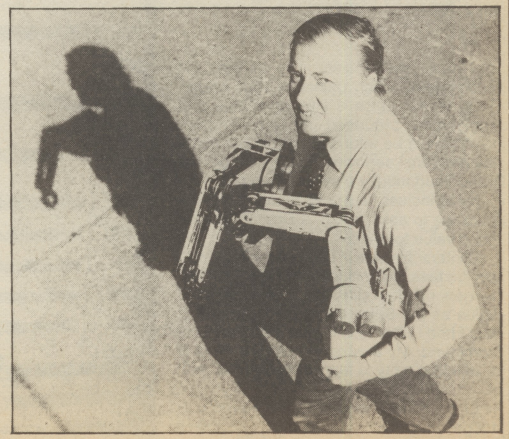
Obsolete humans?

By the time you have added on all the goodies, the total cost should come out at around £750 — about the same as the average Atari or BBC computer owner spends by the time they have added on discs, printers and so on.

"With a £150 starting price people will be able to afford it, whereas they might not if they had to buy the whole thing straight off," says John.

Exciting indeed. And there is no reason why Colne should not follow through. The company has recently received substantial financial backing from Prutech — the same high-technology investment company that backs Dragon Data. Says John: "Thirty-five percent of our capital is owned by Prutech and we expect to develop very quickly from now on. We have just set up a sub-division in Florida, manufacturing the Armdroid I for the US market."

What I want to know is — will the Colne Personal Robot be capable of locating and recharging itself from an electric power point? If so, what use will it have for obsolete things like humans? ■



Graphically illustrated!

***Graham Taylor** looks at some of the graphics software available for home micros*

"But does it have good graphics?"... the home computer buff's perennial question when faced with some new wizzo games to end all games.

Rightly or wrongly, graphics are one of the most important features affecting sales in the home computer market. But, what do the popular micros have to offer — how do they compare? And, given that you've bought the damn thing, what can you get to beef it up?

Whatever its strengths — and there are many of them — the Dragon 32 is not renowned for its graphics. For the beginner, the various modes make it far from simple to mix high resolution and text. Nevertheless, it can be done and, if you want to prove it for yourself, take a look at Salamander's *Graphics System* or Wintersoft's *Artist Designer*.

When Run, the Salamander program presents you with a help page which lists the various commands available. You can then choose the mode for drawing and, within the restrictions of that mode, the colour combination.

A flashing target can be moved around the screen, using a joystick. When the position is right, pressing a key will draw a box, an arc, a line, a circle or even a polygon with up to eight sides.

Having designed your picture (which somehow always ended up looking like something by Paul Klee in my case), you may want to claim authorship. By pressing *T* you can move a box cursor using the joystick to place text on the screen in any of the four arrow directions - text with resolution, it can be done!

It is great fun to play about with the various modes and see how your design changes under each one — it's also very instructive.

If I have one criticism, it is with the *Fill* command, which paints in your shape. This tended to be a little unreliable and sometimes produced an error report, which could be infuriating to people using the program "seriously" to create a picture rather than merely playing around.

Nevertheless, I would recommend the package to anyone with a Dragon as very good value for money.

Wintersoft's *Artist Designer* offers very similar features, including the text facilities. In general, I would rate it just as good value as the Salamander package and in fact I had rather less trouble with the *Paint* command. My only reservation is that it is a little less easy to familiarise yourself with it.

In a different league is the *Hi-res* cartridge from Compusense. At £25.30 it won't be the sort of thing you rush out to buy immediately.

What do you get for all that money? The cartridge comes with a 16 page explanatory booklet, but the difference is obvious as soon as you switch on — the screen has grown!

In fact, the hi-res cartridge more than doubles the screen size to a 51 x 24 character/line display. You can print on this new screen using a new command *Print!* which works exactly like *Print@* but has 1224 positions.

Perhaps more impressive still is *Print%* — this command allows you to place an 8 x 8 bit sprite in any one of 49152 positions. A total of 224 sprites can be defined and moved around the screen.

The cartridge comes with nine international character sets, including Danish and Japanese. It uses the high resolution screen area on the Dragon, which leaves you with 20,000 bytes for programs.

Its demise has been predicted

Although its demise has been predicted for months, the Vic20 is still selling well and should continue to do so, unless the Commodore 64 drops in price.

Early Vic games all tended to have very "chunky" low resolution, graphics. Admittadly it is possible to buy the super expander, which offers very good high resolution graphics, but only a low percentage of Vic owners have actually done so — perhaps because there is little commercial software that makes use of it.

However, recent Vic games have



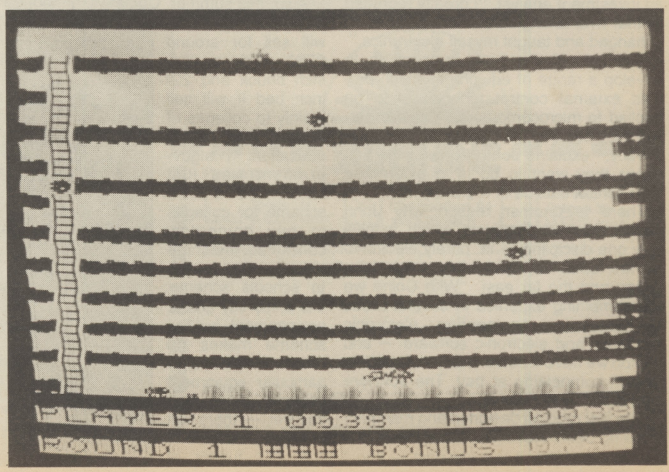
proved that even on the unexpanded model dazzling displays are possible. *Wacky Waiters* is one example, but perhaps the most impressive game I've seen graphically on the Vic is *Mutant Herd* — one of Thorn EMI's range of cartridges.

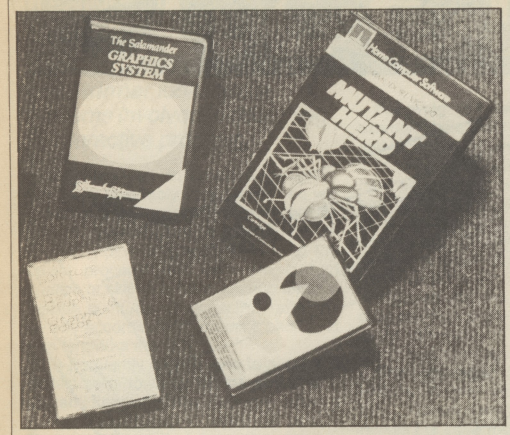
You must use a pair of crossed laser beams to guide your mutant slayer into the mutants' burrows, at the same time herding the mutants away from the pulsating powerhouse. Assuming you manage that bit, then you must guide your slayer down into the burrows to destroy the 15 mutant eggs and their Queen, avoiding the falling rubble.

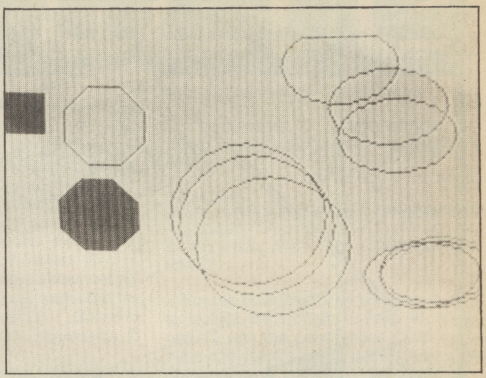
The game itself is great fun and the movement of the creatures, especially the Mutant Queen, is lively and entertaining.

The message, if you like, is this — it is rarely the hardware that makes quality graphics impossible, it is more often the quality of the programming. Most deficiencies can be overcome by judicious programming.

It hardly needs me to point out that the ZX81 has a number of failings in respect of its graphics — no colour is one, but lack of hi-resolution is another almost as significant. I doubt that we'll ever see anyone doing too much about the former, but the latter problem has been largely solved.







The solution has taken the form both of fairly expensive add-ons and inexpensive software.

High Resolution is a cassette and a manual from Computer Rentals. The program uses three-quarters of a K to provide a screen of 256 x 192 squares.

For practical purposes, this means that the program gives addressable graphics of 256 x 192 resolution. In fact, the ZX81 has only 128 codes for dot patterns, but it achieves the pseudo resolution by finding the nearest one to a specified point.

The "mini characters" can be used in an ingenious way — eight printed in succession will provide a user definable shape.

Convulsions of an unpleasant kind

The only thing I would print out is that this program is for fairly sophisticated users — it works by calling machine code routines and screen positions which have to be *Poked*. Nonetheless, it is a most ingenious program that is highly recommended. There are surprisingly few editor/designer type packages for the Spectrum, perhaps because the free *Horizons* cassette contains both a character creator and an artist sketchpad program.

The Spectrum is perhaps the best example of software overcoming the deficiencies of hardware.

As the advertisements say, the Spectrum has high resolution, higher in fact than the Dragon, and you can freely mix text and graphics in even the simplest Basic program. What they don't say is that the colour resolution is considerably lower and each of the 21 by 31 squares can only support two colours.

This means that, for example, drawing pie charts is nearly impossible, as the line marking the boundary of each slice is bound to cut across several such squares. When you try to fill in that segment's colour, the neat hi-resolution edge will become a jagged series of steps.

This ought to mean that anything approaching arcade style colour and detail, would always be lacking, and the early games did tend to have a "chunkyness" about them. However, it soon became clear that surprising things could be achieved when the *Horace* series appeared. *Horace* could be moved animatedly around the screen without any apparent colour resolution problems at all.

Other attempts suffered from "flicker", so that spaceships, etc, appeared to be undergoing convulsions of a particularly unpleasant kind as they moved across the screen.

With *Arcadia* and now *Ah diddums*, Imagine reduced the flicker to a shudder. But, my vote for "best graphic achievement in a Spectrum game" goes to *Psst* from Ultimate Play the Game.

The idea of the game is to move a little robot around the screen, collecting various cans of insecticide. These are needed to fight off the numerous garden beasties that are trying to eat the plant which you are attempting to nurture.

The slugs, spiders and wasps not only look realistic, they move in highly individual ways. Should your plant remain uneaten, it will prosper and eventually bloom into a blaze of colour.

Maybe *Psst* represents the most that can be achieved with the hardware — I don't know — but it illustrates wonderfully the "point" if you like of this article. With ingenuity even serious defects in hardware can be overcome and, by extension, the precise details of a new computer will matter less and less to the potential buyer, while the quality of its software will become even more important. ■

Firm	Program	Micro	Price
Wintersoft 101 Westminster Bridge Road London SE1 7HR	*Artist's Designer*	Dragon 32	£6.99
Salamander Software 27 Ditchling Rise Brighton East Sussex	*Graphics System*	Dragon 32	£9.95
Computer Rentals 140 Whitechapel Road London E1	*High Resolution*	ZX81	£5.95
Compusense PO Box 169 London N13 5XA	*Hi-res*	Dragon 32	£25.30
Ultimate Play the Game The Green Ashby de la Zouch Leicestershire LE6 5JU	*Psst*	Spectrum	£5.50
Thorn EMI Video Thorn House Upper St Martin's Lane London WC2	*Mutant Herd*	Vic20	£20.00

STARTECH

Absolutly the lowest prices!



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 ☐

POR.C.W.5.83

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

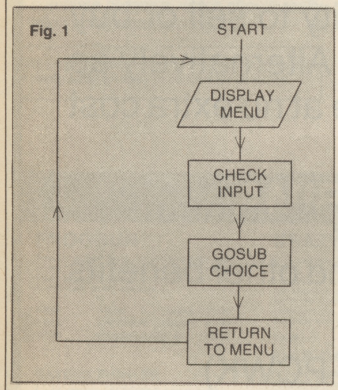
What's on the menu?

***Bob Skinner** looks at the problems involved in designing an interactive program*

Designing an interactive program almost invariably means that you will have to give the user a number of choices as to the operations to be followed by the program. For example, continue with the current process, exit from the current situation or skip to another section. Such a decision point, at which the program may 'branch' according to the user's choice, is often termed a menu.

It is frequently a good idea to present a master menu towards the beginning of a program, from which the user may select a course of action and to which the user is returned at the end of the action chosen. The task of programming such a menu is made easy by the use of subroutines. Figure 1 shows a flowchart representing the general concept.

Fig. 1



Of course, each subroutine from the main menu may also contain submenus and subroutines of its own. Coding the main menu is relatively simple, but note that we need to check the user's input choice for illegal values.

Figure 2 shows one way of coding the general algorithm:

Fig. 2

```
10 CLS.....clear the screen
20 PRINT "MAIN MENU".....title
30 PRINT.....print a blank line
40 PRINT "1. . .SEARCH FILE"
50 PRINT "2. . .ADD NEW DATA"
60 PRINT "3. . .AMEND DATA"options
70 PRINT "4. . .DELETE ENTRY"
80 PRINT "5. . .END"
70 A$=INKEY$:A=VAL(A$) .....read keyboard
80 IF A<1 OR A>5 THEN GOTO 70  trap illegal
   values
90 ON A GOSUB 200,300,400,500  perform
   subroutine
100 IF A=5 THEN CLS: END .....terminate if
   required
110 GOTO 10 .....repeat process
```

Following the flow of control in this example, note that the program will ignore any key press other than the numbers 1 to 5 inclusive. Once the chosen subroutine has been executed (ie, a *Return* statement has been encountered) the program returns to line 100, from where control passes to the start of the menu. The process is then repeated, unless *A=5* in which case the *On. . .Gosub* statement will be ignored and line 100 will terminate the program. Notice the use of *On. . .Gosub* to avoid too many *If. . .Then* statements to get to the subroutines.

This technique can be extended to include several options. This is where *On. . .Gosub* really saves space and makes the code more readable than lines like:

```
90 IF A=1 THEN GOSUB 200
92 IF A=2 THEN GOSUB 300
94 IF A=3 THEN GOSUB 400
96 IF A=4 THEN GOSUB 500
   and so on . . .
```

A "tree" diagram of Figure 1 would look something like Figure 3, which shows clearly the "Top-Down Structured Programming" approach to program design (*Popular Computing Weekly*, 5-11 May). In fact, this is how all program design should start, with a general chart of the overall structure of the main parts of the program. Each section can then be detailed, first by flowcharting, then by coding into the language required. This allows a modular approach wherein each subroutine has a specified function, is given certain values when called, performs some task and possibly returns values to the part of the program which called it.

We want to prompt the user to enter two numbers (*N1* and *N2*), then to choose from a menu which mathematical function he/she wishes to be applied to those numbers. Let us use the four functions:

	FUNCTION	DESCRIPTION
i)	(N1 + N2) * (N1 + N2)	— SQUARE OF SUM
ii)	(N1 * N1) + (N2 * N2)	— SUM OF SQUARES
iii)	(N1 * N1) * (N2 * N2)	— PRODUCT OF SQUARES
iv)	(N1 * N2) / (N1 + N2)	— PRODUCT-SUM RATIO

For the main menu, all we have to do is to replace the prompts in lines 40, 50, 60 and 70 with the descriptions given in the table and insert a line to get the user's two numbers:

```
12 PRINT "ENTER TWO NUMBERS"
14 INPUT N1$:N1 = VAL (N1$)
16 INPUT N2$:N2 = VAL (N2$)
18 CLS
```

Notice that the two numbers are entered as strings, rather than numbers. This is to prevent the interpreter breaking in with an error message like *Redo from start* should the user enter non-numeric characters.

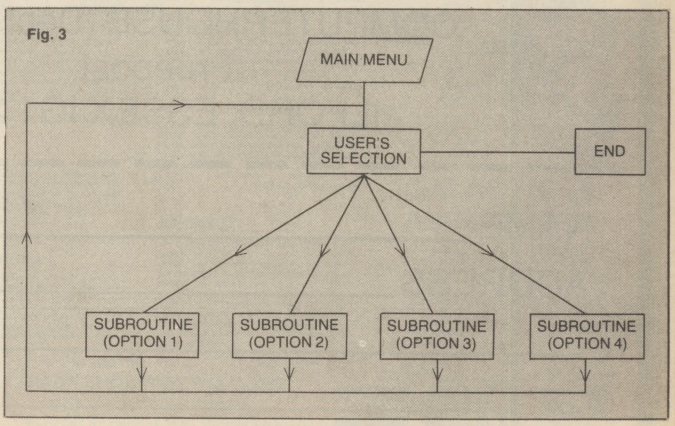
We now need to flowchart the four subroutines. Essentially, what we want to do is to give the relevant subroutine the variables *N1* and *N2* (which is done automatically) and to get an answer (a number) back. That is, each subroutine will have the form:

DATA → PROCESS → OUTPUT
N1,N2 → SUBROUTINE → RESULT

In fact, the subroutines will have very similar formats when coded:

```
200 C$="SQUARE OF SUM"
210 R = (N1 + N2) * (N1 + N2)
230 RETURN
```

Fig. 3



To show how this works in practice, let us look at the design of a simple program to do some maths. We will use the principle outlined above.

```
300 C$="SUM OF SQUARES"
310 R = (N1 * N1) + (N2 * N2)
320 RETURN
```

continued on page 19

SELL, EXCHANGE or BUY SOFTWARE

the COMPUTERHOUSE WAY

By becoming a member of COMPUTERHOUSE and entering your unwanted software on the COMPUTERHOUSE lists (which are circulated to all members) you get the opportunity to sell or buy software at 80% of its original cost. Alternatively as a member you can simply exchange at no extra cost to yourself other than postage.

MEMBERSHIP ONLY £12.95 per annum

For further details of membership and other benefits send large SAE to:

COMPUTERHOUSE (Dept. PCWK)
Freepost
ILFORD, ESSEX IG1 2BR

NAME _____

ADDRESS _____

_____

_____

```
400 C$="PRODUCT OF SQUARES"
410 R = (N1 * N1) * (N2 * N2)
420 RETURN

500 C$ = "PRODUCT-SUM RATIO"
510 TV = N1 + N2
520 IF TV = 0 THEN R = 0
530 IF TV = 0 THEN GOTO 550
530 R = (N1 * N2) / TV
550 RETURN
```

It is vital to check (line 520) in any division that the divisor will not be zero. If it were, the program would crash and the interpreter report *Division by zero.*

Finally, we want to see the result and, after letting the user check the answer, return him to the main menu:

```
102 PRINT "NUMBERS WERE ";N1;" AND ";N2
104 PRINT "CALCULATION OF ";C$
106 PRINT "RESULT IS:";R
108 PRINT "PRESS SPACE TO CONTINUE"
109 A$ = INKEY$:IF A$<>CHR$(32) THEN 109
```

Line 104 prints the name of the subroutine that has just been completed, this is a useful programming technique which can greatly aid debugging programs.

Putting these modules together gives us the complete program, which should really be tidied up by renumbering. ■

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

```
10 CLS

12 PRINT "ENTER TWO NUMBERS"
14 INPUT N1$:N1 = VAL(N1$)
16 INPUT N2$:N2 = VAL(N2$)
18 CLS

20 PRINT "MAIN MENU"
30 PRINT
40 PRINT "1...SQUARE OF SUM"
50 PRINT "2...SUM OF SQUARES"
60 PRINT "3...PRODUCT OF SQUARES"
70 PRINT "4...PRODUCT-SUM RATIO"
80 PRINT "5...END"
70 A$=INKEY$:A=VAL(A$)
80 IF A<1 OR A>5 THEN GOTO 70
90 ON A GOSUB 200,300,400,500
100 IF A=5 THEN CLS: END

102 PRINT "NUMBERS WERE ";N1;" AND ";
    N2
104 PRINT "CALCULATION OF ";C$
106 PRINT "RESULT IS:";R
108 PRINT "PRESS SPACE TO CONTINUE"
109 A$ = INKEY$:IF A$<>CHR$(32) THEN
    109
110 GOTO 10

200 C$="SQUARE OF SUM"
210 R = (N1 + N2) * (N1 + N2)
230 RETURN

300 C$="SUM OF SQUARES"
310 R = (N1 * N1) + (N2 * N2)
320 RETURN

400 C$="PRODUCT OF SQUARES"
410 R = (N1 * N1) * (N2 * N2)
420 RETURN

500 C$ = "PRODUCT-SUM RATIO"
510 TV =  N1 + N2
520 IF TV = 0 THEN R = 0
530 IF TV =0 THEN GOTO 550
540 R = (N1 * N2) / TV
550 RETURN
```


ANIROG SOFTWARE

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

CAVERN FIGHTER

All M/C version of SCRAMBLE. Lasers, bombs, continuous scoring and sound effects give all the thrills of arcade game. Pilot your space ship through the tortuous tunnels and caverns, destroying enemy missile launchers, fuel dumps and airborne fire saucers. Four ships to complete mission. 10 skill levels.

KB/JS VIC 20 Unexp. £5.95

CRAWLER

All M/C version of Centipede. Homing spiders, mushroom laying fleas and multi-direction travel makes this game fast and furious with 10 skill levels.

JS VIC 20 Unexp. £5.95

PHARAOH'S TOMB

Once you enter, the only way out is with the aid of a key which unlocks the mystery of the Pharaoh's tomb. Beware of the mantraps the ancient Egyptians so painstakingly built. One false move and you will meet the same fate as befell other tomb robbers over thousands of years. A multi-screen big graphical adventure with M/C movements.

KB VIC 20 16K £5.95

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

SLAP DAB

NEW

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

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

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 movements.

KB/JS VIC 20 16K £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

DRACULA

Count Dracula is asleep somewhere in his castle. He rises at midnight and you must find him and drive a stake through his heart before he rises. A multi-screen graphic adventure.

KB VIC 20 3K £5.95

TINY TOT'S SEVEN

Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap, O's and X's, Word Jumble, Bomber, Duck Shoot and Mad Drivers.

KB SPECTRUM 16K/48K £4.95
KB 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



GALACTIC ABDUCTORS

A stunning action packed game which rises 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

SOFTWARE WRITERS

We are looking for top class writers to join our growing software team. If you have written a quality game for VIC 20, SPECTRUM, DRAGON 32, ORIC 1 or COMMODORE 64, then contact us. We pay top royalties for accepted programmes.

TRADE ENQUIRIES WELCOME, GENEROUS DISCOUNT

PAYMENT BY CHEQUE, P.O., ACCESS, VISA
ANIROG SOFTWARE
26 BALCOMBE GARDENS
HORLEY, SURREY
ENQUIRIES: HORLEY (02934) 2007 6083

BARCLAYCARD VISA — Access

24 HR. CREDIT CARD SALES HORLEY (02934) 6083

Please enclose 50p post/packaging per order.

Over the moon!

***Maurice Gavin** presents a program to show all the phases of the moon's orbit around the earth*

The moon is our nearest neighbour in space and its influence has been ingrained upon us from antiquity. Witness the words "Monday, month" and even "lunacy".

For many, a silvery full moon riding high in winter, or a golden crescent in the western sky at dusk, is a splendid sight. Our moon, like all the other planets and satellites in the sun's family, is a globe shining by reflected sunlight. The following program, for 16K Spectrum, explains how the moon's appearance changes throughout the month.

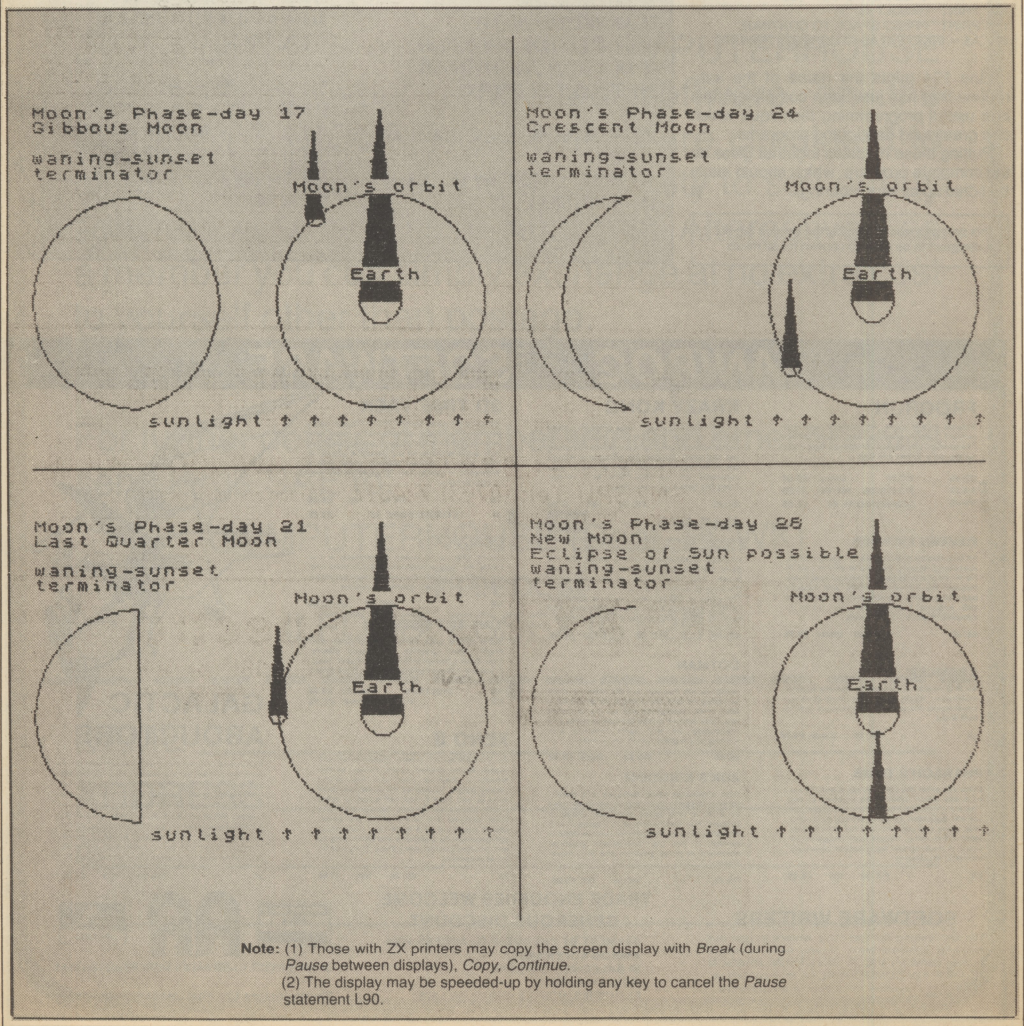
This program has a split display showing the phases and daily motion of the moon about the earth. It demonstrates eclipses of the sun and moon and shows why a total eclipse of the sun, for any given place on earth, is very rare.

Each phase of the waxing and waning moon is described via the conditional *Print* statement in lines 25, 26 and 27. The bright limb or edge "nearest" to the sun is *Drawn* first (*L 40*) where *Pi* = a semicircle and then the terminator or sunrise/sunset line (*L 70, 80*). The latter is actually a semi-ellipse and not a simple arc *Drawn* so rapidly by the Spectrum.

The program accurately shows the foreshortening effect as the terminator approaches the limb at new or full moon.

Once Run, a complete monthly cycle is shown. The program invites the entry of any selected day or decimal day for display. The economical conditional *Goto* on line 210 automatically reruns the program if a day < 0 *or* > 28 is entered!

Colour and sound can be added to taste and will not affect the technical accuracy of the presentation ■



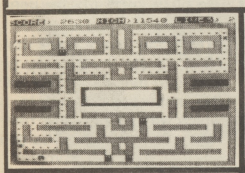
Note: (1) Those with ZX printers may copy the screen display with *Break* (during *Pause* between displays), *Copy, Continue.*
(2) The display may be speeded-up by holding any key to cancel the *Pause* statement L90.

```
  1 REM
Moon's Phases © Maurice Gavin 83
  4 LET G=192: LET H=69: LET J=
58: LET K=52: LET M=108: LET Z=0
  5 REM ----------------------
        0 to 28 days=mainloop
----------------------------------
  6 FOR D=0 TO 28
  7 REM ----------------------
        draw Earth & Moon orbit
----------------------------------
  8 CLS : CIRCLE G,H,J: CIRCLE
G,H,12
  9 REM ----------------------
        draw Moon in orbit
----------------------------------
  10 LET P=PI: LET A=(D-7)/14*P
  11 LET C=G+J*COS A: LET E=H+J*
SIN A: CIRCLE C,E,5
  12 REM ---------------------
        draw Moon's shadow
----------------------------------
  13 FOR N=.5 TO 5: PLOT C+N,E:
DRAW 0,K-10*N: PLOT C-N,E: DRAW
0,K-10*N: NEXT N
  14 REM ---------------------
        draw Earth's shadow
----------------------------------
  15 FOR N=.5 TO 12: PLOT G+N,H:
 DRAW 0,M-9*N: PLOT G-N,H: DRAW
0,M-9*N: NEXT N
  18 REM ---------------------
        describe Moon's phase
----------------------------------
  20 PRINT "Moon's Phase-day ";D
  23 PRINT FLASH 1;("New" AND (D
=0 OR D=28))+("1st" AND D=7)+("L
ast" AND D=21)+(" Quarter" AND (
D=7 OR D=21))+("Full" AND D=14)+
("Crescent" AND (D>0 AND D<7 OR
D>21 AND D<28))+("Gibbous" AND (
D<>14 AND D>7 AND D<21))+" Moon"
  25 REM ---------------------
        eclipses & terminator
----------------------------------
  26 PRINT FLASH 1;("Eclipse of
 Sun possible" AND (D=0 OR D=28)
)+("Eclipse of Moon possible" AN
D D=14)
  27 PRINT ("waxing-sunrise" AND
 D<14)+("waning-sunset" AND D>14
): PRINT "terminator"
  28 PRINT AT 11,22;"Earth";AT 5
,18;"Moon's orbit"
  29 PRINT AT 21,8;"sunlight ↑ ↑
 ↑ ↑ ↑ ↑ ↑ ↑"
  35 REM ---------------------
        draw bright limb
----------------------------------
  36 IF D>14 THEN LET P=-P
  40 PLOT J,10: DRAW 0,J*2,P
  45 REM ---------------------
        draw terminator
----------------------------------
  50 LET B=D-7: LET X=2.5
  60 IF B>7 THEN LET B=B-14
  70 LET N=X*ATN (PI/180*-B*25)
  80 PLOT J,10: DRAW 0,J*2,N
  82 REM ---------------------
        jump out of loop(z=1)
----------------------------------
  85 IF Z=1 THEN GO TO 200
  90 PAUSE 300: NEXT D: LET Z=1
200 INPUT "Select day ";D
205 REM ---------------------
        if D<>0 to 28 goto 1
----------------------------------
 210 GO TO (D>=0 AND D<=28)*8
9900 REM ---------------------
        save & autorun
----------------------------------
9990 SAVE "moon" LINE 1
```


DJL SOFTWARE

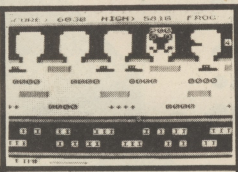
DEPT PC WK, 9 TWEED CLOSE, SWINDON, WILTS
SN2 3PU Tel: (0793) 724317 Trade enquiries welcome
Export Orders: Please add £1.00 per tape airmail

SEE US AT THE COMPUTER FAIR, EARLS COURT. SINCLAIR VILLAGE — STAND V71



ZUCKMAN
ZX81 (16K)
- *ALL MACHINE CODE (10K)
- *FOUR INDEPENDENT GHOSTS
- *HIGH-SCORE 'HALL OF FAME'
- *AUTHENTIC ARCADE ACTION
- *TITLE/DISPLAY MODE

ONLY £5.95 INC. P&P



FROGGY
ZX81 (16K)
- *MOVING CARS, LOGS, TURTLES
- *ALLIGATORS, DIVING TURTLES
- *FOUR 'SCREENS' OF ACTION
- *ALL ARCADE FEATURES
- *ENTIRELY MACHINE CODE

ONLY £5.95 INC. P&P

★ ZX Spectrum ★ New / New
FROGGY 16K or 48K

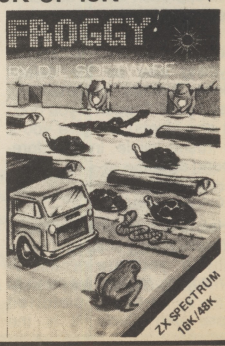
SPECTRUM VERSION OF ARCADE GAME WITH FULL ARCADE FEATURES:—

- *Fabulour Hi-Res Colour Graphics
- *Authentic Sound Effects + 3 Tunes
- *3-D Logs, Swimming & Diving Turtles
- *3 Lanes of Multi-coloured vehicles
- *On-screen Score, Hi-Score, Time-bar
- *Snake, Alligators and Baby Frog
- *'Top 5' High-Score initials table
- *Demonstration Game routine

Your home-sick frog must leap across a busy main road, then onto logs and turtles in the river to reach safety of the river-bank frog-homes.

THIS MACHINE-CODE GAME MUST BE SEEN TO BE BELEIVED!!

ONLY £5.95 INC. P&P



Command performance!

Keith and Steven Brain *present the Pic-man's guide to graphic commands*

The Dragon 32 uses Microsoft Extended Color Basic, which features a very versatile set of hi-resolution graphics commands. But, while these commands are very powerful they can be somewhat overpowering to the novice.

In an effort to explain more clearly the syntax and application of the Dragon graphics commands, we have therefore enlisted the help of our friend the *Pic-man*. Perhaps we should explain that he is quite unlike his abbreviated relative *Pi-man*, in that he is definitely not an automaton and certainly has no political aspirations (hence his appearance in glorious black and white). And, unlike *Pac-man*, he has no fear of ghosts or insatiable appetite for power pills. Instead, he has deliberately been constructed from a wide assortment of graphics commands so that he demonstrates how you can use most of the available hi-resolution drawing commands.

Start by setting the *Pmode* to *4*, so that you have the highest possible resolution and can therefore add lots of fine detail. *Screen 1,0* gives us white on a black background:

```
10 PMODE 4,1:SCREEN 1,0:PCLS
```

In its simplest form, the *Circle* command only needs two parameters: the *X* and *Y* screen co-ordinates of the centre, and the diameter of the circle, so that will do nicely for a pair of small round eyes. Remember that co-ordinates are always specified on a 256 × 192 grid, no matter which *Pmode* you are using.

When planning a design you can use graph paper or fancy plotting sheets, but a trial and error approach on the screen is often quicker where there is a lot of fine detail to squeeze in. There is no need to specify anything else as the default values (values automatically used by the Dragon if you don't set any others) will give you a full round circle in the foreground colour:

```
40 CIRCLE(79,48),2
50 CIRCLE(84,48),2
```

Heads are not actually round but rather egg-shaped (especially if you are a micro-maniac), so for that we need to form a vertically-distorted ellipse with *Circle*. It is the height/width (*HW*) ratio which allows you to include this distortion, but note that this must be the *fourth* parameter.

It is very easy to forget that the system can only tell which is the fourth item if it can already see three other parameters — therefore you must now also include the third parameter (colour). Although we have actually put the number 1 in to set the colour to white, the computer will also recognise a comma on its own as the default value, so either of the following lines has the same effect. In this program we have deliberately included all the actual values to make it easier to read. The *HW* ratio is greater than *1*, so that distortion is vertical rather than horizontal:

```
30 CIRCLE(82,50),8,1,1.5
30 CIRCLE(82,50),8,,1.5
```

A further feature of *Circle* is the ability to form only certain arcs of the whole circle, using parameters five and six to set the start and finish. *Pic-man* is smiling, so his mouth is the bottom half of a circle which is only drawn from 0 (three o'clock) to .5 (nine o'clock):

```
70 CIRCLE(82,55),3,1,1,0,.5
```

The simplest sort of *Line* just goes from one point to another, as in the nose, and *Pset* rather than *Preset* means that white (the foreground colour) is used:

```
60 LINE(82,52) – (82,54),PSET
```

Although his ears may look positively princely, they are rather too small to form with *Circle*, so they are simply boxes formed by specifying the top left and bottom right corners and adding *B* to the end of the *Line* command. The neck is made the same way:

```
 80 LINE(73,46) – (74,49),PSET,B
 90 LINE(90,46) – (91,49),PSET,B
100 LINE(80,61) – (84,63),PSET,B
```

Now we have a neck, we can add the round-shouldered look by a combination of all the previous *Circle* ideas to give the top half of a horizontally-distorted ellipse:

```
110 CIRCLE(82,72),18,1,.5,.5,1
```

We could have continued to use *Line* to draw the rest of his body, but *Draw* is more versatile as a whole series of lines in different directions can be *Drawn* at the same time. First, the top half of the body:

```
120 DRAW"BM64,72D28R6U24R2D2-
    0R20U2
      0R2D24R6U28"
```

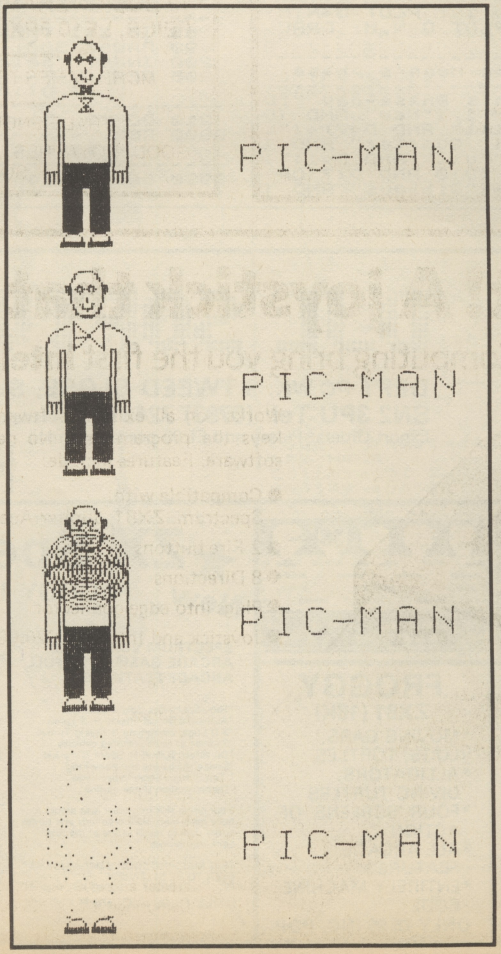
and then the bottom:

```
130 DRAW"BM72,97D30R8U20R4D2-
    0R8U30"
```

Note the use of blank moves (*BM*), to set the starting position, and make sure you follow the instructions round to see which way they go. It is best to try to plan your route carefully, so that it is as compact as possible. You must also always remember that the next *Draw* command will normally start from the last point *Drawn*, even if that was done an hour or more ago (as long as you don't use *Run*). So, if things start going haywire in your programs, look back and check what was the last thing *Drawn*!

Draw can be used to make any sort of design and it is very useful in putting text on the high-resolution screen. The let-

Continued on page 25



THARGON COMPUTATIONS

SPECTRUM SOFTWARE

SPACE STUMBLE 16K/48K **£4.95**
You are an Astro Fighter Pilot of the Earth Galactic Federation, presently on duty on the space station Tharg. Your task is to protect your sector of the galaxy from alien space craft, who are using it as a stop-off point in a hyper space jump. The only way to destroy them is to ram them before they disappear and leave a deadly reminder of their last known position. Featuring machine code animation, this is a highly addictive game for children and adults alike.

AIRSTRIKE 16K/48K **£4.95**
You are the pilot of a Phantom jet, flying over a city, and you are low on fuel. To gain the relative safety of the ground, you have to bomb away the buildings to be able to land. The aircraft is able to climb, but this drains your limited amount of fuel. Also featuring machine code animation and progressive skill levels.

Prices are inclusive of VAT and postage.

Cheques or Postal Orders made payable to:

THARGON COMPUTATIONS
10 Fleet Road, London NW3

Trade enquiries welcome

NAME .....

ADDRESS .....

.....

.....

.....

Please tick appropriate box for game required

SPACE STUMBLE 16K/48K ☐
AIRSTRIKE 16K/48K ☐

Also available at local branches of Metyclean

PLWK

HORNET

SOFTWARE LTD

FOR THE
DRAGON 32 & TSR80 CO-CO

A BRAND NEW MACHINE CODE GAME IN THE UK

WORMTUBE
FROM ZETA

1 to 4 players — 9 speed/skill levels — Joystick Control — Pause Control — Arcade style action and sound — Wormtube has Rainbow certification seal and was reviewed in March 83 *Rainbow* as a well-conceived game with great graphics and strong sound effects

£8.00

HORNET SOFTWARE LTD
10 BUCKINGHAM'S WAY, SHARNFORD
LEICS, LE10 3PX. TEL: 0455 272037

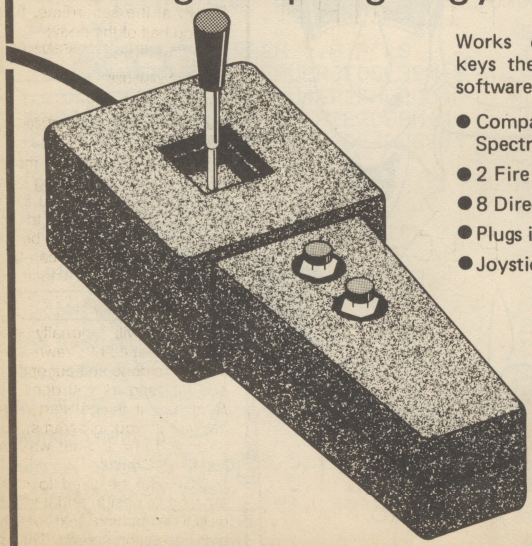
MORE GAMES TO BE RELEASED SOON

TRADE ENQUIRIES WELCOME

GOOD ROYALTIES PAID FOR DRAGON M/C SOFTWARE

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 Fire buttons
- 8 Directions
- Plugs into edge connector
- Joystick and Interface £26.00

Name .....

Address .....

.....

Please send me.....joysticks @ £26.00 for the Spectrum ☐ ZX81 ☐ Jupiter Ace ☐

Cheques and P.O.s made payable to:
Cambridge Computing,
1 Benson Street, Cambridge CB4 3QJ.

Dealer enquiries welcome please ring C P Lloyd on Cambridge (0223) 522905

● IMMEDIATE DELIVERY ●

SPECTRUM 16 OR 48K

ARE YOU

AN EXPERT IN MICRO-COMPUTER

BASIC KNOWLEDGE?

NOW YOU CAN BE WITH

MICRO I.Q.

1,000 MULTICHOICE QUESTIONS/ ANSWERS. 100K OF PROGRAM PACKED INTO 9 16K SECTIONS

LEARN RARE POKES AND IMPROVE

YOUR PROGRAMMING

MICRO I.Q. IS IN M/CODE AND BASIC WITH HI-RES, COLOUR, SOUND, ETC.

CHEQUES OR PO TO

M.K. CIRCUITS

63 FELSTEAD ROAD
GRIMSBY, S. HUMBERSIDE

£5
INC. P&P

64 HARDWARE

(add £1 p+p)

VICSPRINT 64, CBM 64 IEEE serial to centronics printer interface cartridge with control code and colour interpretation **£57.50**

64 SOFTWARE

(add 50p p+p)

AUDIOGENIC
Renaissance, Motor Mania ..... each **£8.95**
Grand Master chess **£19.95**

LLAMASOFT
Grid Runner, Attack of the Mutant Camels, Matrix each **£8.50**
Rox **£4.95**

RABBIT
Monopolee, Adventure Pack 1 ..... each **£5.99**
Pakacuda, Escape MCP, Centropods, Cyclons each **£5.99**

RAM ELECTRONICS
Bomber, Tank Alert, Sprite Editor ..... each **£4.95**

BUBBLE BUS
Krazy Kong, Alien Panic, Cavern Run ..... each **£8.99**

INTERCEPTOR
Star Trek, Panic, Frogger, Scramble, Spriteman (Pacman game) ..... each **£7.00**

Send cheque or postal orders or ring us with your Access of Visa card number on (02514) 5858 (closed all day Wednesday).

RAM ELECTRONICS (FLEET) LTD
(DEPARTMENT PCW)
106 Fleet Road, Fleet, Hampshire GU13 8PA
Overseas orders add £2 p+p. Prices include VAT at 15%



ters forming the title *Pic-man* are *Drawn* in this way (for more details of this technique see *Dragon 32 Games Master*):

```
20 DRAW"BM150,100S8U6R3FDGL3BM + 8, +
   3R2LU6LR2BM + 5, + 6HU4ER2FHL2GD4FR
   2EBM + 2, – 2R4BM + 2, + 3U6F2E2D6BM + 4,
   + 0U5ER2FD5U3L4BM + 8, + 3U6DF4DU6S4"
```

Pic-man obviously favours Doc Marten's as his boots are quite massive top halves of *Circles* with thick soles formed by boxes *Filled* with the foreground colour:

```
140 CIRCLE(76,132),5,1,1,.5,1
150 CIRCLE(88,132),5,1,1,.5,1
160 LINE(71,132) – (81,134),PSET,BF
170 LINE(83,132) – (93,134),PSET,BF
```

To make him look more solid, we have *Painted* in his trousers. *Paint* will fill an area with the first specified colour until it reaches the second specified colour — the main user difficulties are making sure you set the right co-ordinates and that there are no holes through which *Paint* can leak. Try altering the co-ordinates in line 180 and watch what happens:

```
180 PAINT(74,100),1,1
```

Draw always acts on a string, but this string can also be defined in advance and used repeatedly. As we have two identical hands to *Draw*, these have first been defined as *H$*.

H$ also uses another useful parameter called 'no-update' or '*N*'. Normally each new *Draw* command continues from where the last line *Drawn* ended, but if you put *N* in front of a command then the next line is *Drawn* from the same place as the current one. Follow the sequence carefully to see how each finger is formed (his thumbs are out of sight in case you think he is deformed).

```
190 H$ = "ND5R2ND5R2ND5R2ND5"
```

To put the hands into the appropriate positions, we just need to set the screen start position and then execute *H$* by sandwiching it between '*X*' and ';'.

```
200 DRAW"BM64,100XH$;"
210 DRAW"BM94,100XH$;"
```

We are afraid that *Pic-man* is really rather pompous and has taken to wearing the bow-tie defined in *A$*. Notice that this is *Drawn* from the centre using some of the diagonal commands (*F* and *G*) and that it is deliberately asymmetrical.

A relative blank move is used to separate the final short stripe from the rest of the picture. This has the advantage that you do not have to calculate the actual position, but only the displacement from the current position as + and – a number of screen points. It is not usually essential to start *Drawing* a design from the centre, but in this case *Pic-man* wants to prove to you that this is actually a revolving bow-tie, which grows, so he needs a central point to work from:

```
220 A$ = "BM82,69F3U6G6U6F3BM + 1, + 0R2":S
    = 4
```

The scale parameter '*S*' sets the size of the string *Drawn*, the angle parameter '*A*' allows you to change the direction of *Drawing* by 90 degree steps and the colour parameter '*C*' allows you to change the colour of *Drawing*. You can use a variable to change any of these, provided that you first convert the variable to a string with *Str$*. All these ideas have been combined together in this little sequence in which the tie is *Drawn* in colour 1 and then colour 0 (ie, drawn and erased), in all possible directions and at ten different increasing scales. The sound is included to slow things down so that the movement can be clearly seen:

```
230 DRAW"S" + STR$(S)
240 FOR N = 0 TO 3:DRAW"A" + STR$(N)
250 FOR M = 1 TO 0 STEP – 1:DRAW"C" +
    STR$(M) + A$
260 SOUND255,1:NEXT M,N
270 S = S + 1:IF S<10 THEN 230
```

Of course, pride always comes before a fall and that rotating tie looks very dangerous, so it is hardly surprising that it eventually explodes. Explosions are very frequent features of computer programs, so this is a very general routine. A series of expanding concentric *Circles* are drawn by using the variable '*X*' to set the diameter — a sound is integrated with each expansion of the circle. *Play* is used instead of *Sound*, as it allows the use of a much shorter duration if tempo (*T*) and note-length (*L*) are set to their highest values (255):

```
280 FOR X = 1 TO 59 STEP 2:CIRCLE(82,69),X,1:
    PLAY "T255L255CD":NEXT X
```

Once it has passed its peak, the explosion dies away as the *Circles* are now drawn in reverse order by *Step– 1*, so that only *Pic-man's* boots and a few fragments remain. Notice that integration of graphics and sound is more complete here as *X* also varies the volume and tempo of the *Play* command:

```
290 FOR X = 59 TO 1 STEP – 1:CIRCLE(82,69),
    X,0:PLAY"L255V" + STR$(INT(X/2)) + "T" +
    STR$(X * 4) + "DC":NEXT X
```

■

FULL LISTING FOR 'PIC-MAN'

```
10 PMODE 4,1:SCREEN 1,0:PCLS
20 DRAW"BM150,100S8U6R3FDGL3BM+8
,+3R2LU6LR2BM+5,+6HU4ER2FHL2GD4F
R2EBM+2,-2R4BM+2,+3U6F2E2D6BM+4,
+0U5ER2FD5U3L4BM+8,+3U6DF4DU6S4"
30 CIRCLE(82,50),8,1,1.5
40 CIRCLE(79,48),2
50 CIRCLE(84,48),2
60 LINE(82,52)-(82,54),PSET
70 CIRCLE(82,55),3,1,1,0,.5
80 LINE(73,46)-(74,49),PSET,B
90 LINE(90,46)-(91,49),PSET,B
100 LINE(80,61)-(84,63),PSET,B
110 CIRCLE(82,72),18,1,.5,.5,1
120 DRAW"BM64,72D28R6U24R2D20R20
U20R2D24R6U28"
130 DRAW"BM72,97D30R8U20R4D20R8U
30
140 CIRCLE(76,132),5,1,1,.5,1
150 CIRCLE(88,132),5,1,1,.5,1
160 LINE(71,132)-(81,134),PSET,B
F
170 LINE(83,132)-(93,134),PSET,B
F
180 PAINT(74,100),1,1
190 H$="ND5R2ND5R2ND5R2ND5"
200 DRAW"BM64,100XH$;"
210 DRAW"BM94,100XH$;"
220 A$="BM82,69F3U6G6U6F3BM+1,+0
R2":S=4
230 DRAW"S"+STR$(S)
240 FOR N=0 TO 3:DRAW"A"+STR$(N)
250 FOR M=1 TO 0 STEP-1:DRAW"C"+
STR$(M)+A$
260 SOUND255,1:NEXT M,N
270 S=S+1:IF S<10 THEN 230
280 FOR X=1 TO 59 STEP 2:CIRCLE(
82,69),X,1:PLAY"T255L255CD":NEXT
 X
290 FOR X=59 TO 1 STEP-1:CIRCLE(
82,69),X,0:PLAY"L255V"+STR$(INT(
X/2))+"T"+STR$(X*4)+"DC":NEXT X
300 I$=INKEY$:IF I$="" THEN 300
```



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

SEE US ON STANDS JA & S
7th ZX MICROFAIR
ALEXANDRA PALACE
SATURDAY JUNE 4th 1983

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.
'a remarkably good version....well worth the money.'
...Sinclair User...

ZX81 £5.95

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

Spectrum £4.95
ZX81 £4.45

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

ZX81 £5.95

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

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. 4 selectable speeds and choice of 1 to 9 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 3 is a bargain" (From *PCW* review) SNAKES, LANDER & INVADERS. (No joysticks).
3 ON ONE CASSETTE..... **£6.95**

EDITOR/ASSEMBLER + MONITOR
Two Pass Global type. Supports standard Motorola mnemonics and Addressing modes. Powerful Debug Monitor. Recommended for the serious user.
SUPPLIED ON CASSETTE WITH USER INFORMATION..... **£28.75**

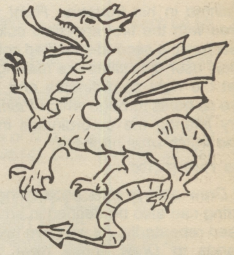
DISASSEMBLER
Written in position Independent Machine Code, will run anywhere in RAM. The ideal tool to have around.
SOLD ON CASSETTE **£11.85**

SPECIAL OFFER
Buy Editor Assembler and Disassembler together and save £5.60.
Cost of both as one purchase..... £35.00

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 pieces. 8 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**



Cheques/POs payable to
J. MORRISON (MICROS) LTD
(Dept DU1)
2 Glensdale Street, Leeds LS9 9JJ
Tel: (0532) 480987
ALL ORDERS DESPATCHED BY RETURN FIRST CLASS POST
Callers and Trade enquiries welcome

J. MORRISON (MICROS)

Wizard Software

ARCADE GAMES FOR THE DRAGON



SMASH **£7.00**
A super "break out" type game in high resolution graphics. Features include a demonstration mode, 9 bat angles and walls of increasing difficulty from a single wall up to a full three walls. Continuous display of score, best score and balls remaining. RECOMMENDED BY THE MICROCOMPUTER SOFTWARE CLUB.

EVICTOR **£7.00**
A reactive game with machine code for extra zip. Evict the aliens from their self re-generating and defended base. Features lasers, phasers and bombs. 5 skill levels. Also features a demonstration mode.

ALIENS+ **£7.95**
A machine coded Arcade game presented in high resolution graphics. Features 48 invaders, mother ship, 4 defenders per wave, 4 shields + bonus shields. Continuous display of score during game.

Still available:

WIZARD £6.50	FRUITA £6.50
SIRIUS IV £6.50	TRIPLET £5.50
GALLEONS £5.00	BREAKER £3.50

DRAGON STARTREK £8.45

All prices inclusive, mail order, cheques or postal orders to:
WIZARD SOFTWARE, DEPT. PCW, PO BOX 23
DUNFERMLINE, FIFE KY11 5RW
Also available from software retailers
Send large SAE for full program catalogue
Royalties paid for superior quality DRAGON software

Teaching turtle . . .

***Boris Allan** completes his two-part series on turtle graphics*

The potential of turtle graphics is immense, from the writing of graphics games to the teaching of mathematical and arithmetical ideas. I will see how the procedures can be used in games later (after I have shown how we can have more than one pen colour at a time), but this week I want to show how the turtle graphics routines can be used to produce useful effects in teaching.

The first of the procedures, ie, *Procspiral,* has two parameters. The routine draws spirals, where each side gets *Inc* bigger at each linear portion. After each line the turtle turns through *A* degrees to produce remarkably different effects.

Try *Procspiral (60,1)* and a hexagon builds up to fill the screen, while *Procspiral (60,2)* results in a hexagonalish shape that is now clearly a spiral. *Procspiral (61,2)* produces an effect which looks remarkably like a spiral rush mat.

Trying to explain why changing the angle by one degree (from 60 to 61) should make such a dramatic change, leads on to the idea of prime numbers, and divisibility. 60 goes into 360 exactly, whereas the prime number 61 does not (and all prime numbers greater than five are divisible into 360, but most non-prime numbers are divisible into 360 or some low multiple: $360 = 2^3 \times 3^2 \times 5$). A great deal of fun can be had predicting what the spiral will look like; eg, is the 'inner' spiral going to appear to be clockwise or counter-clockwise?

The next procedure *Procsinfn* also provides fun, but it's probably more applicable at the secondary level — variants can easily be produced to help in the teaching of polar geometry. What is actually plotted is the locus of the curve $r = sin(\theta/k)$ which, depending on the value of the constant *k*, produces a circle ($k = 1$), a cardoid (or "heart") ($k = \frac{1}{2}$), rather more complex looping curves (k at smaller values, try minus values), and then variants on "propeller shapes".

The parameter *Size* sets the size of the plot, and the parameter *Factor* corresponds to *k* (and values can be entered as, eg, ⅓). Find out what happens when *Cos* is exchanged for *Sin*, and more complex variants.

The three final procedures are used to produce Kasner snowflakes (see *Mathematics and the Imagination*, by E. Kasner and J. Newman, p.296-302). The only drawing is performed in *Prockasner*, when the order of the curve (*Oder*) has reached zero, otherwise a recursive call is made to *Procrecursive* which actually then calls *Prockasner*. *Procsnowfl* sets the scene by defining the order (*Oder*) and the size of each little step (*Inc*).

What happens with the procedure is seen by running the program for different orders (0 and upwards). The snowflake and similar curves (see Kasner and Newman) have many intrinsically interesting features: eg, the snowflake (as the order increases) is held to have an infinite perimeter, but a finite area. Kasner and Newman suggest investigating the "anti-snowflake" where in *Procrecursive* the angles are $A - 60$ and $A + 60$ (and not $A + 60$, $A - 60$). The recursive technique can also be used for other purposes. ■

```
>L.2000,
 2500REM----------------------------------
 2510REM----------------------------------
 2520DEF PROCSPIRAL(A,INC)
 2530 LOCAL I
 2540PROCCENTRE: REPEAT
 2550PROCTURN(A): PROCMOVE(I,1):I=I+INC
 2560UNTIL INKEY$(0)="F"
 2570*FX15,0
 2580ENDPROC : REM SPIRAL
 2590REM----------------------------------
 2600REM----------------------------------
 2610DEF PROCSINFN(SIZE,FACTOR)
 2620LOCAL I,MAX
 2630IF FACTOR<=1 THEN MAX=180/FACTOR ELSE MAX=180-(INT(FACTOR/2)*2=FACTOR)*180
 2640FOR I=1 TO MAX: PROCCENTRE: PROCTURNTO(I): PROCMOVE(SIZE*SIN(RAD(I*FACTOR))
,0): PROCMOVE(0,1): NEXT I
 2650ENDPROC : REM SINFN
 2660REM----------------------------------
 2670REM----------------------------------
 2680DEF PROCKASNER(ODER,ANGLE,INC)
 2690 PROCTURNTO(ANGLE)
 2700IF ODER>0 THEN PROCRECURSIVE(ODER-1,ANGLE,INC) ELSE PROCMOVE(INC,1)
 2710ENDPROC : REM KASNER
 2720REM----------------------------------
 2730REM----------------------------------
 2740DEF PROCRECURSIVE(O,A,I)
 2750PROCKASNER(O,A,I): PROCKASNER(O,A+60,I): PROCKASNER(O,A-60,I): PROCKASNER(O
,A,I)
 2760ENDPROC : REM RECURSIVE
 2770REM----------------------------------
 2780REM----------------------------------
 2790DEF PROCSNOWFL(ODER,INC)
 2800PROCKASNER(ODER,60,INC)
 2810PROCKASNER(ODER,-60,INC)
 2820PROCKASNER(ODER,180,INC)
 2830ENDPROC : REM SNOWFL
 2840REM----------------------------------
 2850REM----------------------------------
>
```

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

Dragon Dungeon

FIRST WITH THE LATEST!

Latest Dragon games into stock:

'BOPSWIZZLE' — Makes 'Pimania' look staid! Your opponents include Gloops (jellyblobs, who turn you into glue), Smoochers (giant flying lips, who kiss you to death) and Yerkles (who will throw you into the nearest midden). **£5.95**

'SCANNER 13' — A sensational combination of all that's best in both arcade and adventure games. With *total* scrolling (up, down, sideways and 360-degree viewing) and X-ray penetration, the game takes the Dragon's sound and colour capacity to new horizons. Locate the drones and destroy them, before they pin-point your location. **£8.45**

'ALIEN ODDESSY' — Parts 1 and 2 of a massive 60K-plus adventure, set on an alien world. Battle your way through the warren of streets of the capital to the Grand Harbour where the mighty Land-Ships set out across the Great Grass Plain. SF readers of 'Green Oddessy' may find the concept familiar. **£9.95**

'DROIDS' — Morrison's best m/c arcade game yet. Get the Invader Lordes before they pull out the lead shields under the Neutron Bombs, which will vaporise you! **£6.95**



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

COMPUSENSE LTD

286D Green Lanes, PO Box 169
Palmers Green, London N13 5TN

Tel: 01-882 0681 01-882 6936

SOFTWARE FOR DRAGON 32

HI-RES High Resolution Display for DRAGON 32

Supplied on Cartridge, for DRAGON 32 **price £25.30**

HI-RES gives you a 51 column by 24 line display instead of the 32 column by 16 line display on your DRAGON 32 computer. If that was all it would be quite something, but in addition HI-RES has the following features:

★ HI-RES does not eliminate BASIC
★ Upper and lower case as standard
★ Auto repeat, International character sets
★ Improved shift control to give more key values
★ Redefinable characters and Sprites
★ Extra BASIC commands for screen control
★ About 19,500 bytes available for BASIC programs
★ Load and save programs and use printer normally
★ Return to standard display mode at any time
★ Graphics and text can be mixed on the screen

We firmly believe that HI-RES is the most useful and powerful software item you can obtain for your DRAGON 32 computer.

HI-RES does not invalidate any programs you have written so far, although you will find that they can be enhanced to take advantage of your new BIG screen — over twice the capacity of the existing screen.

How easy is HI-RES to use?

Just plug the cartridge in, switch on your computer and HI-RES will be in action. You will wonder how you ever managed before HI-RES was around.

What about Graphics?

HI-RES allows Sprite graphics which are not available on a standard DRAGON 32. If the entire character set is used then over two hundred sprites can be defined in a single program! The BASIC graphics functions work directly on the HI-RES screen allowing you to mix text and drawings. HI-RES allows two colours, green and white, in both normal (black on colour) and inverted (colour on black) mode.

What extra commands do I get?

HI-RES implements two extra PRINT statements to allow normal and sprite printing on its big screen. Extra functions (about twenty) have been added to the CLS command. These allow you to change character sets, switch the cursor on and off, underline text and more . . .

Is there anything else?

Yes. HI-RES extends the keyboard so that an extra shift is possible on the top row of keys. We supply you with a free overlay which neatly positions over the top of your keyboard, you write in the values depending on the character set selected.

Sounds good? — It's even better in the flesh! Place your order by phone or post or send a LARGE SAE for details of all our products.

Order by **ACCESS/VISA** or cheque by telephone or post. 24-hour answerphone service.

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

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.

Super Breakout

on Vic20

Super Breakout runs on the unexpanded Vic20 and uses some of its best features.

This version of the famous game has 1-5 levels with one objective — keep the ball in play and demolish the bricks.

If you get a high score this will be stored at each level.

Program notes

Lines	
10-80	Title page
100-190	Move ball with sound effects
200-250	Move bat. Note location 197 is peeked for key value
300-410	Game over and Hi score
2000-2180	Instructions in lower case

```
0 REM **(C)C.ANDERSON**          1982
10 GOSUB2000:POKE36879,186:PRINT"■■■■■■■■■■■                    ":PRINT"■■■■■ *SUPER
BREAK* "
20 PRINT"■■■■■                    ":PRINT"■■■■■  C.ANDERSON    ":SP=7680:CC=38400:SO=3
6874
25 V=SO+4:PRINT"■■■■■       1982        ":PRINT"■■■■■             "
30 PRINT"■■■■■■■■■LEVEL(1-5)"
40 GETG:IFG=0ORG>5THEN40
43 IFG=1THENB$=" ■▔▔▔▔▔▔▔ ":M=14
47 IFG=2THENB$=" ■▔▔▔▔▔▔ ":M=15
50 IFG=3THENB$=" ■▔▔▔▔▔ ":M=16
60 IFG=4THENB$=" ■▔▔▔ ":M=17
70 IFG=5THENB$=" ■▔ ":M=18
80 POKE36879,14
100 PRINT"■":FORI=2TO7:FORJ=1TO20::POKESP+J+I*22,207:POKECC+J+I*22,I:NEXTJ,I
110 BL=6:BT=11:POKESO,240
120 A=1:B=8+(IANDBL):X=1:Y=1:BL=BL-1:IFBL=4THENBL=BL-1
130 POKE36877,0:FORI=1TO10:POKEV,15:FORJ=1TO10:NEXTJ:POKEV,0:FORJ=1TO10:NEXTJ:NE
XTI
140 IFBL=0THEN300
150 POKESO,0:POKESP+A+B*22,32
160 A=A+X:B=B+Y
170 IFA=20ORA=1THENX=-X:POKE36874,230:POKEV,15:FORQ=1TO25:NEXT:POKE36876,0
180 IFB=0ORPEEK(SP+A+B*22)=207ORPEEK(SP+A+B*22+22)=99THENPOKESP+A+B*22,32:Y=-Y:G
OSUB1000
190 IFB>21THENPOKEV,15:POKE36877,240:FORER=1TO500:NEXT:GOTO120
200 POKESP+A+B*22,81
210 IFPEEK(197)=29THENBT=BT-1
220 IFBT<0THENBT=0
230 IFPEEK(197)=37THENBT=BT+1
240 IFBT>MTHENBT=M
250 PRINT"■■■■■■■■■■■■■■■■■■■■■■"TAB(BT)B$:IFSC<285THEN150
300 FORI=1TO5:PRINT"■■■■■■■■GAME OVER":FORJ=1TO200:NEXTJ:NEXTI
310 PRINT"■■■■■■■■          ":FORJ=1TO200:NEXTJ
320 SC=0:FORI=2TO7:FORJ=1TO20
330 IFPEEK(SP+J+I*22)=32THENSC=SC+(8-I)
340 NEXTJ,I
350 PRINT"■■■■■■■■■■■■■■■YOU SCORED"SC:PRINT"■■■■■■ON LEVEL"G:IFSC=420THENPRINT"
■■■■■■■
355 IFSC>HI(G)THENHI(G)=SC
360 PRINT"■■■■■■HI SCORE ="HI(G):FORI=1TO2000:NEXT
370 PRINT"■■■■■■■■■■■PLAY AGAIN?":PRINT"■■■■■■■■■■(Y■ OR■ N)":POKE198,0
380 GETG$
390 IFG$="N"THENPOKE36879,27:PRINT"■■":POKESO,0:END
400 IFG$="Y"THEN30
410 GOTO380
1000 POKEV,15:POKESO,225:FORA1=1TO50:NEXT:RETURN
2000 PRINT"■INSTRUCTION'S (Y/N)"
2010 GETG$:IFG$=""THEN2010
2020 IFG$="N"THENRETURN
2030 POKE36869,242:PRINT"■HE OBJECT OF THE GAME";
2040 PRINT"IS TO KNOCK OUT AS
2050 PRINT"MANY OF THE ╲ULTI-
2060 PRINT"━OLOURED ⎸RICK'S AS
2070 PRINT"POSSIBLE.
2080 PRINT" ⎸OU HAVE ▁OUR BALLS
2090 PRINT"AND ♦IX WALL'S TO TRY
2100 PRINT"AND KNOCK OUT.
2110 PRINT" ⎸⎸-♦CORE'S ARE GIVEN
2120 PRINT"FOR EACH LEVEL.
2130 PRINT"■⎸┌╱▁ ┬╱⎸▁┘└╱♦ ♠▁▔
2140 PRINT"■■K=L▔▁⎸
2150 PRINT"■■D=▁╲⎸⎸⎸
2160 PRINT"■■■■■■■■■⎸╲⎸ ♠ ╱▔⎸
2170 GETG$:IFG$=""THEN2170
2180 POKE36869,240:RETURN
```

Super Breakout
by C Anderson

GEM SOFTWARE

for LYNX, DRAGON, SPECTRUM and ZX81 Software

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 and DRAGON) **£7.95.** Price (SPECTRUM and ZX81) **£4.95.**

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. Prince (LYNX and DRAGON) **£7.95.**

CHARACTER GENERATOR by John Line. A program for the programmer, allowing creation and saving of character sets/shape tables and subsequent inclusion into users basic program. Demonstration program and full ASCII character set included. Price (DRAGON) **£9.95.**

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 and DRAGON) **£7.95.**

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 died and hid his treasure, he also 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.**

GAMES PACK III by Christopher Hunt.

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.**

LYNX COMPUTING BOOK by Ian Sinclair. Excellent book, which the beginner will find an invaluable aid, in helping to unravel the LYNX'S many varied features! Price **£6.95.**

All titles available mail order or Access
All cassettes despatched by return of post

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

HIRE ZX81/SPECTRUM PROGRAM TAPES

Make the most of your computer by hiring from the original and still the only software library offering all these features:

- Over 900 tapes stocked, offering more than 120 different programs from 39 suppliers (all with their permission)—many of the best currently advertised, plus some specially commissioned—and the range increases each week!
- Arcade, adventure and simulation games, many business and home utilities, graphics, education...and so much more besides
- Descriptive catalogue helps you make your choice
- **Free** quarterly, illustrated magazine includes tips from a professional programmer, DIY plans, reviews, letters, discount offers—and our **Top 40 Tapes** chart averaged from thousands of members' scores
- Full-time staff offer you a friendly, efficient welcome & service
- A fortnight's hire for just £1 +40p p/p—hire what/when you like
- All tapes guaranteed loadable
- Help given with loading problems (azimuth test tape available) and with marketing members' programs
- You may switch from ZX81 to Spectrum at any time
- Send SAE for details—or join on money-back no-risk approval today

The SINCLAIR OWNERS' SOFTWARE LIBRARY PCWK
Warren Road, Liss, Hants GU33 7DD.

Please send me on money-back approval my magazine, descriptive library catalogue and order form, on the understanding that if I'm not delighted with your service within 28 days you will refund my money in full.

NAME.....

ADDRESS.....

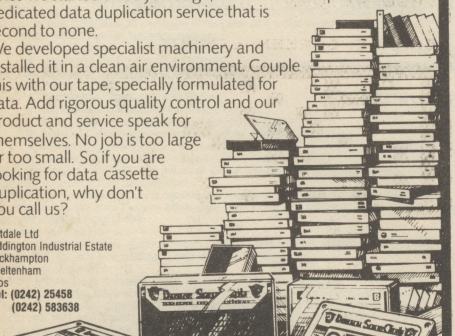
.....

Please enclose cheque/P.O. for £8.50 (year's ZX81 membership)/ £9.50 (Spectrum). Overseas £2 extra in each case.

Kiltdale

At Kiltdale we don't treat computer program duplication as a side line. We are the specialists.

Since we started three years ago, we have developed a dedicated data duplication service that is second to none.
We developed specialist machinery and installed it in a clean air environment. Couple this with our tape, specially formulated for data. Add rigorous quality control and our product and service speak for themselves. No job is too large or too small. So if you are looking for data cassette duplication, why don't you call us?



Kiltdale Ltd
Liddington Industrial Estate
Leckhampton
Cheltenham
Glos
Tel: (0242) 25458
(0242) 583638

QUITE SIMPLY THE BEST

SPECTROGRAPHICS

for ZX Spectrum (48K)
price £6.90 including Manual

Enables you to exploit the Spectrum's superb graphics potential to the full. Eleven graphics procedures in a single user-friendly program. Hi-res and lo-res sketchpads, eight sizes of text, a mini-text editor, colour WASH and PAINT, etc. Create your own UDG characters in a 4 × 2 array. SAVE your display on tape or PRINT on ZX Printer. ReLOAD displays for editing or updating. Etc. etc!

BUSINESSMEN – *use SPECTROGRAPHICS to prepare point-of-sale adverts.*
TEACHERS – *prepare lesson illustrations at home to show your pupils at school.*
GAMES ENTHUSIASTS – *design invaders, monsters, backgrounds etc. to LOAD into your latest game.*
GRAPHIC ARTISTS – *turn your Spectrum into a colour graphic sketchpad.*
EVERYONE – *have fun with SPECTROGRAPHICS!*

Other GRAPHICS software for ZX81 available.
Send s.a.e. for further details and full list of all our quality games, statistics and Astronomy software.
Prices all inclusive. Full money-back guarantee.

Dept. PS, BRIDGE SOFTWARE
36 Fernwood, Marple Bridge
Stockport, Cheshire SK6 5BE

Bridge Software

Rebound

on ZX81

This program has a very simple objective. The player's piece, '0', starts near the top left hand corner of the screen and, by rebounding it off the various obstacles, the player must reach the bottom right hand corner (screen position 20,30) after passing through the 'gate' which randomly opens and closes.

Once the player has reached the bottom right hand corner, the time taken and the best time are displayed, and the player is invited to play again. My best time is 29 seconds. Instructions as to which keys to press are included in the program which is just under 3.5 kilobytes in length.

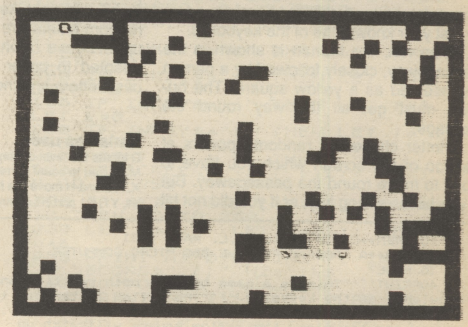
The program is written in three parts. The first section between lines 1 and 217 is the initialisation routine. I have used a string to hold the contents of the screen as I prefer this method when a full screen is needed. The second section between lines 220 and 380 is the game playing routine. In an attempt to make the program faster, the piece is *Poked* into the display file rather than *Printed* on to the screen. The final section from line 2000 onwards prints out the instructions.

Program notes

Line(s)	
3	Ensures the program auto-runs after *Loading*
10-150	Sets up the layout of the screen in the string
160	Discovers the address of the display file
210	Allows the user to print on the bottom two lines
217	Prints out screen
230	Decides which way the piece should move depending upon what key has been pressed. This is a more concise method than five IF....THEN statements
280	Will open or close the 'gate' depending upon the value of RND
360-362	Print the time and the best time on to the bottom two lines
365-380	Flash the 'Game Over' message on the screen and wait for key 'R' to be pressed before re-starting
2000-2050	Print out the instructions and wait for a key to be pressed
2060-2090	Once a key has been pressed the player is asked to wait for a few seconds. The program than returns from the subroutine to set up the screen

```
  1 REM REBOUND 23.4.83
      (C) NEAL BLACKSHIRE
  2 LET BT=0
  3 SAVE "REBOUND"
  4 GOSUB 2000
  5 CLS
  6 FAST
 10 DIM S$(704)
 20 LET S$(TO 32)="
                  "
 30 LET S$(673 TO 704)=S$( TO 32)
 40 FOR I=1 TO 673 STEP 32
 50 LET S$(I)="■"
 60 LET S$(I+31)="■"
 70 NEXT I
 80 FOR I=1 TO 125
 90 LET S$(INT (RND*640+32))="■
"
100 NEXT I
110 LET S$(664 TO 671)="     ■
"
120 LET S$(632 TO 639)="     ■
"
130 LET S$(600 TO 607)="     ■
"
140 LET S$(568 TO 575)="     ■■
■"
150 LET S$(34 TO 38)="  0  "
160 LET D=PEEK 16396+256*PEEK 1
6397
170 LET P=D+37
185 LET HOME=D+691
190 LET T=0
200 LET M=1
210 POKE 16418,0
215 SLOW
217 PRINT S$
220 LET I$=INKEY$
230 LET M=(M AND I$="")+(VAL "1
" AND I$="Q")+(VAL "33" AND I$="
A")+(VAL "34" AND I$="P")+(VAL "
32" AND I$="L")
240 IF PEEK (P+M)<>CODE " " THE
N LET M=-M
250 IF PEEK (P+M)<>CODE " " THE
N GOTO 280
260 POKE P,CODE " "
265 LET P=P+M
270 POKE P,CODE "0"
280 POKE VAL "655"+D,(CODE "■"
AND RND<.5)+(CODE " " AND RND>=.
5)
320 LET T=T+1
340 IF P=HOME THEN GOTO 360
350 GOTO 220
360 PRINT AT 22,0;"YOU TOOK ";T
;" SECONDS"
361 IF T<BT THEN LET BT=T
362 PRINT AT 23,0;"BEST TIME=";
BT
365 PRINT AT 10,10;"GAME OVER";
AT 10,10;"GAME OVER"
370 IF INKEY$="R" THEN GOTO 4
380 GOTO 365
2000 CLS
2010 PRINT AT 0,12;"REBOUND";TAB
 7;"BY NEAL BLACKSHIRE"
2020 PRINT ,,"THE AIM OF THE GAM
E IS TO MOVE  FROM THE TOP LEFT
OF THE SCREEN TO THE BOTTOM RIGH
T. YOU CONTROLTHE ""O"" BY THE F
OLLOWING KEYS:"
2030 PRINT ,,"Q=MOVES HORIZONTAL
LY","A=MOVES VERTICALLY","P=MOVE
S DIAGONALLY RIGHT","L=MOVES DIA
GONALLY LEFT"
2040 PRINT ,,"YOU MUST REBOUND T
HE ""O"" OFF","THE OBSTACLES AND
 INTO THE  ENCLOSURE (WHEN T
HE DOOR IS  OPEN).",,"YOUR TI
ME IS DISPLAYED AT THE  END OF
EACH GAME.TO RE-RUN PRESS""R"" W
HEN THE ""GAME OVER"" MESSAGEIS
FLASHING."
2050 PRINT "PLEASE PUT ME IN A
FAST."
2060 LET I$=INKEY$
2070 IF I$="" THEN GOTO 2060
2080 PRINT AT 21,0;"PLEASE WAIT
FOR A FEW MOMENTS"
2085 FOR I=1 TO 50
2086 NEXT I
2090 RETURN
```

SAMPLE SCREEN LAYOUT



Rebound
by Neal Blackshire

Scrolling

on Dragon

In a recent edition of *PCW*, there was an article concerning sound on the Dragon. In this article it was mentioned that there are no scrolling facilities on the Dragon. With this in mind I have devised the following programs in assembly language. I have also given their Hex codes to make programming easier.

MACHINE CODE ON DRAGON

The following five machine code routines are for manipulating the high and low resolution screens on the Dragon 32.

1) Low resolution left scroll.

```
8E 04 00              LdX £0400
A6 01       Loop      LdA X+1
A7 80                 StA,X+
8C 06 00              CmpX £0600
26 F7                 Bne Loop
39                    Rts
```

2) Low resolution right scroll.

```
8E 06 00              LdX £0600
A6 1E       Loop      LdA X-2
A7 82                 X-,StA X
8C 04 00              CmpX £0400
26 F7                 Bne Loop
39                    Rts
```

3) Low resolution down scroll.

```
8E 06 00               Ldx £0600
A6 00       Loop       LdA X
A7 88 20               StA X+32
A6 82                  X+
8C 03 DF               CmpX £3DF
26 F4                  Bne Loop
39                     Rts
```

4) High resolution left scroll.

```
8E 06 00              LdX £0600
A6 01       Loop      LdA X+1
A7 80                 StA,X+
8C ** **              CmpX £****
26 F7                 Bne Loop
39                    Rts
```

Note. **** stands for the hex code which is one higher than the last address of the screen in the PMODE in which you are working.Get the information from the small booklet supplied with your Dragon.1E 00 in mode 4

5) High res right scroll

```
8E ** **              LdX £****
A6 1E       Loop      LdA X-2
A7 82                 X-,StA X
8C 06 00              CmpX £0600
26 F7                 Bne Loop
39                    Rts
```

Note. ** ** see note above.

Any of the above routines can be loaded with the following BASIC programme.

```
10 CLEAR 200,32000:A=32000
20 INPUT A£:IF A£="XX" THEN END
30 POKE A,VAL("&H"+A£):A=A+1
40 GOTO 20
```

Run this programme and enter the Hex codes (in the left hand column) in pairs and enter XX to end.
Run these programmes by EXEC 32000
All the routines are relocatable.

Scrolling
by G Twist

Catch Me

on BBC

This program for the BBC Micro is a game to test your knowledge of the keyboard.

When run, the human is shown in the passageway, closely followed by a demon represented as a yellow square. The human must get all the way round the passage.

A letter chosen at random appears at the top of the screen which you have to copy to move round the passageway. But if you hit the wrong key, or if you did not hit the right key fast enough, the demon will decrease the gap between you until it finally catches and eats you.

Five levels of play are provided, giving you from five seconds down to one second to hit the right key. In the program the random letters are provided only from the upper case alphabet but it is easily adapted to cover both upper and lower case letters and indeed numbers as well.

Variables used

D inputs the level of play
M is used to count correct hits
X,Y,G and H move the human round the screen
X1, Y1, G1 and H1 control the movement of the demon

Program notes

30 to 60	Gives instructions and inputs speed of play
80	Changes to Mode 5
90 to 110	Sets up the characters, line 110 being the victorious human with his hand in the air.
120	Calls the *Proc*edure*Proc*play
140 to 260	Defines *Proc*play which:
150	Sets letter counter to 0
160	Sets a really random start else the initial game starts with the same sequence
170	Calls the *Proc*edure to set up the board
180	Selects random upper case character
350 to 490	Set the moves of the human
500 to 630	Set the moves of the demon
640 to 730	Ends the game if the human is caught.
750 to 860	Sets the scene if the human completes the course
870 to 910	Asks whether you want another game

PROGRAM OF THE WEEK

```
   10  REM**CATCH_ME (c) J.L. WARD 1983
   20 REM**A PROGRAM FOR THE BBC MICRO COMPUTER
   30 MODE7
   40PRINT'''"This is a game to test both reaction and
knowledge of the keyboard."''"The yellow letter has to
be tapped onto the keyboard.  If you make a mistake
or you are too slow, the yellow square willcatch up
and swallow you"
   50 PRINT''CHR$130; "There are 5 levels of play
from"''CHR$130;"      1(easiest) to 5(hardest)."
   60     PRINT '''CHR$129; "What level(1 to 5)
":INPUT '''A
   70 IF A<1 OR A>5 THEN 60
   80MODE5
   90VDU23,224,28,28,8,127,8,20,34,65
  100 VDU23,225,127,127,127,127,127,127,127,127
  110 VDU23,226,156,92,40,31,8,20,34,65
  120PROCplay
  130END
  140DEF PROCplay
  150M=0
  160 X=RND(-TIME)
  170PROCboard
  180B$=CHR$(64+RND(26))
  190 M=M+1
  200 COLOUR3:PRINT TAB(0,2)"TYPE THIS LETTER  ";
:COLOUR2:PRINT B$;
  210 D=100*(6-A)
```

```
  220 A$=INKEY$(D):IF A$<>B$ GOTO 240
  230 PROCmove: GOTO 180
  240 PROCcatch
  250  GOTO 180
  260ENDPROC
  270DEF PROCboard
  280MOVE 50,10:DRAW 1250,10:DRAW 1250,850
  290DRAW 50,850:DRAW 50,10
  300MOVE 150,110:DRAW 1150,110:DRAW 1150,750
  310DRAW 150,750:DRAW 150,110
  320  X=7:Y=7:X1=1:Y1=7:G=17:H=30:G1=18:H1=30
  330  COLOUR2:PRINT TAB(X1,Y1);CHR$225;:COLOUR1:
PRINT TAB(X,Y);CHR$224
  340ENDPROC
  350DEF PROCmove
  360PRINT TAB(X,Y);" "
  370IF X<>18 THEN X=X+1:GOTO 470
  380IF X=18 AND Y<>30 THEN Y=Y+1:GOTO 470
  390  IF Y=30 THEN PRINT TAB(18,30);" "
  400 PRINT TAB(G,H);" "
  410 IF G<>1 THEN G=G-1:GOTO 440
  420  IF G=1 THEN H=H-1
  430     IF H=7 THEN PRINT TAB(6,9);"VERY GOOD":PROC
victory:PROCrepeat
  440 COLOUR1:PRINT TAB(G,H);CHR$224:GOTO 480
  450IF Y=30 THEN X=X-1:GOTO 470
  460IF X=1 THEN Y=Y-1
  470 COLOUR1:PRINT TAB(X,Y);CHR$224
  480 PROCcatch
  490 ENDPROC
  500 DEF PROCcatch
  510PRINT TAB(X1,Y1);" "
  520 IF X1<>18 THEN X1=X1+1:GOTO 560
  530 IF X1=18 AND Y1<>29 THEN Y1=Y1+1:GOTO 560
  540    IF Y1=29 THEN PRINT TAB(18,30);" ":GOTO 570
  550  IF X=18 AND Y=30 GOTO 570
  560   IF X1=X AND  Y1=Y THEN PROCcaught ELSE COLOUR
2:PRINT TAB(X1,Y1);CHR$225:GOTO 630
  570  PRINT TAB(G1,H1);" "
  580  IF G1<>1 THEN G1=G1-1:GOTO 600
  590  IF G1=1 THEN H1=H1-1
  600  PRINT TAB(G1,H1);CHR$225
  610 IF X=18 AND Y=30 AND G=(18 OR 17) AND G1=17
THEN PROCcaught
  620  IF H1=H AND G1=G THEN PROCcaught ELSE COLOUR 2:
PRINT TAB(G1,H1);CHR$225
  630ENDPROC
  640DEF PROCcaught
  650 IF Y=30 PRINT TAB(X,Y);" ":GOTO 670
  660 COLOUR 2:PRINT TAB(X,Y);CHR$225
  670  COLOUR3:PRINTTAB(3,10); "YOU ARE CAUGHT"
  680  FOR Z=64 TO 4 STEP -4
  690    SOUND 1,-10,Z,2
  700 NEXT
  710 PRINTTAB(3,12);"YOU HAD ";M-6
  720 PRINT TAB(3,14);"LETTERS RIGHT"
  730 PROCrepeat
  740 ENDPROC
  750 DEF PROCvictory
  760 PRINTTAB(3,12);"YOU HAD ";M-6
  770 PRINT TAB(3,14);"LETTERS RIGHT"
  780  X=101
  790 FOR I=1 TO 10
  800             SOUND 1,-15,X,1
  810             FOR J=1 TO 80:NEXT J
  820                SOUND 2,-15,X+48,1
  830    NEXT I
  840 PRINT TAB(G1,H1);" "
  850 PRINT TAB(G,H);CHR$226
  860 ENDPROC
  870 DEF PROCrepeat
  880  PRINTTAB(3,21);"ANOTHER GAME?"
  890  IF GET$="Y" RUN
  900 CLS:END
  910ENDPROC
```

Catch Me
by J Ward

Red Carpet

on Spectrum

The idea of the game is to move about a maze of star shaped nebulas, laying red carpet for the Queen. If you touch the carpet after it has been laid, or if you touch the stars, you will be destroyed by their burglar alarms.

As you are in space, you carry on moving in the last direction keyed in. Full instructions and a high score facility are included in the program.

To save, type *Save* "Red Carpet" *Line 1*

```
    5 LET hs=0
   10 PAPER 0: CLS : BORDER 0
   20 FLASH 0: OVER 0: INVERSE 0
   30 BRIGHT 0
   35 PRINT AT 10,0; FLASH 1; INK
 4;"STOP THE TAPE - PRESS ANY KE
Y": PAUSE 0: CLS
   40 PRINT INK 3;"RED"; INK 7;"C
ARPET""""For the 16K ZX Spectrum
""""By Gavin Devine""""Move Chri
s the carpet layer    about the
 maze laying the QueensRed Carpe
t,as she is about to   take her
 first steps into the   stars.One
 problem:The carpet andstars hav
e burglar alarms and   if Chris
 touches them he will   be destro
yed.Use:""""Z-Left""""X-Right""""C
-Down""""F-Up""""Press 'S' to sta
rt"
   45 PAUSE 600
   46 IF INKEY$<>"s" THEN GO TO 4
5
   50 RESTORE
   70 FOR f=USR "a" TO USR "b"+7
   80 READ a: POKE f,a
   90 NEXT f
   95 CLS
  100 LET s=0
  120 PRINT : PRINT : PRINT INK 5
;"**************************
***                    *
**  **  ********  *  *********  **
**  **            * * *          **
**  **********  * * *  **********
**                                **
**  **************************
**                                **
*******  ********************  ****
***    *                        *
**  **    *******    ********    **
**  **          *    *          **
**  **  *  *****  * *  *  ******  *
*******          *                ****
```

```
***          ******************
 **  ****  *                    *  ****
 **
 F"
  130 PRINT INK 6;"**********
          **********
                      **************
******************"
  140 LET a=16: LET b=10
  145 LET e=-1: LET f=0
  150 PRINT AT a,b; INK 7;"A"
  160 BEEP .01,0: BEEP .01,1: BEE
P .01,2: BEEP .01,3: BEEP .01,4:
 BEEP .01,5: BEEP .01,6: BEEP .0
1,7
  170 IF INKEY$="z" THEN LET e=-1
: LET f=0
  180 IF INKEY$="x" THEN LET e=1:
 LET f=0
  190 IF INKEY$="c" THEN LET f=1:
 LET e=0
  200 IF INKEY$="f" THEN LET f=-1
 LET e=0
  210 PRINT AT a,b; INK 2;"■"
  220 IF SCREEN$ (a+f,b+e)="*" TH
EN GO TO 250
  225 IF ATTR (a+f,b+e)=BIN 00000
010 THEN GO TO 250
  230 LET s=s+1: LET a=a+f: LET b
=b+e
  235 PRINT AT 0,0; INK 7; INVERS
E 1;"SCORE=";s;" HI=";hs
  240 GO TO 150
  250 PRINT AT a+f,b+e; FLASH 1;
INK 6; PAPER 2;"B": FOR f=1 TO 2
0: BEEP .01,5: NEXT f: BEEP .1,1
0: BEEP .01,10
  260 IF s>hs THEN GO TO 300
  270 PRINT AT 21,0;"Instructions
 (y/n) ?": INPUT a$: IF a$="y" T
HEN CLS : GO TO 40
  280 CLS
  290 GO TO 100
```

Continued on page 35

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, INVASIVE 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

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

50 games cassette — only £9.95 inc vat & pp

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

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

Name _____ PCWK2

Address _____

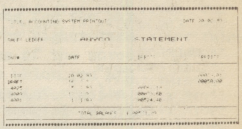
Mail order only. ORDER NOW!

NEW

For VIC 20 and CBM 64 Users

SIP ACCOUNTING SYSTEM

Highly comprehensive program designed for 16K, 24K, VIC20 & Printer, 40 col VIC20, CBM 64. Makes an ideal introduction for you and your staff to the world of computer accounts.

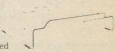


Features include:
- Menu driven – simplicity to use!
- Up to 250 accounts per tape
- Day book
- Sales and purchase ledger (or just 1 type)
- Statements print (for all or just one company)
- Overdue account statements (as above)
- End period carry on to next data tape
- Cash summary – debitors and creditors
- VAT entry (net or gross)
- PLUS many, many more features – all in ONE program.

Program specification:
SIPIAC 20 – 16K (approximately 130 invoices per data tape)
SIPIAC 20 – 24K (approximately 350 invoices per data tape)
SIPIAC 40 – 40col + 24K + 3K (approximately 430 invoices per data tape)
SIPIAC 64 – CBM64 (approximately 650 invoices per data tape)
Note: printer required for all programs.

TAPE PROGRAM, DATA TAPE AND MANUAL £24.95 + VAT

Printer plinths
– designed to save space, improve paper flow, and tidy stray cables, has anti-vibration mounting, superb design in high impact smoked Perspex.
SIP/P1515 for VC 1515 and GP 80 **£17.95** + VAT
SIP/P1525 for VC 1525 and GP 100 **£18.95** + VAT



Acoustic covers
– reduces noise levels dramatically, smartly styled.
SIP/C80 for VC1515 and GP 80 **£37.50** + VAT
SIP/C100 for VC1525 and GP 100 **£39.80** + VAT



SPECIAL OFFER! GP 100 VC Printer PLUS SIP accounting program. *Phone for details*

Please specify machine size when ordering
Trade enquiries invited
Send your orders or for further information please write or telephone:

Shore Industrial Plastics Ltd
[Dept P.C.N.] 1-13 Corsham Street, London N1 6DP.
Telephone: 01-250 1978.
Telex: 943763 Ref. SHAMAH.

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. SNAIL LOGO supports standard Logo commands, e.g. Procedures, Repeat, Parameters, Replace. It includes syntax checking and an editor, plus other detail features.

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:
CP SOFTWARE, Dept.W5, 17 Orchard Lane, Prestwood, Bucks. HP16 0NN

Also available from WH Smith – Computer Branches

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

```
300 CLS : PAPER 6: CLS
310 INK 0
320 PRINT AT 1,3;"
330 PRINT AT 10,1;"
340 PRINT AT 17,1;"
 ";hs
350 PRINT AT 19,1;"
 "
360 FOR f=1 TO 250: NEXT f
370 PRINT AT 17,1;"
 "
380 FOR f=1 TO 25: PRINT AT 21,
f;s: BEEP .05,f: PRINT AT 21,f-1
;" ": NEXT f
390 FOR f=21 TO 18 STEP -1: PRI
NT AT f,25;s: BEEP .05,f: PRINT
AT f,25;" ": NEXT f
400 FOR f=25 TO 14 STEP -1: PRI
NT AT 18,f+3;" ";AT 18,f;s: BEEP
.05,f: NEXT f
410 PRINT AT 18,14;s;"     "
412 FLASH 0: PAPER 0: INK 7
420 LET hs=s: GO TO 270
1000 DATA 24,24,126,24,24,36,36,
36
1010 DATA 153,90,60,255,255,60,9
0,153
```

Red Carpet
by Gavin Devine

Screen Colour

on Vic20

This program enables the use of the function keys to change the screen/border colour combinations.

F1. Decrements the contents of (36879).
F3. Increments the contents of (36879).
F5. This resets the screen/border colour to white/blue.

The program works in the following way.

The keyboard is scanned every 1/60th second by the interrupt routine; location 197 on the zero page will contain different values depending on the last key pressed. The relation between the contents of this address and the key pressed are as follows:

Function 1 = 39
Function 3 = 47
Function 5 = 55

Control branches to three separate subroutines consecutively. At each routine the contents of 197 are checked against the values for the appropriate function key. If they tally the contents of (36879) are either incremented/decremented, or loaded with 27, which resets the border/screen colour to normal.

Control then branches to (60095), and the process is repeated.

To start the routine: SYS 673.

To stop: run/stop restore.

```
5 REM************************
7 REM**F1 DEC REGISTER *******
11 REM**F3 INC REGISTER ******
13 REM**F5 CHANGE NORM. ******
17 REM**SYS 673 START   ******
19 REM**RESTORE END     *******
21 REM************************
30 I=673
40 READ A:IF A=999 THEN END
50 POKE I,A:I = I+1:GOTO 40
100 DATA 169,173,141,20,3,169,2,
    141,21,3,96
110 DATA 234,32,187,2,32,208,2,32,
    227,2,76
120 DATA 191,234,234,234,165,197,
    201,39,240,1,96
130 DATA 173,15,144,201,0,208,1,96,
    206,15,144
140 DATA 96,234,234,165,197,201,47,
    240,1,96,173
150 DATA 15,144,201,255,208,1,96,
    238,15,144,96
160 DATA 165,197,201,55,240,1,96,
    169,27,141,15
170 DATA 144,96
180 DATA 999
```

```
LDAIM 173
STA 788
LDAIM 2
STA 789
RTS
NOP
JSR FN1
JSR FN3
JSR FN5
JMP 60095
NOP
NOP
*FN1 LDAZ 197
CMPIM 39
BEQ 1
RTS
LDA 36879
CMPIM 0
BNE 1
RTS
DEC 36879
RTS
NOP
NOP
*FN3 LDAZ 197
CMPIM 47
BEQ 1
RTS
LDA 36879
CMPIM 255
BNE 1
RTS
INC 36879
RTS
*FN5 LDAZ 197
CMPIM 55
BEQ 1
RTS
LDAIM 27
STA 36879
RTS
```

Screen Colour
by Robert Watson

STARTECH

Absolutely the lowest prices!



BLANK DATA CASSETTES

£5-95 Inc VAT Postage and Packing 45p

Computer Grade Data Cassettes suitable for use in all of todays home computers. Each comes with its own case.

Tick for further information
☐ VIC 20 PRODUCTS
☐ COMMODORE 64
All prices subject to availability or change without notice

PLEASE SEND ME

Pack of 10 Data Cassettes

Qty	Price	TOTAL
	£6.40 inc p&p	

Name _____

Address _____

I enclose Cheque, P/O for _____

CREDIT CARD ☐ ACCESS ☐ BARCLAY CARD ☐ (24hr. ANSAPHONE SERVICE)

Pop.CW.5

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

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

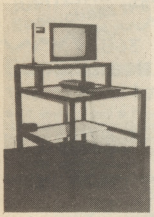
BYTEWELL

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

A HOME FOR YOUR COMPUTER

TRY OUR EASILY ASSEMBLED

WORK STATION



Dimensions: Overall height 35in. Width 26in. Depth 28in. Height of work area 28in.
Available in white melamine (illustrated) or teak finished board.
Cost: £62.50 + £7.50 p & p. Allow 14-21 days for delivery.

Send order with cheque payable to: **COMP-U-CARE**
27 Jessopp Road, Colehill, Wimborne, Dorset
(0202) 897218 or 885819

M & J SOFTWARE

DRAGON COMPANION BOOK **£4.95**
Discover seven extra graphics modes. Study the workings of BASIC with the disassembler. Take complete control of video memory mapping. Increase the processor speed (not a hardware mod.). Append programs from tape. Incorporate useful routines from BASIC in your programs.

DRAGON fig-FORTH **£10.00**
This is a cassette-based implementation and is fully documented.

FORTH ASSEMBLY LISTINGS **£7.00**
6502, 8080/Z80, 6809, 6800, 8086/8088, 68000, PDP-11, 1802. These are standard fig-FORTH assembly listings.

INSTALLATION MANUAL **£5.00**
Necessary for implementing FORTH and its editor.

6502 MACRO ASSEMBLER **£5.00**
This program is written in fig-FORTH and is a structured one-pass assembler. It will work on any fig-FORTH implementation with only one alteration. Control structures include: BEGIN, END, AGAIN, IF, THEN, ELSE, ENDIF, REPEAT, UNTIL, WHILE.

All prices fully inclusive of postage and packing etc. Cheques and POs to:

M & J SOFTWARE
DEPT 5, 34 GRAYS CLOSE, SCHOLAR GREEN
STOKE-ON-TRENT ST7 3LU. Tel: (0782) 517876
(Dealer enquiries welcome)

ATTENTION ALL SPECTRUM USERS

— BASIC TRACE —

A 760 byte machine code routine which intercepts each BASIC Statement prior to execution, displaying the line number, statement number, and the statement itself in the lower screen area.

● FEATURES INCLUDE:—
- Single step or continuous program execution.
- Trace listings to ZX Printer if required.
- No corruption of upper screen display
- TRACE ON and OFF at will.
- 16K and 48K versions on same cassette.

● ALL THIS FOR ONLY £6.95 INCLUDING P & P FROM: ●

Texgate Computers Ltd.
14 Brook Lane, Corfe Mullen, Dorset BH21 3RD

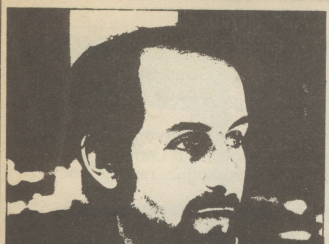
SALE P.&R. COMPUTER SHOP SALE

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



Atari adventures!

Now that Atari has cut the price of its machines to compete with the other popular micros, they are coming into the budget of many more computer enthusiasts. The range of software available is second to none, most of the worthwhile packages coming from the United States.

There have been several good text adventures written for the Atari, though the number available is certainly nowhere near that for the TRS80 or Spectrum. The Atari relies on large commercial software house far more than the Sinclair or Commodore range of computers — and the large houses are usually interested in arcade games rather than mind games.

To begin our look at representative software, let's load in *Pharoah's Curse,* from Synapse Software. This name will be well-known to present Atari users as an American producer of consistently high-quality software.

Pharoah's Curse is written by Steve Colman and is a straight-down-the-line arcade adventure. You have to guide your little explorer down the funnel of the pyramid, in a search for the pharoah's treasure. Each of the four levels consists of 16 rooms — once you have collected all the treasure on one level (there is one item in each room), and survived, you are given a password to get you to the next.

The hazards range from little buttons which, when stepped on, shoot out flames which will roast you, to rods which rise and fall from the roof of narrow passages.

The strange colours (gold, mauve, grey and purple) of the weird-shaped room, the myriad puzzles (each room has its unique combination of conundrums to be solved), and the continuous noise make it an ideal game.

Journey to the Planets, from another well-respected American company, JV Software (which produced *Ghost Encounters* and *Action Quest* that I wrote about some weeks ago) has an arcade flavour, but is much closer to the traditional adventure. Starting off on your world, your task is to visit all the planets in the galaxy, and find the treasure hidden on each one. Like the traditional adventure, there are objects close at hand which will help you in your quest, you just have to find them! Each planet consists of six separate screens, or sections, which can be explored at will.

The arcade action starts as soon as you've exhausted the possibilities on your home planet. Move on to that funny little H-shaped thing and press *Fire* on the joystick. Yup, it's your spaceship! After lift-off you can manouvre your craft with the joystick — the engines fire in all four directions, and movement is inertial, so a delicate touch is needed in order to stay on the screen. A second touch of the *Fire* button will reveal a galactic map, on which your progress is charted, along with planets explored and unexplored.

You can choose which planet to visit next, and some more arcade action awaits you here. Apart from the odd meteroid trying to nudge you into oblivion, you will have to negotiate the wickedly designed approaches to the planet's surface.

All in all, a rather charming program, with the typical Atari low high-resolution graphics, and piping fairground music.

Although several text adventures are available for the Atari, it is surprising that no one has come up with a *Hobbit,* to utilise the graphic capabilities of the machine, in combination with a good text adventure.

Staying with the Atari, I have only one enquiry about an adventure for the machine. This is from B Walker, from Romford (you know, home of the beer). He is playing *The Sorceress,* and seems to have completed quite a bit of it, but now he seems to be stuck in getting the cannon from the ship, neither can he blow a hole in the wall. Can any Atarists help us?

Meanwhile, don't forget — *Jabba the Hutt merely has a slight weight problem!*

```
1000 LET 0$="": INPUT "CODED
     MESSAGE";C$
1010 LET CN=LEN C$-7*INT (LEN
     C$/7)
1020 IF CN<3 THEN LET CN=CN+3
1030 IF CN=LEN C$ THEN LET
     CN=CN-1
1040 FOR H=1 TO LEN C$
1050 LET X=0
1060 FOR I=1 TO CN
1070 FOR J=I TO LEN C$ STEP CN
1080 LET X=X+1
1090 IF J=H THEN LET 0$=0$+C
     $(X)
1100 NEXT J
1110 NEXT I
1120 NEXT H
1130 PRINT 0$
```

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.

Cruising & Blind Alley

£10 to be won

Can you beat the new high score?

Cruising

First there was *Space Invaders,* then there was *Pacman* – now there is *Cruising.* This all-action, machine code, arcade type game, will test your powers of co-ordination to the limit. Never before has a game asked you to think so quickly, or move so fast.

Achieving a high score on *Cruising* takes considerable skill, and not a little patience.

Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising.* All you have to do to enter this month's competition is send a print-out of your highest score, together with your name and address, to:

Popular Computing Weekly
Cruising
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The winner of last month's competition with a score of 22664 was I. C. Willis of Shore Lane, Sheffield, who receives £10. Entries for this month's competition close on June 30.

Notes

1) Each entry must consist of a ZX printout and your name and address.
2) Closing date for this month's *Cruising* challenge entries is June 30.
3) The highest score each month will receive £10.
4) High scores cannot be transferred from one month to another.
5) The judges' decision is final.
6) No employees of Sunshine Publications Ltd, or their families, will be eligible to enter.

Blind Alley

Blind Alley is a game of strategy. In order to win you must outwit the computer, using your craft to fence in and finally destroy the enemy pursuit vehicles. But, watch out for the solid trail left by your opponents — one touch is fatal!

Each month *Popular Computing Weekly* is giving away £10 to the player with the highest score on *Blind Alley.* To enter this month's competition simply send in a copy of your score and the code at the bottom of the score table, together with your name and address to:

Popular Computing Weekly
Blind Alley
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

The highest score sent in so far this month is 70625 from Stuart Williamson of Bradford, West Yorks. Entries for this month's competition close on June 30.

PAEAN systems

Quebec Marketing, Dept PCW, Little Bealings Woodbridge, Suffolk IP13 6LT

PAEAN are hunting for high quality, imaginative and exciting programs for the BBC Micro to market in the UK and overseas.

If you have written an original games, educational or business program which you believe has commercial potential, send a cassette to PAEAN Systems and if we agree with you, we will offer you a contract. Don't forget to include your name, address and telephone number.

Think about this:

A £50 note will be sent to the first response which correctly interprets the hidden significance of the PAEAN Logo.

Winner's name will be published

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.

ANGLIA HOME COMPUTER BARGAINS

Dragon 32	@ £151.95+VAT	Osborne D/D	@ £1,195.95+VAT
Spectrum 48K	@ £112.95+VAT	Epson HX-20	@ £369.95+VAT
Commodore 64	@ £259.95+VAT	Epson FX-80	@ £389.95+VAT
Oric 48K	@ £139.95+VAT	Epson RX-80	@ £269.95+VAT
Lynx 48K	@ £192.95+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

WANTED

LYNX SOFTWARE

Good quality **games,** adventures, utilities and educational. Top royalties with author's credit.

For further details ring:

BUS-TECH
on 0705 735310 during office hours
or 07014 53279 out of office hours
or send tapes to BUS-TECH
19 Landport Terrace, Portsmouth, Hants

MONSTER SOFTWARE CLUB

SOFTWARE LIBRARY FOR THE

DRAGON 32

OVER 70 TOP-QUALITY CASSETTES FOR HIRE. ALL TAPES USED WITH THE MANUFACTURERS PERMISSION
(WE PAY ROYALTIES)

ANNUAL MEMBERSHIP FEE £8.00
Tape hire **£1.50** per fortnight plus 40p p & p
(this includes a pre-paid return envelope)

SPECIAL TRIAL OFFER
3 months membership for just **£3.00**

PLEASE NOTE: Two tapes may be hired at the same time
Further tapes by return post

SAE for details

MONSTER SOFTWARE CLUB
32 LENNOX DRIVE, LUPSET PARK
WAKEFIELD, WEST YORKS

FOR THE KEEN PROGRAMMER

ZX SPECTRUM GRAPHICS PADS

- Explore for yourself the amazing graphics potential of the ZX Spectrum and prepare your own exciting screen displays.
- The pads contain high-resolution grids printed on quality A4 size paper. Each grid shows every plot and every print position, thus enabling you to plan both graphics and text on a single grid. Clearly numbered print and plot co-ordinates then allow you to program your plan quickly and accurately.
- The grids are available on white paper for general use and also on training paper for those occasions when you wish to copy directly from drawings, prints etc.
- Why not send for a pad now and begin to make the most of our and your Spectrum's graphics capabilities?

PAPER PAD (80 pages, 80 grids) **£3.95 incl p&p**
TRACING PAD (50 pages, 50 grids) **£3.50 incl p&p**

Cheques and Postal Orders to

A & K Computer Products (Dept ZXP)
Lancaster House, 435 Clifton Drive North
A & K **Lytham St Annes FY8 2PW** A & K

NEW FROM A.S.N.
FOR THE COMMODORE 64

BRAIN STRAIN

The Computer selects a secret code of coloured pegs. You have ten attempts to break the code. The codes are selected at random. There are no set patterns so there are thousands of possible combinations. Even the same coloured peg can be used in the code. Full instructions are provided. Brain Strain has three levels of play. Level 1 = 4 coloured dots. Level 2 = 5 coloured dots. Level 3 = 6 coloured dots.

Price **£8.95** incl VAT. Dealer Enquiries Welcome

Send to:

A.S.N. COMPUTER SERVICES LTD
DEPT PCW, 89 STATION CRESCENT
ASHFORD, MIDDX TW15 3HN

★★ Software Authors wanted. Top royalties paid for all Popular Micros

CAMEL PRODUCTS ★ CAMEL PACK

DREAM 81 ★ CRAMIC-81 ★ PIO SP

£19.95 OH, BLOW IT! £14.95

PIO-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.

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

Cambridge Microelectronics Ltd., One Milton Rd., Cambridge. CB4 1UY Tel (0223) 314 814

ROM 81 ★ PROMER-81 ★ BLO PROM 81



PLOTTING ROUTINE

Paul O'Neil of Main Street, Chappenhall, Airdrie, Strathclyde, writes:

Q I wish to interface a ZX printer to a MZ80A and I would be grateful if any reader could offer some assistance. What I/O device does the ZX81 printer have, (assuming that it is I/O mapped). Also does anyone know of a routine to plot hi-res graphics on the device. (I do appreciate that the graphics might be completely different to the MZ80A graphics.)

A The ZX printer is not I/O mapped in the memory map, which means that you will have to access it through the I/O map of the CPU. So any programs you write controlling the printer with the MZ80A will have to be written in machine code.

There is some useful information on page 4 of the manual that comes with the printer. As you can see, A2 will have to be low for the printer to work at all, and the same section tells you what the data lines D0 to D7 control.

I have not got any specific information about hi-res plotting using the MZ80A, but you must keep in mind that the printer is a serial device that plots characters line by line, a pixel at a time. Thus it could plot (256 × 7) +8 pixels, before it completes the first full character.

CONDITIONS OF SALE

C J Knee of Alphington, Essex, writes:

Q I have written a number of original games for my Vic20, and am considering selling them. But, I have run up against one main problem, namely copyright. I have looked up copyright in the local library, but could find nothing of practical use. I am sure I am not alone, so could you please include something about protecting software through copyright.

A We ran a long article on software copyright in our 3-9 February issue. Since then there has been quite a lot of correspondence in our Letters page concerning software libraries and the use of compilers, but nothing has been resolved.

There seems to be no sign of action by the government, so the tradition of legal precedence is probably going to be the final arbitor. But, as yet, the precedents have still to the created.

The legal questions will partly revolve around the type of software you are developing; for example, when is *Space Invaders* not *Alien Invaders*? Just what constitutes a copy will probably have to be settled by specific court cases.

If you are developing completely new software, then I can only suggest that you have a very clear note on your cassette as to who owns the copyright. If you want to avoid libraries using your cassette without paying a royalty, add a note to the effect that the cassette may not be hired or lent without prior permission, and that this is a condition of sale.

You might find it useful to contact the recently formed CTA (Computer Trade Association). It has already established a committee to look into this problem.

HI-RES DUMP!

D Owen of Brander Road, Leeds, writes:

Q I use two BBC computer model Bs; one has the 0.1 operating system, and the other has the 1.2. I would like to know how to dump hi-res graphics from the screen on to an Epson Mk III printer. I am writing a program where the user would make his own graphics, and then dump them straight on to the printer. If you could help me I would be grateful.

A I'm afraid that I have not got a program to dump hi-res graphics from the screen on to an Epson printer, and as I have not seen a copy of your program I do not really have any idea of how to help you specifically. The only thing that I can suggest is that you have a look at *Laserbug*, issue 11, April 1983. It contains an in-depth review of the Epson in use with the BBC, and though it does not give the hi-res dump program you want, it might supply you with sufficient extra information to develop your own.

VOLUME AND TONE

B Walton of Brentwood Close, Holywell, Whitley Bay, Tyne & Wear, writes:

Q I bought a 48K Spectrum Upgrade kit from Watford Electronics which came back with four chips (741s) soldered in place. The instructions for available memory is *Print Peek* 23732 + 256 ⋆*Peek* 23733; this should give 65536, however it only gives 65535. When the upgrade is not fitted it should give 32768, but it only gives 32767. Is this correct?

Upon *Save*ing a program all appears well until it's used, when nothing happens. This also happens with *Load*. It sounds all right on the tape and I have tried all the usual things such as wriggling the leads and so on. I can *Load* existing tapes, but it will not *Save* and re*Load*. This problem happens whether or not the extra memory is fitted.

A Your first question crops up a lot on a wide variety of computers. Many people forget that a computer starts counting at nought, thus 0 is the first address, which makes 1 the second address, and so on.

Problems with Spectrum *Save* are beginning to filter through. I do not think that it will approach the epidemic proportions that *Loading* did on the ZX81, but nevertheless, it should not happen. In all fairness I do not think that the Spectrum is solely to blame. Commercial cassettes are recorded at such a wide range of levels, that sometimes quite major changes of volume and tone are needed, despite the Spectrum being very tolerant to a wide range of levels.

The thing to look out for are the bars that move up the screen, around the box. If there are no bars, then the volume is too low to raise a signal. In the same way, if they start to flicker or jitter too wildly then the volume might well be too high. You say that you have listened to the tape and it sounds all right. If, in fact, it is not very loud, when you have the volume turned right up, then it might well not be all right. The only other thing that I can suggest is that you pull out the other lead in case it is causing interference. If you still get problems, then it would probably be best to return your computer.

SPECTRUM POTENTIAL

Eugenio Da Costa of Rua Ferrellra Borges, 1300 Lisbon, Portugal, writes:

Q I am very interested in buying a ZX Spectrum, but I am concerned about its potential for driving a disk unit, other than Sinclair's own.

More specifically, would it be possible for the Spectrum to drive another manufacturer's disk unit via a RS232C interface, in conjunction with another manufacturer's operating system? If it is any help I would want to use it with an Apple disk drive.

A Now that an RS232 interface is available for the Spectrum, it can be made to access quite a wide range of disk drives, printers and other peripherals. I can see no problem specifically with the Apple disk drive, or any other, as long as it has the RS232 interface.

As for the operating system, you will have to write your own to enable the computer to address the disk drive, whatever make it is.

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

APPLE II arcade-style games for sale, disk or cassette, large selections, reasonable prices. Details: K. Diu, 108 Clase Road, Morriston, Swansea SA6 8DY.

ACE SOFTWARE for the 3K Ace, Games Tape One. For the 19K Ace, Hawkeye £6 and Spacehop £6. Federation Software, 56 Rawley Crescent, New Duston, Northampton.

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.

BBC MODEL B — POKER, £3. Bluff and gamble with three computerised card sharps at saloon style seven-card stud poker. Full instructions and house rules included. Cheques to: C. J. Matthews, 20 Exton Road, Sherwood, Nottingham.

ESTUARY SOFTWARE PRODUCTS
E.S.P. 42
A NEW NAME IN THE sinclair SOFTWARE
HITCH-HIKERS
GUIDE TO THE
GALAXY
For 48K Spectrum £8.95
Also for Apple 2 £16.95
LARGE RANGE OF SOFTWARE ON DISPLAY AT OUR SHOP
261 Victoria Avenue
Southend-on-Sea, Essex
Credit card holders may phone in their orders
(0702) 43568

ASSASSIN SOFTWARE
48K Spectrum, Toads Travels; Four Lanes of Traffic, Children's Playground, Hungry Crocodiles, Floating Logs.
£4.95 to
10 ASH ROAD, LEEDS LS6 3JF
Cheques/POs payable to Town Nathan

MARTIAN DAISIES. An original light-hearted "Space Game", for the 16K Spectrum. Attractive graphics and m/c sound, £2.20 to: A. Crooks, Church House, The Street, Shotley, Suffolk.

VIC20 SOFTWARE
All the Imagine Software Cassettes including : Arcadia, Whacky Waiters, Catcha Snatcha. All for either the expanded or unexpanded computer at only **£5.00** each!!
(inclusive of postage and packing)
Send cheques/POs to:
RULE COMPUTERS
30 TYLERS ACRE ROAD, CORSTORPHINE, EDINBURGH EH12 7HZ
(Tel: 031-334 7261)

VIC20 (UNEXPANDED). Arcade quality game: Invaders from Outer Space, 100 per cent machine code with true hi-res graphics, send £4.95 to: Swift Software, 75 Broadgate Lane, Horsforth, Leeds.

TAIPAN
VIC20 COMPUTER GAME WITH A DIFFERENCE!
Become a millionaire at the Hong Kong Bank! Trade in commodities such as silk, arms and opium!
As you sail around the China seas in your Hong, the prices of goods go up!
You buy and sell. Beat the Pirates, Bank Robbers and Storms. This is an above average non-graphics game of skill, intelligence and luck.
See if you can win in under 15 minutes.
£5 including p&p. Cassette in Basic 3.5K.
C. CLIFFE, 17 RUGBY ROAD LUTTERWORTH, LEICS

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.

ZX81 16K PROGRAMS. Hangman £1. Text Lprinter £3. Lprint Artist £3. Graphix £2. Movies £3. Nick Godwin, 4 Hurkur Crescent, Eyemouth, Berwickshire TD14 5AP.

LYNX 48K SOFTWARE
Labyrinth — 3D Maze Game
Othello — our version of popular board game in fast machine code
Chancellor — run the UK economy for 10 years
Space Trek — zap the Klingons.
£4.75 each inc. p&p. Cheques/P.O. to:
QUAZAR COMPUTING DEPT., PCW
17 TEG CLOSE, PORTSLADE, SUSSEX.

SECONDARY SOFTWARE for VIC20!!
PLUTO LANDER — Fuel is low and gravity drags you down. Will you land or crash (unexpanded) — £4.95. **WIZQUEST** — A text and graphic adventure (16K) — £5.95. Cheques or PO's payable to P. East: Secondary Software, 4 Coed-y-Pia, The Rise, LLANBRADACH, Mid Glamorgan.

EARN MONEY

EARN MONEY SELLING SPECTRUM SOFTWARE. SAE to:TJO. Norlington, Lewes Road, East Grinstead.

UTILITIES

SPECTRUM 64 PRINT, amazing software that gives 64 characters per line instead of 32, prints anything from your Basic program, cassette, 48K or 16K, £3.50. K. Ahmed, 28 Magpie Hall Lane, Bromley, Kent.

VIC20 machine code automatic line numbering program, saves much time and typing. Cassette. £2. Send SAE to: S. Pendry, 65 Stonewood, Bean, Dartford, Kent.

SPECTRUM "FLOW-CHART" help plan programs, follow programs better than list. This program gives you an accurate flow-chart of basic Spectrum programs. £1.70.

TAPE COPIER (Spectrum 16/48K). Two versions on cassette for £3.50. One uses no memory of program area, copies all programs (including machine code). One supports verify, multiple copies, abort + user friendly. Money back guarantee. L. Evans, 16 Stonepit Drive, Cottingham, Market Harborough, Leics.

SPECTRUM KOPYKAT £4.95
100% machine code. Enables almost any ZX Spectrum program or data-file to be backed-up on to a fresh tape.
Programs over 41.5K (8.7K for 16K models) can now be copied with ease.
Plus: FREE Tape-header Reader program.
Both programs on one cassette. **Only £4.95.**
IMMEDIATE DESPATCH. Send cheque/PO to:
MEDSOFT
61 Ardeen Road, Doncaster DN2 5ER
IT CAN EVEN COPY ITSELF

007 SPY. Lets you stop and copy any previously unstoppable Spectrum cassette. ON cassette, £2.95. Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancs.

SPECTRUM BACK-UP COPIER
First of all you had to back-up programs by making tape-to-tape copies. Now KEYSOFT present:
THE KEY
100% machine code! Copies any type of program. Easy to use
Order THE KEY for any ZX Spectrum
Only £5.95
KEYSOFT, Dept PCk
6 Bruce Grove, London N17 6RA
NB: KEYSOFT advise users not to infringe the Copyright Acts
Dealer Enquiries Welcome

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

ADAM ADAPTORS eliminate expansion problems on the ZX Spectrum (16K). ADAM I allows use of 16K/64K Ram pack. ADAM II allows use of 16K Ram pack **PLUS** memory-mapped devices (disc, Eproms, etc) up to 16K. Works with microdrive, printer, etc, on ALL models. Plugs in between Ram pack and Spectrum. No soldering or going inside the case. ONLY **£9** including VAT and postage.
STEPHEN ADAMS, 1 LESWIN ROAD LONDON N16

SPECTRUM "SNIFFER", reads tapes and prints out program name, length in bytes and start address. Machine Code and Basic! Also gives auto run line number, £2.50 from AWA, 50 Dundonald Road, Didsbury, Manchester.

TELETEXT ON YOUR SPECTRUM. ZX text lets you create your own personal teletext system. Similar to Ceefax and Oracle. Capacity 900 pages. Full colour, graphics, 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, 12 Torry Drive, Alva, Scotland FK12 5NQ

DRAGON USERS. Dismon, new powerful disassembler monitor. Over 20 commands. Gets right into the machine. Opens more doors. Cartridge. Send £18.86, KayJay, 13 The Boulters, Gorleston, Great Yarmouth, for prompt delivery.

SPECTRUM COPYCAT. Make security copies of your favourite programs. Copies any Spectrum tape file. 16/48K. Easy to use. £4.95 from AWA, 50 Dundonald Road, Didsbury, Manchester.

VIC20 (6.5K) machine code line and plot routines. Full instructions. Send £5 to: R. Selwood, 15 Sandy Lane, Stretford, Manchester M32 9DB.

EDUCATIONAL SOFTWARE

48K SPECTRUM EDUCATION. Create multichoice question files easily with Multiset. Full editing facilities. Use these files in multitest on up to 30 candidates. Analysis of results. Hard copy. Full instructions. Ready prepared files coming soon. Both programs for £6.95 or details from Philip Allwood, 24 Rowthorne Lane, Glapwell, Chesterfield, Derbyshire.

SOFTWARE

DO YOU HAVE unwanted Sinclair software? Sae 118 Newman Road, Exeter.

VIC20 GAMES TAPE, 12 excellent 3.5K games, full colour and sound, some hi-res and machine code, including Klingon Defence, Alien Attack, Sorcerers Castle, Pacman, etc. All only £5 inclusive. Andrew Ross, 6 Beechgrove, Ryde, Isle of Wight.

SPECTRUM GAMES to swap or sell, wide selection. Tel: John (0803) 863646 after 6 pm.

MZ-80A MZ-80K
UTILITY BUSINESS and GAMES SOFTWARE
Converters AK/KA £6, Renumber/Append £6
Invoices £6, Databank £6, Inventory £6
Copier £4, Wordpro £10, Games £3
SAE for catalogue
DAVID COMPUTER SOFTWARE
38 South Parade, Bramhall, Stockport

ZX81 OWNERS
SPECIAL LAUNCH OFFER
Flipsides: Two On One + Free Gifts: Read On
Each cassette cost £6.25 inc P&P
FL/1 (A) Side — House Of Cards
Flipside — Spelling Time Bomb
FL/2 (A) Side — Grammaphor Tutor
Flipside — Morse Code Tutor (with sound)
FL/3 (A) Side — Horse Race Analysts
Flipside — Football Analysts
FL/4 (A) Side — Kiddies Adventure
Flipside — Maths Time Bomb
Buy all Four Flipsides and choose a Free Gift
Gift (1) A 16K Ram Pack or Gift (2) A Push Button Keyboard
Don't delay — send today cheques/PO to:
VII SOFT COMPUTER SERVICES
C/o M. C. Agency, 3rd Floor, Colwyn Chambers
24 Mosley Street, Manchester M2 3AG

EXCHANGE UNWANTED SOFTWARE through our club. FREE MEMBERSHIP. Send SAE for details A+P Software Services (PCW1), 142 Broadstone Way, Bradford, Yorkshire.

SPECTRUM WORD PROCESSOR. Features include: Print on printer, line, space, save and edit commands. Up to 28K of text handled. Runs on 16K or 48K. Only £4.95. Cheque/PO to K. Farrows, 3 Wainwright Avenue, Hutton, Brentwood, Essex.

TANDY COLOUR COMPUTER PROGRAMS
Hardware required; 16K Computer + Printer.
Software: Teddy — Text Editor (Word Processor), £5. Invoicer — Sales Ledger Invoicing System, £5. SSP — Statutory Sick Pay System, £10 or all three for £15. Send cheque or postal order to Dept. PCWK 3 Mc Com Software Ltd., Freepost, Liverpool LI9 9AB (no stamp required).

STOCKBROKER for 16/48K Spectrum. The game for up to six players who want to make money, rather than kill aliens, £4.50 to P. Maycock, 21 Manilla Road, Clifton, Bristol BS8 4EB. Tel: 737693.

ORIC QUALITY SOFTWARE. Tape 1: The Word (up-market Hangman) plus Dice (define up to five randomly thrown dice). Tape 2: Death-Trap (moving graphic game, build bridges to survive) plus Oriclock (on screen clock with alarm or stopwatch). Tapes plus full instructions, £4.95 each or £8.50 both. Send SAE for full list: Headfield Technology Ltd, Lock Street, Dewsbury, W. Yorks WF12 9BW.

NEWBRAIN
Quality software now becoming available. Our first offering:
NEWBRAIN INVADERS
Full machine code version of the original video game. All features are included. On cassette with full instructions.
£5 incl. post/packing
More coming soon — games and serious applications. Details sent with order.
AA SOFTWARE, 128 BEECHCROFT ROAD WANDSWORTH, LONDON SW17

DRAGON INDEPENDENT OWNERS ASSOCIATION
MATHS DERBY. Programmable Maths Race. Children of all capabilities can play on equal terms, kids can play dad.
MATHS ADVENTURE. Aimed at 9-11 years, use their maths and tables to get into the secret castle and outwit the Maths Monster.
£4.95 to DIOA School House, Winter Gardens, Canvey Island

SOFTWARE WANTED

Top quality, Original, Business and Utility Software required for CBM 64 and VIC20.

We will pay generous royalties or purchase outright.

S.I.P. LTD
1-13 CORSHAM ST
LONDON N1 6DP
Tel: 01-250 1978

SPECTRUM SOFTWARE. Excellent condition, Time-Gate, Caterpillar, Rescue, Espionage Island, all £4.50 each. Telephone Sunderland 493377.

SPECTRUM 48K
WHEELER-DEALER
NEW, EXCITING BUSINESS GAME FOR 3-20 PLAYERS.
"Better than Monopoly!"
£8.95
Send orders to: Ramtop Software, 12 Milnthorpe Road, Burtonwood, Warrington, Cheshire.
Purchase Ledger, Sales Ledger and Sales Journal
Special offer £14.95 each or £39.95 the set.
for orders ring:
St. Helen's (0744) 59883.

NEWBRAIN. High-resolution character generator creates up to 256 symbols for easy use in your basic or m/c programs, £5.95. Also full Z80 disassembler in Hex/Decimal allowing hard copy screen dump, £4.50. From C. Dixon, 57 Marine Parade, Brighton.



BBC CHARACTER GENERATOR
Menu driven facilities include reflect, invert and 3 rotates. Display is on grid for multi-character pictures. Full load and save etc.
£9.95 P&P FREE
CHEQUES TO
VISCOUNT SERVICES LTD
2A Boulton Road, Southsea, Hants.
0705-833633
NO FUSS GUARANTEE

VIC 20 SOFTWARE
All the Imagine Software Cassettes including: Arcadia, Whacky Waiters, Catcha Snatcha, Frantic. All for either the expanded or unexpanded computer.
New for the ZX Spectrum; Jumping Jack.
All at only £5 each!!
(inclusive of postage and packing).
Send cheques/POs to:
RULE COMPUTERS
30 Tylers Acre Road, Corstorphine, Edinburgh EH12 7HZ
(Tel: 031-334 7261)

SERVICES

EARNING GOOD MONEY Programming? Hasn't it occurred to you that the taxman is on the lookout for people earning a few bob on the side? Let me help you to keep as much of your earnings free of tax and keep you out of trouble! Reasonable fees. Tel: 01-207 2356.

Printer listing of your Tandy colour computer programs. Send your programs on tape with £1.50 + 50p for each additional program to:
Dept PCWK 1, McCom Software Ltd, Freepost, Liverpool LI9 9AB
(No stamp is required)

REQUIRE THE USE of a Printer? Join our Printer Club. Membership is available for the ZX81/Spectrum and BBC Microcomputer at £10 a year. Members' special prices: Computer listings 25p each. Graphic printouts 20p each. Send cheques and enquiries to Loophole Software, Arkwright House, Alexandra Road, Llandrindod Wells, Powys.

ORIC/TANGERINE PRINTOUTS. Send your programs on cassette and I will return a high quality printout for £1.60 by return post. 50p for revised programs previously listed. Paul Weller, Arley House, Hanley Terrace, Malvern WR14 4PF. Confidentiality assured.

COMMODORE 64. Up to 40 per cent off. Best sellers latest tapes, £5.99 each inc. VAT, p & p. Gridrunner 1, Gridrunner 2, Attack of the Mutant Camel, Motor Mania, Renaissance, Frogger, Panic, Scramble, Sprite Man, Krazy Kong, Patacuda, Cyclons, Monopole. Cheques/POs to Crestmatt 40-45 New Broad Street, London EC2. Mail order only.

HARDWARE

SARGON CHESS COMPUTER with Morphy Master Chess cartridge and magnetic pieces, £75 including recorded delivery. Hepburn, 4 Cardinal Avenue, Kingston, Surrey KT2 5SB.

ESCAFELD COMPUTER PLUS
Spectrum Joystick and Interface
Fully cased interface to give joystick control on many arcade games. Compatible with ATARI/COMMODORE/COMP. PRO. joysticks. Interface available with our QUICKSHOT joystick (see P.C.N. review w/e 4.5.83) price **£21.00** with a Commodore joystick at **£18.00** or separately at **£11.50** all inc. p&p.
Spectrum Reset Switch
Push button reset completely clears all programs saving wear on power socket. Neatly cased with power on indicator to plug in line with existing power supply. Price **£2.95** inc p&p.
Cheques/PO to
9 St. Margarets Road, Ecclesfield, Sheffield S30 3YB
Tel: (0742) 468337



SPECIAL OFFER
until end of June
ROSCO LTD
STAR DP 510, 80 column, 100 cps printer **£259**
OUTSTANDING VALUE
Add **15%** VAT, P&P: **£8**
GUARANTEED LOWEST PRICE IN UK
ROSCO LTD
Freepost, Birmingham B20 1BR
Tel: 021-356 7402

DEALERS

VIC20/64 SOFTWARE: Vic20: Golf, Pinball, Hitch Hiker I and II, Pontoon, Patience and many others of our own brand name; CBM64: Patience, Pontoon, Maze, Haunted Castle, AMC, Gridrunner. We stock other popular brands. 50 per cent (nett) royalties paid for software. We sell Hitachi C60 tapes, copying machines and have other services including tape copying for companies ONLY. Trade welcomed. Generous discounts. C. P. White (Service), shop: 52 Northfield Avenue, West Ealing, London W13 9SY.

ENFIELD COMMUNICATIONS
VIC20/64, ZX81, SPECTRUM BBC, DRAGON
GAMES: EDUCATIONAL: BUSINESS
Full range of software and accessories
MPF II 64K colour and sound **£269** inc. VAT
Send SAE for full list to:
ENFIELD COMMUNICATIONS
135 HIGH STREET
PONDERS END, ENFIELD
MIDDLESEX. Tel: 805 7434
BARCLAYCARD VISA

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

ORIC 1 48K — £137

Now in stock at Snobeech Micros
£137 + £4.25 P&P or call in at **SNOBEECH MICROS**
1 EAST GRINSTEAD ROAD
LINGFIELD, SURREY RH7 6EP
Tel: Lingfield 832476
Also Oric, BBC, Vic20, Dragon, Spectrum, ZX81 and Atari software. Blank cassettes **39p each**

ZX81 High Res Graphics Unit
£32 (excl. VAT)
Tel: William Haynes **01-969 0819**
Tools for Living
Notting Dale Technology Centre
191 Freston Road, London W10 6TH
Cheque/PO (add 15% VAT) plus 75p p & p

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.

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

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

COMMODORE 64 + Vic20
SOFTWARE AND HARDWARE FROM
NOLANSCO ELECTRONICS
Large selection of cassettes and cartridges available, including Forth, Gridrunner, Educational programs, etc.
Mail orders accepted
Phone Karen
Biggleswade (0767) 316702 (24 hrs)

CLUBS

SPECTRUM OWNERS. Save time and money by joining our fantastic software club. Wide selection of tapes and books. No rental charge. Just £15 annual membership (you pay p&p). For more details send SAE now to 'Microsoft'-ware Club, 73 Alcester Road, Moseley, Birmingham 13.

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

ORIC-1 OWNERS. Tangerine created Oric-1 now TUG creates the rest. An independent users group with a solid reputation for progressive system support. Monthly newsletters, meetings, software, hardware, reviews, advice and lots more. We have a proven record of performance on our system. Join TUG. You'll like us, we do! Send £1.00 + SAE (A4) for sample newsletter and details. Tangerine Users Group, 1 Marlborough Drive, Worle, Avon BS22 0DQ.

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.

CRS EXPRESS, BBC only. Reliable software exchange club. Send SAE for details. CRS Express, 7 Carlton Mews, Heighington, Lincoln LN4 1RB.

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.

MAGAZINES

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

COURSES

Microcomputer courses at Durham University
for young people and/or parents. Full board accommodation, first class instruction. Courses from August 6 to 27, at £80—£100 per week including half day excursions. SAE for details. **Assistant Bursar, College of St Hild and St Bede, Durham, DH1 1SZ. 0385 63741.**

CALEDONIAN computer consultants provide programming consultancy and training courses in Basic, held regularly for beginners upwards. 292 Caledonian Road, London N1 1BA. Tel: 01-607 0157.

COMPUTING FOR BEGINNERS. A one day course to be held at the Ladbroke Mercury Hotel, Bracknell, on Saturday, July 16, only £15. Phone Bracknell (0344) 84423.

ACCESSORIES

DISKS, Continuous labels etc. at discount prices. Call for lists Amersham (02403) 7540, Luton (0582) 412215.

SMART, WASHABLE PVC COVERS with Cotton binding available for any computer, printer etc., BBC, TI, Epson, £3.95. Dragon, Atari, Vic20, £2.95. Sharp MZ80AK, £4.95. For others please phone or write to Sherborne Designs, Victory House, 8A The Rank, North Bradley, Trowbridge, Wilts. Tel: 02214 4425. Also made to measure service. Dealer enquiries welcome. Access and Barclaycard.

CASSETTE LABELS PRINTED, self-adhesive, any amount. Sae samples: Six-Jays, Swanpool, Falmouth, Cornwall.

BUSINESS SOFTWARE

BUSINESS SOFTWARE
SHARP MZ80A + 80B
CPM based business software
Stock control systems
Data-base systems
Buy direct from software house, trade prices
THE BUSINESS MICRO-CENTRE
16 THEOBALD STREET
BOREHAMWOOD, HERTS
Tel: 01-207 5950

NEWBRAIN SOFTWARE. Business and serious application. Fully descriptive price list available on request. Cormix-Micro, 16 Kneesworth Street, Royston, Herts SGA 5AA.

WANTED

TEXAS TI 99/4 RS232 interface wanted, old type, not plug-in, for TI-box. Tel: 07912 4465 evenings.

REWARD — ORIGINAL PROGRAMS. Any Micro, especially racing type or educational programs. Distributed in UK and USA. Chris Vlahovic (Kiksoft), 32 Briarlyn Avenue, Huddersfield HD3 3NN. Coming soon: Damsels in Distress — Spectrum.

WANTED: USED ZX81 64L plus Fuller or DK'Tronics keyboard or 48K Spectrum plus Fuller etc. Tel: 01-527 8986 (evenings).

WE ARE currently looking for original preferably debugged games and utility programs. Anything from ½K to 24K is acceptable. If you have any programs that fit those criteria write to: Bamby Software, Leverburgh, Isle of Harris, PA83 3TX.

WANTED URGENTLY, BBC Model B with or without accessories and software. Tel: 01-852 0434.

FOR SALE

BBC MODEL B + Welcome Booklet, Cassette, User Guide, Business Games Book and Cassette for A and B + four Acornsoft games for B. All new. £380. Tel: Mayfield (Sussex) 873314.

BBC MODEL B + disc interface, 100K disc drive, 10 inch black/white monitor, CTR80 cassette recorder, joysticks, software on cassette and disc, selection of books. £700 the lot or will consider offers for individual items. Tel: Newent, Glos. (0531) 821634 (evenings).

INTELLIVISION + Sub Hunt, Golf, Advanced Dungeons and Dragons, Space Battle, Skiing, Soccer, Armor Battle, Tennis. Bargain £130. Tel: Rochdale 43027 (evenings).

DRAGON 32K. As new, joysticks + cartridge + two books of programs and games, worth £250, sell for £180. Tel: Cumbernauld, Scotland (02367) 38586.

AGF JOYSTICK and interface, as new, 7 months guarantee, £15. Medway 363723.

ATARI VCS Missile Command, Haunted House, day old cartridges, uneeded gifts, £40. Phone Harrow (204) 9372 between 12—5 pm Monday—Friday.

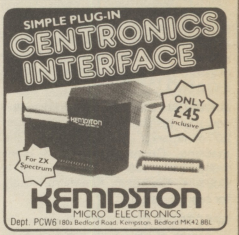
16K ZX81 with Fuller keyboard, ZX printer, Zonx 81 sound unit, PSU manual, 4 program books, manual, 11 games, tapes, £120 ono; 4" Rigonda black and white TV, £25 ono; Texas Instrument TI57 programmable calculator with PSU and manual, £16; Gross 2131 desk calculator, £6. Ring Tunbridge Wells (0892) 25042 evenings.

BBC MODEL B cover, tapes, 3 months old, hardly used, £325. 01-337 8126 evenings).

VIC20 + Arfon expansion unit + cassette unit + super-expander cartridge, Avenger cartridge, speech synthesis unit, programmers reference guide, Vic Revealed, plus games books and cassettes, all this for only £160 ono. Tel: Studley (Warwickshire) 2934.

16K SPECTRUM, as new, £72. Tel: Newcastle (0632) 863826 after 6 pm.

DRAGON 32, joysticks, cassette recorder, books, software, cost over £400, sell for £295 ono. Tel: Formby 77707.



ATARI VCS, Five cartridges, joysticks, paddles, £100. Tel: (0742) 340433.

VIC20 BARGAIN, with C2N recorder and 3K Ram, plus few extras. Nine months old, £130 ono. Tel: 0865 512251 ext. 576, Graham.

ATARI 400; recorder, basic cartridge, joysticks, Space Invaders, Missile Command, Asteroids, Star Raiders and manuals. Hardly ever used. Only £280. Tel: (01) 603 7905, evenings only.

EXCHANGE TI99/4A, two months old plus cables, software, etc., for Spectrum. Tel: 06065 56579 or 56482.

A REAL ZX81 Keyboard. Full travel keys plus spacebar, smart 10½in x 5½in case. Simple plug-in connectors, £18 inclusive. A. Baldwin, 11 Wiloughby Avenue, Lenton, Nottingham. Tel: 0602 474973.

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

SPECTRUM SOUND GENERATOR, used for 16K or 48K + cassette, £20. Tel: Kilbachan 2288.

SPECTRUM, 48K, issue 2 + Fuller keyboard, soundbox, software, magazines, cassette case, ZX printer, £200 ono. Tel: 521-0672.

SPECTRUM, 48K + software + consul, £160. Tel: Torquay 22058.

48K SPECTRUM, + computex carrying case, Ferguson tape recorder, £115 software and books, manual, leads, £220 ono. Tel: 0803 526253.

SPECTRUM, 16K, complete with Sharp cassette recorder + £40 software + books, £90. Tel: 01-671 6348 (between 6 pm-8 pm).

FOR SALE 48K SPECTRUM and over £270 worth of latest games and utilities + machine code data and magazines. Sell for £170 ono. Tel: 0908 75094 after 6 pm.

16K SPECTRUM, new, boxed, all leads + manuals, over £50 software, magazines, £80 ono. Tel: 01-310 7852.
48K SPECTRUM + £20 software + books and magazines, for quick sale £100. Tel: Thanet 32385.
SPECTRUM 48K, £100 ono. Tel: Wigan 53452.
16K SPECTRUM, as new, in original packing, with all leads, manual and demonstration tape, £75. Tel: 0386 831638.
16K SPECTRUM, Issue 2, boxed, as new, £75. Erith 45470.
48K ZX SPECTRUM with manuals and leads, also has guarantee, manuals + software, £160 ono. Tel: 01-571 2870.
48K SPECTRUM, 6 weeks old, printer + books, £140. Tel: 0732 361920 (Tonbridge).
16K SPECTRUM, excellent condition, books, 2 games + tape recorder, £95. Tel: 01-986 0989.
48K SPECTRUM + over £100 software + tape recorder, £170 ono. Tel: 051-428 6281.

ZX81s for sale

ZX81 16K + Redditch keyboard, Thurmtill input and output board, £25 of software, £60. Tel: 01-890 1842 after 3 pm.
ZX81 + **16K,** 20 tapes, four books. (Selling because updated to a Spectrum). Offers around £90. Tel: Derby 0332 371378.
16K ZX81 with DK'Tronics keyboard, power supply, etc, £60. Tel: 01-363 6075.
ZX81 16K swap for Spectrum 48K. Tel: 992-3124.
ZX81 COMPUTER + Memotek 16K, with ZX81 sound unit tapes, all leads and introduction, £65. Tel: St Ives 69350.
ZX81, two books, two cassettes + magazines, £30. 5 Lancaster Road, Southall, Middx.
ZX81 1K with power supply and manuals, in box, £25. Tel: Botley 3111.
16K ZX81 with tapes, £65. Tel: Bethesea 600647.
ZX81 1K with all leads and manuals, £25. Tel: Wargrave 2702.
16K ZX81, six months old, £35 for quick sale. Tel: 0834 812212.
16K ZX81 + following DK'Tronics products, 4K graphic Rom, 4K toolkit Rom, case, keyboard and keypad, complete set of graphic Rom software and others, £85. Tel: 01-851 0872 after 5 pm.
ZX81 + leads + extra manual, hardly used, £25. Tel: 01-440 7040.
ZX81, 64K, £40 software, large quantity of books, £100 the lot. Tel: Dursley 0543-46601 (Gloucester).
64K MEMO PACK for ZX81, £35. Tel: 01-928 7669.
ZX81, 16K, full-sized keyboard in case, printer, cassette recorder, 4K graphic Rom, joystick and interface, learning lab books, magazines, software, £160 ono. 0279 24668.
ZX81 + Ram pack with tapes and magazines, £49.95. Tel: King's Lynn 672114.
ZX81, 16K, professional keyboard, software, leads, box, etc, £70 ono. Tel: Hemel Hempstead 54763 (4.30 pm).
ZX81 + 16K, magazines, £55. Tel: Scarsdale 23209.
ZX81 with 16K Ram pack, five months old, only £50. Tel: Fife 724459.
ZX81, 1K, excellent condition, all leads power pack, manuals, plenty software programs, accept £30 for quick sale. Tel: Mr Leece, 0753-74111 (office hours).
ZX81, 1K + £15 software, £27. Quick sale. Tel: 01-857 5850.
ZX81, Sinclair built, 16K, leads, manual, Pimania, etc, £45. Tel: Barford 624574.
ZX81, 16K + books/games, £35. 01-743 5779 (Acton).
ZX81, 16K + leads, etc, boxed, £155 of software, compatible tape recorder, games including 3D Monster Maze, Flight Simulation, Scramble, Asteroids, Catacombs, £100. Tel: Wickersley 548091 (after 7 pm).
ZX81, 16K Ram pack + television game software, £50. Tel: Penzance 788316.
ZX81, 16K + Zonx 81 sound + full-size keyboard + 25 games, 28 magazines + manual + leads, new £220, sell £100. Tel: Bookham 52366.
ZX81, 16K Ram, printer + five rolls of paper, Fuller 40 keyboard, repeat key, hi-res graphics, Q Save, Black Crystal + other games, over £70 software + books, worth £200, sell for £90 ono. Tel: 051-724 4201 (after 5 pm).
ZX81, 16K, complete, £45. Tel: Newcastle 658 752.
ZX81, 16K, six games tapes, books + b/w television, portable, under guarantee, £100 ono. Tel: 01-691 6483. Will split.
ZX81, 16K, all leads + manual, six months old + four games tapes, £50. Tel: 0228-24933 (after 6 pm).
ZX81, 16K, boxed, £20 software, leads, three months guarantee, £60 ono. Skegness 5626.
ZX81, internal 16K Ram, DK'Tronics keyboard, power light, on/off switch, internal video inverter, £20 software, £100. Tel: 021-708 1182.
ZX81 + Ram pack + £40 software + tape recorder + five months guarantee, £90. Tel: Sunderland 78215.

Tandys for sale

TRS 80 pocket computer + cassette, interface + sound + over 50 ready-to-run programs, good condition, £45. Tel: Sunderland 483646.
TANDY TRS 80, 16K, Level 2, excellent, including dust covers, lots of software games, etc, books, manuals, cassette recorder, Tandy, VDU + basic trainer, £200. Tel: 521 0672.
TANDY TRS80, level II, 16K, green monitor, manual, numerous books and tapes, £250 ono. Tel: Leamington Spa 26506 before 9 pm.
TANDY 16K colour computer, £180. Tel: 03272 3953.
TRS80, 16K LEVEL 2 VDU. Stringy, floppy, quick-printer, RS232 + games software, £200. Tel: Blackpool 891769.
TRS80, LEVEL II, 16K+ VDU. Over 30 cassettes and cassette recorder, over 60 magazines and other books, £250 ono. Tel: Alan, Barnsley 755160 or 752222.
TANDY TRS 80, 16K Model I, Level II, manual, TV/VDU + cassette recorder included, £120. Tel: Maidenhead 27653.
TRS 80, software, budget management, portfolio analysis, management control, algebra, offers. Tel: Burghfield Common 3373.
TRS 80, Space Warp, games Pack, offers. Tel: Burghfield Common 3373.
TRS 80 MODEL I, Level II, 32K, VDU, tape unit, TRS 80 disk drive, Seikosha GB80 printer, compiler, assembler + game, £400 ono. Tel: 01-555-9977 (after 6 pm).

Acorns for sale

BBC MODEL B 32K, two months old, original packing, little used endorse manual cassette recorder and leads, software and magazines, £410, no bargain seekers. Tel: 061-740 3858.
6 ACORN SOFT BBC B PROGRAMS Rocket Race, Meteors, Arcadian, fun + games, Super Invaders + Algerberic Man, cost £60, sell £10 the lot. Tel: Harpenden 69152.
12K ACORN ATOM, lots of games + books, £100. Tel: King's Lynn 0553-5207.
BBC B, 6 weeks old, 3 cassettes, manuals, £325 ono. Tel: 0228 26964 (after 5 pm).
ACORN ATOM, 12K Rom, 12K Ram + floating point IC + Pin Ball cassette, £100. Tel: 01-560 1892.
BBC MODEL B, 6 weeks old, joysticks, software, 40 games, logged + colour coded with guarantee, worth £650, sell for £450 ono. Genuine sale. Tel: 01-866 0438.
BBC MODEL B, + cassette recorder + software, in moderate condition, £190. Tel: 01-954 4548, ask for Gavin.
BBC SOFTWARE, swap Acorn software IJK + program power + others for other BBC software. Tel: 0232 238373 (after 3.30 pm).

Dragons for sale

DRAGON 32, as new + software. £165 ono. Tel: 01-805 1042.
DRAGON 32, three months old, £160 ono or swap for Spectrum 48K. Tel: 01-794 0198 evenings.
SWAP DRAGON SOFTWARE or other Dragon software. Tel: Jeff, 061-6825225.
SWAP DRAGON 32 tapes for other Arcade or Adventure tapes. Tel: Monk, Exeter 59128 after 6 pm.
DRAGON 32 + joysticks, cassette games, Centronics printer card, Polaris, Project Nebular, Metoroid cartridges, graphics, books, cost £300 sell £220 ono. Also Line Printer Seven (Tandy), Hi-res graphics, 80 columns, cost £250 accept £160 ono. Both above £360. Tel: 0532 561811 (after 5 pm).
DRAGON 32, many cassettes to swap. Tel: Stuart, New Milton, 0425 611694.
CAVE HUNTER CARTRIDGE, as new, cost £20, sell £12. Tel: 025-126 3331.
DRAGON 32 + cassette recorder, books, joysticks, over £100 of software, £200 ono. Tel: 0484 39502 (anytime).
DRAGON, all leads, manuals, £50 software, £180. Tel: Welwyn 4390.
DRAGON 32 with joysticks, £150 software, still under guarantee, £250 ono. Tel: Weybridge 41955.
DRAGON 32, only 6 months old, + cassette, software and books, £160. Tel: Great Yarmouth 55935.
DRAGON 32, 5 months old, tape recorder, joystick, £250 software, £220 ono. Tel: Mark, 0225 742777 (after 6.30 pm).
DRAGON 32, cartridge, Cosmic Invaders, £15. Tel: 01-730 1688.

Ataris for sale

ATARI VCS, as new, with four cartridges, including Demon Attack and Missile Command, complete with joystick and paddle controllers, plus bulletins. £95. Tel: 01-582 8791 evenings.
SPECTRUM 16K, five months old. Very good condition including Introduction and Basic programing books and introduction software cassette, two software cassette games, only £80. Tel: 794-6556 evenings or weekends.
ATARI VCS, + 12 cartridges, extra paddles, good condition, £200 ono. Tel: 0434 604272 anytime
ATARI with 8 cassettes including Defender, Missile Command and Pinball, £150 ono. Tel: 554 6085.
ATARI 400 48K and disc drive + joysticks + manuals, £415 ono. Tel: Hove 720530.
ATARI VCS + 9 cartridges including PacMan, Detender, Indianapolis-500, Asteroids, Space Invaders and Missile Command + controllers for Indianapolis-500, good condition, £160 ono. Tel: Wadhurst 3332.
ATARI VCS + 5 cartridges, £100 ono. Tel: 800 1574 after 7 pm weekdays and weekends.
ATARI 400 + basic cartridge, recorder, joystick with 3 cartridges, Centepede, Missile Command, Defender, Astron IV (cassette) manuals, 4 months old, very good condition, £300 ono. Tel: 01-592 7048 after 4 pm.
ATARI 400 32K + recorder, manuals, basic cartridge, 2 joysticks, £160. Tel: 0533 714737 after 6 pm.
ATARI 400 48K, 4 months old, including basic cartridge, manuals and over 30 program listings, £200 ono. Tel: Dundee 76554.
ATARI 800 3K and cassette recorder, basic cartridges, sound and video output cable, technical manuals (worth £20), Zaxxon, Air Strike and others. Burghfield Common 3373.
ATARI VCS + Space Invaders and Combat, £70. Many other cartridges available. Tel: Redhill 63143.
ATARI 400 SOFTWARE, swap Jumbo Jet Pilot or Star Raiders for Minor 2049 ER or Missile Command. Tel: 01-858 2849.
ATARI VCS + PacMan and Video Chess, boxed, as new, mint condition, £75. Tel: 348 5668 after 5 pm.
ATARI VCS + 6 cartridges including Defender, PacMan, Invaders, Asteroids, £85. Tel: 01-555 8317.
ATARI 400, Defender cartridge, 5 weeks old, perfect condition, £20. Tel: Northwood 22559.
ATARI 800, 48K, cassette, joysticks, £150 software + lots of magazines, £350. Tel: 01-251 3769 after 5.30 pm.
ATARI 800, 32K + cassette recorder, basic cartridge cables for sound + video output, technical reference manual. Zaxxon, Air Strike + others, all new. Offers. Tel: Burghfield Common 3373.
ATARI 400 SOFTWARE to swap or sell games. Tel: 444834 (High Wycombe).
ATARI 400 or 800, Space Invaders cassette, £10 ono. Tel: 01-980 5014.
ATARI VCS, Combat, Airsea, Space Invaders, Adventure, £65. Tel: King's Langley 64697 after 4 pm.
ATARI 400, 48K, mint condition including program recorder, manuals, Basic and joystick + 16 games, £300. Tel: 0732 863815.
ATARI 400, boxed, 2 months old, with cassette recorder point, master joystick, software, cost £255, accept £195. Tel: Bolton 0204 40319 after 6 pm.
ATARI 800 with basic, with program recorder, joystick, £200 software, £375 ono. Tel: 01-958 5508 after 6 pm, also weekends. Can deliver.
ATARI 400 16K, still under guarantee, £750 of software, £299. Tel: Rainham (Essex) (76) 22077 after 6 pm.
ATARI VCS + five cartridges including Defender and Space Invader, £75 ono. Tel: Bradford 02746 7647.
ATARI 800 + disk drive, cassette recorder, joystick, plenty software cartridges/disks, Star Raiders, Shamos, etc, £575 ono or sell separately. Tel: 01-571 2870.
ATARI VCS + Asteroids and Combat cartridge, £70. Tel: Basildon (0268) 281458.

Commodores for sale

VIC20 + C2N, all under guarantee + dust cover + Vic Computing magazines + books + cassettes, £150. Tel: 021-327 4986.
VIC20 + C2N + 8K + 3 Rom cartridges + other cassette software + magazines, cost £300, will sell for £250. Tel: 0844 237678.
VIC CASSETTE DECK + games for £50. Tel: 01-455 2651 (6 pm).
VIC SUPER EXPANDER, £20 ono. Adrian, tel: Chesterfield (0246) 851379.

VIC20 + C2N cassette deck, super expander, joystick unit, various games, books and magazines, 3 months old, still boxed, £150. Tel: 0563 34855.

VIC20 + C2N cassette deck, 16K memory expansion, joystick, books, £120 of software, £250. Tel: 0602 875298.

VIC20 super expander. Tel: 808 6450.

VIC20 with basic cassette recorder, 16K expander, over £100 of software + lots and lots of magazines, £180 ono. Tel: 458 7277 (evenings).

VIC20 with cassette unit + software + 2 books + manual + magazines, £125 ono. Tel: 01-455 6641 after 4.30 pm.

FORTH FOR VIC20, £15 or swap for Vic Revealed and Tank Attack cartridge, will swap for 3K or sell for £10. Call 01-579 2129 after 4.30 pm.

VIC20 + cassette unit, with over £650 of software including over £50 of cassettes, cartridges, 5 books, joystick + dust cover, only 5½ months old, £230. Tel: 01-574 4122.

SWAP VIC20 The Count for a 16K Ram. Tel: 051-356 3874.

SWAP BUGBYTE ASTEROIDS for any other Bugbyte game. Tel: 0341-280726.

VIC20 16K cassette deck, joystick, books and loads of software, boxed as new, under guarantee, £180 ono. Tel: Tilbury 77329.

VIC20, 16K expansion pack, £30 ono. Boss Chess £7.50. Tel: 0287-32949.

VIC20 + adaption for normal tape recorder, super expander, machine language monitor, 3K Ram. Omega Race, Jelly Monsters + £20 cassette software + joystick + reference guide, £290 ono. Tel: Danbury 3888.

VIC20 + cassette deck, £120. Tel: Weston-super-Mare 414618.

COMMODORE VIC20 + cassette player and disc drive with cartridges and tapes, cost £700, sell for £500. Tel: Stubbington 5238.

VIC20 cassette unit + 16K expansion + Superexpander, over £200 of software (cassette and cartridges), £340 ono. Tel: Southampton 0703-464186 after 6.30 pm.

VIC20 + cassette unit + joystick, four months old, £140 + offers for software and books. Tel: Billericay 58812 after 6 pm.

COMMODORE 64, brand new + book, £275 ono. Tel: 01-452 9227 evenings/weekends.

VIC20 Audiogenic Tombs of Drewin adventure games, £10. Also Vic20 Money Manager, £7. Tel: Alan Johnstone, 21586.

VIC20 + cassette, still under guarantee, £250 worth of software. £165. Tel: Stoke-on-Trent 332848.

COMMODORE 64 + CZN cassette unit, software, joysticks, brand new, £320 ono. Tel: Malvern 61602.

VIC20 software and cartridges for sale. Tel: 885 1207.

For sale

16K ZX81 programs, Bugbyte Invaders £2.50, Bugbyte Mazogs £6, Psiori, Flight Simulation £4.50. Tel: Peter, 061-224 2716.

FOR SALE. Hungry Horace, Gulpman, Microgen, Skramble + Mad Martha, Ghost Revenge, Cyber Rats, Penetrator, Blind Alley, Cruising, Timegate, Flight Simulation, Galaxions, Games tape 2, 75% plus original price for each. Tel: Doncaster 0302 722669.

FOR SALE. Half-price Acorn Software for BBC. Tel: 01-788 6993.

SELL OR SWAP for Terrodakil Motor Maul, Centipede, Orbitor and Mind Out. All originals. Tel: 0908 75094.

COMMODORE 3-TAPE expansion cartridge for sale, swap for Jelly Monsters or any other suitable cartridge game. Tel: Harlow 0279 37629.

8K UK 101 FOR SALE. Superb condition with PSU TV and cassette leads with manual and monitor lead, software included, £90 ono. Tel: Bideford 79732 anytime.

TI 99/4A with Extended Basic, Parsec and Invaders cartridges, cassette, lead and joystick. Five months old, £215. Tel: Hinckley, Leics. 0455-634074.

SWAP 16K Spectrum games for any other 16K Spectrum games. Tel: 0766 2908 after 6 pm.

SWAP AMOCK TAPE (Berserk) for other good machine code programe or sell for £3. Tel: 0983-64561.

ATARI SOFTWARE. Datestones of Ryn, Voodoo Castle, Galactic Empire, swap all three for Battle of Shilo or individually for any other adventure. Tel: 0702-63332.

CHESS COMPUTER and spill levels, cost £90, 10 months old, £45 ono. Tel: 021-476 8362 after 8 pm.

SWAP £40 SPECTRUM SOFTWARE, 16K + 48K including Time Gate, Penetrator + 30 Tunnel for a Sinclair Printer and paper. Tel: 01-254 0428.

SWAP ZX SPECTRUM 48K + books + games for an Atari VCS or 400. Tel: Livingston, W. Lothian 410 822.

SWAP ZX81 16K Arcade + adventure games, details. Tel: 0602 269069, between 4 and 5 pm.

SWAP ZX SPECTRUM 16K + 48K Arcade + Adventure Games. details telephone 0602 260 287 after 4 pm.

NASCOM II, 8K, NAS-CYS III, graphics, Rom, Basic, PS manual, £125. Tel: 01-363 6075.

VIEWDATA TERMINAL with 14-inch RGU monitor, both in excellent working order, £250. Tel: 01-363 6075.

MZ 80K, 48K, dust cover, manual, + 35 programs including Startrek, Space Invaders, etc, excellent condition, £275 ono. Tel: Boldon 363819.

PET REVEALED, Pet graphics and library of Pet sup-routines, £5.50 each. Washington 091 4170754.

FOR SALE: Casio SX601P, £30 ono. Tel: Witham 518470.

TI 99/4A, recorder, leads, Munchman cartridge, £90 ono. Tel: Byfleet 42760.

FOR SALE: *Popular Computing Weekly,* from Vol 1 No 26 to Vol 2 No 14, 35p each or £7.50 the lot. Tel: 01-267 6201.

BOXED VIC20, 7 months guarantee remains, + manuals + books + software, £110 ono. Tel: Leven 24249 0333 (after 6 pm).

SWAP 10 ROLLS OF PAPER for the ZX Printer for software. Tel: St Helens (Merseyside) 815128 after 6 pm.

SWAP VIC20 adventure cartridge, The Count, for Voodoo Castle. Tel: 0606 75557 between 3 and 6.

SPECTRUM SOFTWARE: Cyberates, Schizoids, Pastimes, Arcadia, all in mint condition, £3.50 each or £13 for all. Tel: St Helens 26314.

SWAP PHILIPS G7000 with £170 of cartridges for anything to do with Dragon 32 or swap for Intellivision or any colour computer. Tel: 01-789 4269.

SOFTWARE for BBC Model A or B. Asteroids, Invaders, Fun games and seven language programming for BBC computer, worth £32, sell for £20. Tel: Wigan 58719.

ASCOM 1, nas-sys 1, Basic, 48K Ram, P10, Coteis-Blandford cassette interface INNC, Manpower mags, £270 ono. Tel: Stevenage 66355.

SWAP Spectrum games for others. Games include: Horace/Spiders and Colour Flash. Tel: 0622 61917 after 6 pm, ask for Ian.

Wanted

WANTED: computer and video games magazines Nos. 5 and 3. Will pay up to £1.50 each. Tel: 0341 280726.

WANTED: BBC Model A, in exchange for 48K Lynx + £25 cash (brand new and still in box). Tel: 0799 22207.

WANTED: BBC micro or Commodore Vic20. Tel: 01-359 3190.

VIC20 owner in Nottingham area to exchange software and ideas. Tel: 397892.

WANTED: ZX Spectrum, 16K, under £80. Tel: 0603 47137.

WANTED: BBC Model B. Tel: (office) 207 5840; (home) 207 2815.

WANTED TANDY colour computer owners interested in swapping software. Tel: Pelsall (0922) 691618.

WANTED FELLOW SPECTRUM owners in Newcastle area for exchange of software and ideas. Tel: Newcastle 658752.

WANTED BBC MICRO — preferably in good condition — will pay up to £300. Tel: Stonehenge 43343 after 5 pm.

8K RAM CARTRIDGE, Commodore in exchange for super-expander cartridge + some money. 0442 58200.

WANTED ZX PRINTER. Tel: Bournemouth (0202) 429429.

SWAP Master File, Football Pools, Masterkey, Softkit, Autozonx, Androids, Velnors Lair, ZX Scrabble + Heathrow. Witham 518470.

SWAP Horace and the Spiders, Pssst, A & S Painter, Dungeon Adventure, Firebirds, Dragons Lair, Styx. Tel: Witham 518470.

4D PTERODACTYL, Ultra-violet, Cybertron, ET X, Jetsack + Molar Maul, swap for other software. Tel: Witham 518470.

WANTED SPECTRUM 48K. Details please to K. Slader, Woodside Cottage, Woodlands, Southampton SO4 2GN.

WANTED BASIC COMPUTER for Vic20. Tel: 051-992 3639.

WANTED ZX SPECTRUM, 16K or 48K, cash waiting. 0543 371090.

EXPANSION INTERFACE + disc drives + printer suitable for TR80 LVII. Tel: Don on Totton 868947 or 861618.

FIFTY ARCADE GAMES FOR YOUR MICRO

For a limited period we are offering 50 first-class games at a special introductory price. To be sure of your copy order now.

Spectrum 16K or 48K.....	£8.99
Dragon 32	£8.99
Oric 1.....	£8.99
Sinclair ZX81 1K	£4.99
ZX81 16K.....	£5.99

All tapes post free. Mail order only. Cheques/POs payable to Anco Software, 25 Corsewall Street, Coatbridge ML5 1PX.

ACCURATE ASTROLOGY
from
ASTROCALC

Our three basic modules,
Natal, Progressions and Transits
are now available for

DRAGON and NewBrain

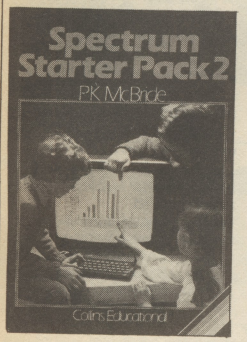
With Astrocalc programs there is no question of planets being several degrees out or in the wrong sign! The average error is less than 1/2 min of longitude for all planets (20th century).
For £18, the natal program gives you the longitudes, declinations, Equal and Placidus house cusps, Qualities and Elements and of course the aspects with actual orbs shown.
For another £15, the progressions and transits modules give you the progressed positions, for any year, mutual aspects, progressed to natal, progressed to progressed, and lunar aspects by month; plus exact date transits for periods of from 1 to 12 months (outer planets) or on a daily basis (all planets).

Special offer for 16K Sinclair ZX81 owners all three modules for only £25

Many more modules for the 48K Spectrum, Genie 1, 2 and 3, Tandy TRS80 1 and 3, Commodore PET 3000, 4000 and 8000.

Please send cash with order, or a large sae for further details to:
For Spectrum and Commodore machines to:
Terry Dwyer, MA DMS Astrol, 53 Loughborough Road, Quorn, Loughborough, LE12 8DU,
tel: 0509 412076
For other machines to:
Colin Miles, BSc DMS Astrol, 67 Peascroft Road, Hemel Hempstead, Herts HP3 8ER,
tel: 0442 51809 (after 8 pm)

PART TWO



Spectrum Starter Pack 2 is the second release in the Collins series designed to teach you how to program.

Each pack in the series consists of a handbook and cassette. *Pack 2* continues where the first part left off and contains a number of routines which stress the sound and colour available on the machine.

Programs include *Sound* — which turns your Spectrum into an electronic organ — and *Bar Chart* — which illustrates how bar charts can be constructed from figures.

Program *Spectrum Starter Pack 2*
Price *£9.95*
Micro *Spectrum*
Supplier *Collins Educational*
PO Box
Glasgow G4 0NB

CAT & MOUSE

Confuse the Cat is a new game for the 32K model B BBC computer. The decidedly odd scenario involves moving a cat around a cellar during a power cut, looking for objects which will enable him to eliminate each mouse.

The game is intended, in the first instance, to be a sort of adventure, where you must gradually discover the uses for each of the various objects.

However, the manufacturer claims that you can play the game more than once, because tactical skill comes into play — how quickly can you eliminate the mice?

The cat's salary is £5,000, with a bonus for each mouse caught. However, a poor performance could mean demotion.

Program *Confuse the Cat*
Price *£4.50*
Micro *BBC B*
Supplier *EF Computing*
6 Victoria Road
Stockbridge
Sheffield
S30 5FW

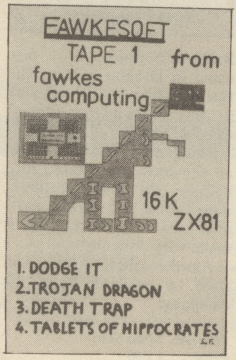
COMPOSER!

Music Maker is a program for the 48K Spectrum designed to enable you to write your own music. It uses a mixture of Basic and machine code to enable you to choose time, signature, key, note value and note pitch. Once your creation is finished, you can play it back and *Save* it on tape.

Bellflower Software is a new company which seems to be concentrating on providing useful utility programs for the Spectrum.

Program *Music Maker*
Price *£5.75*
Micro *Spectrum 48K*
Supplier *Bellflower Software*
6 Rosewood Avenue
Greenford
Middlesex

MULTI-TAPE



Fawksoft is a software company still catering for the ZX81. *Tape 1* contains four games *Dodge It, Trojan Dragon, Death Trap,* and *Tablets of Hippocrates.*

The games are a mixture of machine code and Basic, and are both arcade type — *Dodge It* — and Adventure — *Tablets of Hippocrates.* All of the games require 16K of memory.

Program *Tape 1*
Price *£4.95*
Micro *ZX81 (16K)*
Supplier *Fawkes Computing*
41 Wolfridge Ride
Alveston
Nr Bristol BS12 2RA

TRACE IT!

Trace is a machine code utility program designed for use with Basic programs.

The program shows you how the computer executes each line of Basic. The current line of Basic is highlighted before it is executed.

The program is intended to be used in the teaching of computer languages as well as for the home user.

Program *Trace*
Price *£6.95*
Micro *Spectrum*
Supplier *Texgate*
14 Brook Lane
Corfe Mullen
Dorset BH21 3RD

BIZARRE!

Softek is familiar to Spectrum owners because of its compiler — now reduced in price to £9.95. However, it has just issued five arcade style games.

Of the five, *Joust* is the most unfamiliar and bizarre. Using the keyboard you control a giant bird — an ostrich which you pilot (well, what is the term when you sit on a bird?) in a joust against enemies who are also sitting on birds.

Softek is stressing the high-resolution "flap" of the birds, which it says compares favourably with the achievements of both Psion and Imagine.

Program *Joust*
Price *£5.95*
Micro *Spectrum*
Supplier *Softek*
329 Croxted Road
London SE24 9DB

NO STIGMA

CP White (Services) has another new release for the Vic. *3 Games* is exactly that — three games entitled *Gas Light, Pea Picker* and *Apple Cropper.*

The company says that each of its games could be sold separately — there is a stigma attached to the "games pack" because the games in it are usually poor quality — CP White says that's definitely not the case here.

Program *3 Games*
Price *£3.50*
Micro *Vic20 (+3K)*
Supplier *CP White (Services)*
52 Northfield Ave
West Ealing
London W13 9SY

SHOOT-UP



Oric software is finally arriving, in dribs and drabs. IJK Software is a company that has previously specialised in BBC programs, but it has now issued three cassettes for the 48K machine.

Xenon 1 is in classic "shoot em up" mould with several waves of aliens. You must beat off the Aards and travel on through meteorite showers until you can refuel and defend your planet from the Paratrons.

The "ultimate accolade" is to destroy the Zorgon battle star, which will appear at the end of the game if you survive.

It all sounds like the classic format — if Oric owners are the same as owners of all the other micros, it should do well.

Program *Xenon 1*
Price *£8.50*
Micro *Oric 48K*
Supplier *IJK Software*
9 King Street
Blackpool
Lancashire

BY TOUCH



In the world of Dragon software Microdeal is one of the market leaders, in terms of number of products at least.

Its latest release is *Backgammon* — a computer version of the popular board game. There are nine skill levels and the computer can even be made to play against itself.

A novel feature is that the Microdeal light pen will work with this game, allowing you to enter your moves merely by touching the screen.

Program *Backgammon*
Price *£8.00*
Micro *Dragon 32*
Supplier *Microdeal*
14 Truro Road
St Austell
Cornwall PL25 5JE

ADVANCED

The Spectrum book market is so vast that even the fairly advanced area of machine code has at least three books to itself — and still they keep on coming.

Spectrum Machine Code is the latest addition to Shiva's friendly micro series. Authors Ian Stewart and Robin Jones are well-known for their previous books (*Machine Code and Better Basic* was serialised in *PCW*).

Book *Spectrum Machine Code*
Price *£5.25*
Micro *Spectrum*
Supplier *Shiva Publishing*
4 Church Lane
Nantwich
Cheshire CW5 5RQ

TWISTED!

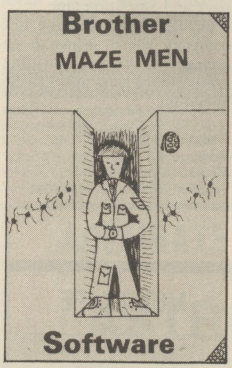
Pentagon is a company offering independent Dragon software. It has just released *Dragon Hawk*.

This machine code game involves fighting off enormous birds that swoop towards you — so far so Galaxian — but the twist is that this is just a screen to enable the mother bird to fly down and pick up a little man.

Your main aim is to defend the man and shoot down the bird if it should pick him up. If that isn't enough, there are some tiny flys for you to attack.

Program *Dragon Hawk*
Price *£6.95*
Micro *Dragon 32*
Supplier *Pentagon*
31 Banks Ave
Achworth
Yorks

3-D MAZE



Brother Software is a new name in Dragon games. The Hertfordshire based company has just issued its first release, *Maze Men*.

The game involves shooting all the men in a maze. But, because the maze is three-dimensional and certain parts of it look very similar, this is made very difficult.

Another three games will soon be available from the company.

Program *Maze Men*
Price *£5.00*
Micro *Dragon 32*
Supplier *Brother Software*
25 Augustus Close
St Albans
Herts

SPRITELY!

Atari owners will be fairly familiar with the English Software Company, but now it is catering for the Commodore 64 as well.

Sprite Maker 64 is a utility program that gives access to the sprite capability of the machine.

You use a cursor to design the sprite capability of the which can then be saved and used in your own program.

Program *Sprite Maker 64*
Price *£6.95*
Micro *Commodore 64*
Supplier *English Software Company*
50 Newton Street
Piccadilly
Manchester
M1 2EA

ADDICTIVE!



Simon Wadsworth

Arctic will soon issue *Adventure E — The Golden Apple*.

Its previous adventure games — A to D — have built up a strong reputation for being addictive and fiendishly difficult to solve — so much so, that Arctic has a number of help sheets available.

Simon Wadsworth, the author, also wrote *Invasion Force* and *Gobbleman* for Artic. Simon is managing to combine A level study with the development of his next adventure — *F*.

Program *The Golden Apple*
Price *£6.95*
Micro *Spectrum 48K*
Supplier *Artic Computing*
396 James Reckitt Ave
Hull
N Humberside

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF.



Ziggurat



Root causes

I have my trusty calculator/clock before me: I enter *11111111* and then press the square root button, the answer is *3333.3333* (and we can guess that the *3s* continue on for ever).

If I square the number (which is supposed to be the square root of *11111111*) by using *X* and then =, the result is *11111110*. The square of the square root does not equal the original number. Obvious, really, would you not think?

My wee calculator does not have an infinite capacity, and thus is not able to store an unending sequence of *3s* — it has an eight-digit accuracy. The number I used above (*11111111*) has eight digits, and thus is stretching its accuracy to the limit. If I enter *1111*, the square root is *33.331666*, and the square of the square root is *1110.9999* — accurate to seven significant figures.

What I have just found for my calculator does not hold for all calculators — some round-off numbers, whereas mine just chops the end off.

Chopping the end off is called chopped arithmetic on posh computers, but we all know that computers are just calculators putting on airs . . . or are calculators computers with an inferiority complex . . .?

We do not have to construct an example anywhere near as complex to illustrate the same sort of quirk on a computer.

Try this tiny program:

```
10 INPUT X
20 S = X/2
30 FOR I = 1 TO 25
40 S = (S + X/S)/2
50 PRINT S
60 NEXT I
70 PRINT S-SQR(X), S-(SQR(X) + X/SQR(X))/2
```

which produces a string of 25 values of *S*, where *S* becomes closer and closer (very soon) to the square root of the number we have input as *X*.

This is the method for calculating square roots known as Newton's Method, and it is an example of an *iterative* method — going through a routine repeatedly each time getting closer to the desired answer.

Many estimation methods work on similar principles. We estimate a value and then use that estimate to produce a new estimate. For those who are interested in such things, the general form of Newton's equation is, when $F(x) = 0$.

$x(i) = x(i-1) - F[x(i-1)]/F^1[x(i-1)]$.

In English this means that the *i*'th estimate of *x* is given by the value of the $(i-1)$'th estimate less the function of *x* divided by its differential at the value *x*.

What is the function in this case? Well,

$F(x) = x^2 - V = 0$

and the differential of the function is

$df/dx = F^1(x) = 2x$

so that

$F(x)/F^1(x) = (x^2 - V)/2x$

and

$x - F(X)/F^1(x) = x - x/2 + V/2x$

$= (x + V/x)/2$

QED — and if it ain't QED, work it out again.

(Incidentally, Chapter 15 in *Pure Mathematics* by A J Sherlock *et al* (John Murray) is a fair explanation at A-level standard.)

In the program above, for some values, the *Sqr* function does not agree with the totally accurate value *S*.

S is as accurate as the machine can allow. The *other* value should never differ, unless the *Sqr* function is amazingly inaccurate.

If you try:

```
X= 0: FOR I = 1 TO 1000: X = X + .001: NEXT I: PRINT X
```

the value of *X* is not $0.001 \times 1000 = 1$. It is usually less — why?

Talking of problems and squares, and square roots, I noticed an easy one, to do with the sides of triangles. It is possible to have an integer-sided triangle with *any* odd number being the smallest side.

Let the little side be *m*, and the other sides be *n* and $n + 1$. Then $(n+1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1$.

As $m^2 = (n+1)^2 - n^2$ then $n = (m^2 - 1)/2$ . . ■

Boris Allan

Puzzle

Howzat!

Puzzle No 60



When Arthur dreamed, he dreamed of cricket — and in particular of the team for which he played — the Stickshire cricket club.

He dreamt of a famous victory. Not all the side batted, but each player who did made a score equal to one of the divisors of the total. Each batsman scored less than the one before and each divisor of the total appeared once on the score sheet. (One is counted as a divisor, but not the total itself — for example, the divisors of 12 are 6, 4, 3, 2 and 1.)

These intensely mathematical imaginings bothered Arthur greatly. Not because he couldn't stop them from happening. Not because he did not know why they came. Not even because they also bothered his analyst.

What really rankled was that he could never work out the final score. All he could remember was that the opening batsmen made a double century and a century.

Can you work out how many batted and what their scores were?

Solution to Puzzle No 55

The problem was to find a succession of right-angle triangles each with sides an exact number of units, such that the longest side of each triangle forms the shortest side of the next.

The first two are 3, 4, 5 and 5, 12, 13. The program to find the next three triangles in the series is:

```
10 A = 3. 20 FOR N = 1 TO 5. 30 X = A : Y = A + 1. 40 Z = SQR(X*X + Y*Y). 50 A = INT(Z). 60 IF Z - A<1E-5 THEN 90. 70 Y = Y + 2. 80 GOTO 40. 90 PRINT X;Y;A. 100 NEXT N
```

The difficulty with the problem is the inaccuracy of the *Sqr* function on most micros. Line 60 takes this into account when it checks that $Z=A$ to within a thousandth of a percent.

The answers given by the program are, for the next three triangles in the series: 13, 84, 85; 85, 132, 157; and 157, 12324, 12325.

Winner of Puzzle No 55

The winner is: A F Salisbury, Clifton Drive South, St Annes-on-Sea, Lancs, who receives £10.

Top 10 Top 10 Top 10 Top 10

Vic20

1	(1)	Introduction to Basic Part 1	(Commodore)
2	(5)	Panic	(Bug-Byte)
3	(8)	Wacky Waiters	(Imagine)
4	(6)	Asteroids	(Bug-Byte)
5	(—)	Arcadia	(Imagine)
6	(9)	Amok	(Audiogenic)
7	(7)	Cosmiad	(Bug-Byte)
8	(3)	Blitz	(Commodore)
9	(—)	Sea Wolf	(Audiogenic)
10	(—)	Chess	(Bug-Byte)

(Figures compiled by Boots & Co, London)

Spectrum

1	(1)	Flight Simulation	(Psion)*
2	(3)	Penetrator	(Melbourne House)*
3	(—)	Jetpac	(Ultimate)
4	(5)	Transylvanian Tower	(Richard Shepherd)*
5	(6)	3D Tanx	(DK'Tronics)
6	(2)	The Hobbit	(Melbourne House)*
7	(4)	Horace Goes Skiing	(Psion/Melbourne House)
8	(—)	Ah Diddums	(Imagine)
9	(7)	Arcadia	(Imagine)
10	(9)	Chess	(Psion)*

*Requires 48K

(Figures compiled by W H Smith and Son Ltd)

Atari

1	(1)	Zaxxon	(Datasoft)
2	(2)	Miner 2049er	(Big Five)*
3	(—)	Hellcat Ace	(Microprose)†‡
4	(—)	Stone of Sisyphus	(Adventure International)§
5	(—)	Chop Lifter	(Broderbund)*
6	(7)	Pharaoh's Curse	(Synapse)†
7	(—)	Sea Dragon	(Adventure International)
8	(—)	Astro Chase	(First Star)†‡
9	(5)	Shamus	(Synapse)
10	(—)	Defender	(Atari)*

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

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

Dragon

1	(1)	The King	(Microdeal)
2	(2)	Space War	(Microdeal)
3	(5)	Katerpiller Attack	(Microdeal)
4	(—)	Planet Invader	(Microdeal)
5	(10)	Dragon Trek	(Salamander)
6	(4)	Alcatraz	(Microdeal)
7	(3)	Defence	(Microdeal)
8	(7)	Mansion Adventure	(Microdeal)
9	(—)	Madness and the Minotaur	(Dragon Data)
10	(8)	Chess	(Dragon Data)*

*Cartridge

(Figures compiled by Boots & Co, London)

BBC*

1	(1)	Rocket Raid	(Acornsoft)
2	(2)	Planet Planetoids	(Acornsoft)
3	(—)	Sphinx Adventure	(Acornsoft)
4	(—)	Killer Gorilla	(Program Power)
5	(—)	Word Wise	(Computer Concepts)
6	(—)	Desk Diary	(Acornsoft)
7	(—)	Philosopher's Quest	(Acornsoft)
8	(10)	Chess	(Program Power)
9	(2)	Great Britain Limited	(Simon W Hessel)
10	(—)	View	(Acornsoft)†

*All BBC Model B only. †Rom chip.

(Figures compiled by Micro Management, Ipswich 0473 59181)

ZX81*

1	(1)	Flight Simulation	(Psion)
2	(3)	3D Monster Maze	(New Generation)
3	(4)	Chess	(Psion)
4	(2)	QS Scramble	(Quicksilva)
5	(6)	Catacombs	(J K Greye)
6	(7)	Galaxians	(Artic)
7	(5)	Space Raiders	(Psion)
8	(—)	Alien Dropout	(Silversoft)
9	(—)	Avenger	(Abacus)
10	(8)	10 Games for 1K	(J K Greye)†

*All 16K except where shown. †Runs in 1K.

(Figures compiled by W H Smith and Son Ltd)

Books

1	(2)	Vic Programmer's Reference Guide, *Commodore*	(Commodore)
2	(1)	Spectrum Rom Disassembly, *Logan*	(Melbourne House)
3	(3)	Spectrum Hardware Manual, *Dickens*	(Melbourne House)
4	(5)	Commodore 64 Programmer's Reference Guide, *Commodore*	(Commodore)
5	(—)	6502 Machine Code for Beginners, *Stephenson*	(Newnes)
6	(8)	6809 Assembly Language Programming, *Leventhal*	(Osborne)
7	(—)	Dynamic Games for your Dragon 32, *Hartnell*	(Interface)
8	(—)	The Working Commodore 64, *Lawrence*	(Sunshine)
9	(9)	Enter the Dragon, *Carter*	(Melbourne House)
10	(—)	Mastering the Vic20, *Jones*	(Sigma)

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

(Last week's position in brackets)

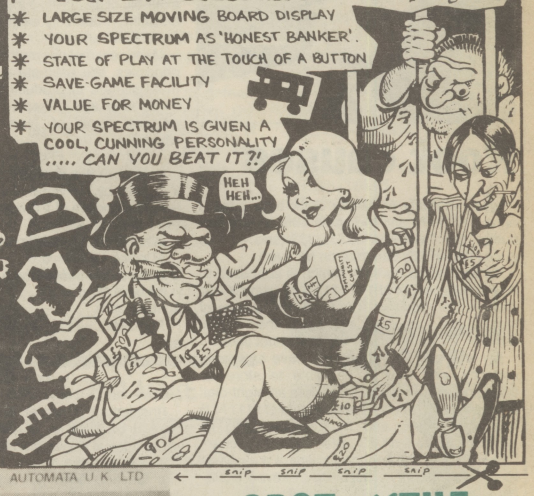
PIMANIA the best adventure game ever reviewed!



AUTOMONOPOLI we dare you to play against your computer!

FOR 48K ZX SPECTRUM (2 to 5 players)

- LARGE SIZE MOVING BOARD DISPLAY
- YOUR SPECTRUM AS 'HONEST BANKER'.
- STATE OF PLAY AT THE TOUCH OF A BUTTON
- SAVE-GAME FACILITY
- VALUE FOR MONEY
- YOUR SPECTRUM IS GIVEN A COOL, CUNNING PERSONALITY ..... CAN YOU BEAT IT?!





photograph courtesy of Cennis McHugh Photographic Co. Ltd.

SPOT THE DIFFERENCE COMPETITION

HERE IS A PICTURE OF THE "AUTOMATA" STAND AT A RECENT COMPUTER FAIR. THE OBSERVANT AMONG YOU MAY SPOT SEVERAL DIFFERENCES BETWEEN US & THE OTHER SOFTWARE HOUSES. PLACE THESE DIFFERENCES IN ORDER OF IMPORTANCE, BY WRITING THE NUMBERS '1' to '8' IN THE BOXES. FOR EXAMPLE, IF YOU THINK DIFFERENCE "D" IS THE MOST IMPORTANT YOU WRITE THE NUMBER "1" IN ITS ADJACENT BOX. OK?

DIFFERENCE	ONE FREE ENTRY WITH EVERY ORDER	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)	
B	Automata is committed to non-violent games. No killing, no conquering, no bombing.....just First Class entertainment.	
C	These back-page advertisements are rather silly, and may well get sillier. Don't we care about making pots of money?	
D	There are eleven-thousand red ourang outangs in Balkan dance costumes, just outside of camera range. Honest there are...	
E	There are no computers on our exhibition stand. Our games' reputations and their reviews seem to be all that's needed.	
F	We rather enjoy dressing up in bright pink combinations and Groucho Marx outfits, and then go exposing ourselves.	
G	There are a great many happy people with smiling faces in the photograph. This makes us happy too.	
H	We are pleased to meet our public face to face. We don't want to lose contact with our most important clients: you.	

HAVE YOU FILLED IN ALL THE NUMBERS? GOOD. NOW WRITE A SLOGAN FOR "AUTOMATA" THAT IS EVEN DAFTER THAN "WE PUT SOME TING IN COMPUTING" IN NOT MORE THAN TEN WORDS, and write it in the following space:-

.....

.....

Nobody has won the £6,000 Golden Sundial of Pi yet, and we can't wait to give something away, so £100 TO THE WINNER of our SPOT THE DIFFERENCE COMPETITION. All entries must be accompanied by your order, (we're not THAT daft), to be received by Tuesday July 5th. The winner's name will be published on this page, Thursday July 14. The judge's decision will be final. So make US laugh for a change.

DEAR AUTOMATA, DESPITE YOUR VERY SILLY ADVERTISING, I AM ORDERING THE FOLLOWING COMPUTER SOFTWARE FROM YOU.....

			tick
AUTOMONOPOLI	(Spectrum 48K)	@£6.oop	
PIMANIA	(Spectrum 48K)	@£10.oop	
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....