POPULAR Computing WEEKLY

35p 24-30 March 1983 Vol 2 No 12

This Week

Chess machines

John White looks at some of the latest chess machines to come on to the market and compares them with the "Big Three". See page 12.

Psion

David Kelly talks to Psion managing director David Potter. See page 10.

Spectrum m/c

Deborah Annette presents two machine code routines to control sound and print on the Spectrum on page 29.

Dragon games

Keith and Steven Brain explain how to add cursor control to your own programs in the last of their current series on Dragon games. See page 31.

★STAR GAME★
Escape on 16K Spectrum by John Durst. See page 8.

News Desk

Software companies fight Buy'n Try scheme

by David Kelly

BUY'n Try is the name of a program exchange scheme launched by the Software Centre on Friday March 11.

Commercial software for nearly every home micro can be bought from the London-based centre — either by mail-order or over the counter — and then repeatedly exchanged for other programs.

Any program returned within six months of purchase is bought back by the Centre for 80 percent of its original purchase price — this is given in the form of a discount against a subsequent purchase.

Some software manufacturers have condemned the Software Centre's scheme and are considering backing their complaints with legal action. One has already done so.



The first action has been taken by Quicksilva who applied to the High Court last Friday for a temporary injunction to stop the Software Centre from exchanging its tapes. The application — heard with only Quicksilva present — was turned down. As we go to press, another hearing, where the Software Centre will also be able to put its case, should take place on Tuesday March 22.

"I think we have a good chance to stop them," said Quicksilva's Managing Director Nick Lambert. "If we don't try, we might as well all pack up and go home now."

Weekly four-page advertisements from the Software Centre show over 300 titles on offer with material from Sin-

Continued on page 5

Classified

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Continued on page 34

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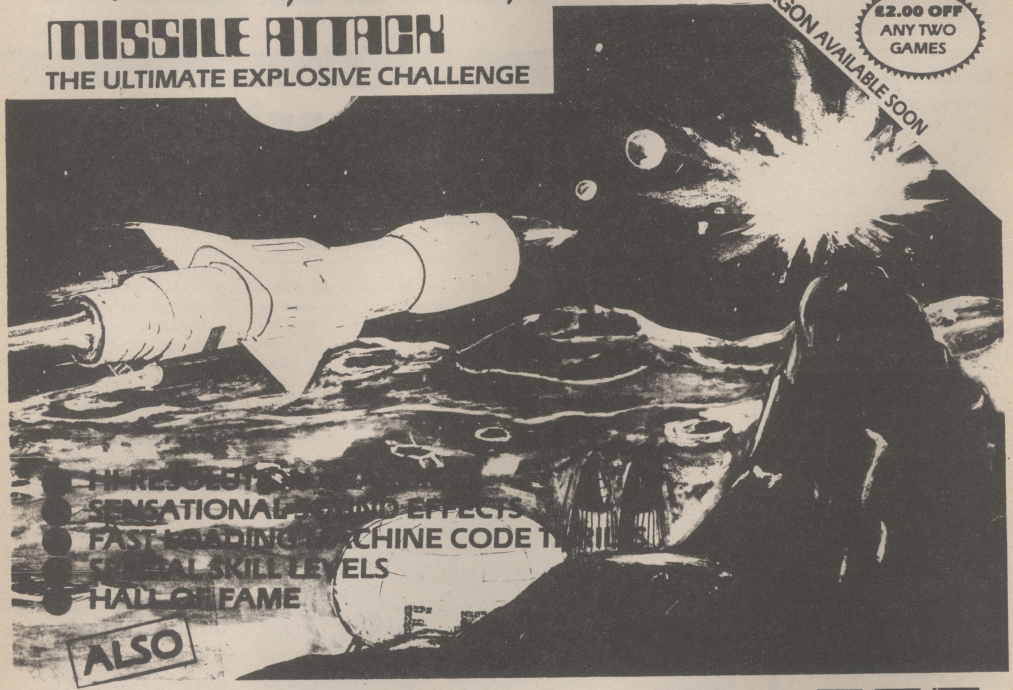
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POPULAR Computing WEEKLY

24-30 March Vol 2 No 12

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

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.

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Editorial

There can be few people now who fail to recognise ET. Even if you have not seen Stephen Spielberg's blockbuster film, there have been so many newspaper reports, posters and cartoons, that you would have to be a hermit not to have come across this friendly Extra Terrestrial.

However, the search for ET's home is not confined to the realms of cinematographic fantasy. The search for alien life is on for real.

Project SETI is a US-based operation designed to monitor the Milky Way for radio emissions of intelligent origin. Paul Horowitz of Harvard, part of the SETI team, has developed a prototype radio receiver which can be linked to a computer to distinguish between intelligent signals and natural radio waves. When linked to a radio telescope, the SETI system will tune in to 128,000 possible channels and should be able to pinpoint radio signals up to 1,000 light years away.

The US Congress has recently agreed to allocate project SETI $1.5m from within the 1983 NASA budget.

The search for alien life is not a new idea. But, this is probably the first time a computer has been used for such a purpose. If the search is successful, I will lay odds that the computer makes contact with another computer.

ET come home — all is forgiven.

Next Thursday

Can you avoid the rampaging lion, the ferocious hippo, and get from one side of the island to the other? Try it next week in April Fool Island — a new game for the BBC B by Nick Wilson.

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CENTIPEDE is a full colour machine code arcade game where the object is to defend yourself with your Laser against a fast moving centipede which weeves in and out of the mushroom patch. There are other versions of this game but we think you'll prefer ours because we always strive for an extra dimension of realism, which makes all the difference!
PAINTER, is another well loved Arcade game, here you must paint in between the numbers on a multicoloured screen before you have to overlap. Price for the Spectrum is **£5.00.**

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DRAGON

FIGHTER PILOT/ CITY BOMBER



FIGHTER PILOT is an ingenious program for the Dragon 32. It begins with a briefing session giving details of the fire attack waves and shows you pictures of the aircraft which include Messerschmidt and Junkers. You have to get the aeroplanes within your sights and shoot them down. There are five different screens including a parachuting sequence. It makes full use of Hi-Res graphics, colour and sound.
CITY BOMBER involves bombing buildings whilst your plane flies lower and lower towards them. All this for the unbelievable price of **£5.00.**

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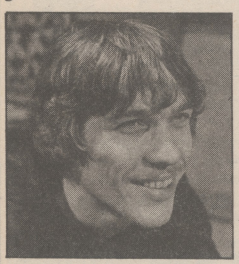
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Software Centre furore

Continued from page 1

clair Research, Commodore, Dragon Data, and just about every other major supplier.

Commodore UK's software manager, Gail Wellington said "A big commercial venture like the Software Centre could well put many smaller software houses out of business. We are big enough to take it, but it could well cause us to move into Rom software. For us that would be a very sad decision to have to make and it would very considerably increase the cost of our programs."



Nick Lambert of Quicksilva.

In addition to the mail-order facility, the Software Centre has a retail outlet for its Buy 'n Try service just off Oxford Street. Two more shops are planned in the next three weeks and the company is considering expanding as a franchise operation.

The exchange venture has been set up by Bill Cannings, founder of the Byte Shop chain, who formed a company called Computer Aided Systems in November 1979. "We have been planning the scheme for over a year," he said. "People who buy mail-order are often unhappy with what they are sent and for the first time we are offering people a chance to buy with confidence — if they don't like it they can send it back.

"I don't think there are even the same dangers to the software manufacturers as there are in normal retail selling — we make it very clear that all the material is copyright, which is more than most retailers do.

"It will be obvious if someone is copying tapes at home, because they will be turning them round every couple of weeks. In such cases we shall inform the manufacturers, though I don't know what they can do about it."

Don Malham is manager of the first Buy 'n Try store. He says: "We have had an incredible response from the public. Obviously we have had a certain amount of flack from some of the software houses, but they are battling upstream. They think their sales will drop. What we are discovering is that people are going for more expensive programs which they perhaps would not otherwise have bought.

"We will not make any money on a program until about the third or fourth sale," he commented.

Quicksilva claims that software for the Centre has been bought by Computer Aided Systems as a normal dealer, with no indication given that the Buy 'n Try offer was on the cards.

One possible method software houses will be considering combating the exchange deal involves the way the stock was bought. It is Quicksilva's hope that buying material without disclosing the fact that it was intended for exchange will nullify the original contract of sale.



Bill Cannings – Software Centre head.

This approach is being followed up by Bug-Byte. They have given the Software Centre seven days to return all stocks of Bug-Byte programs. If the Centre does not comply, Bug-Byte will also bring proceedings for an injunction.

Imagine's Dave Lawson was "horrified" when he saw the advertisements. "They pose such a threat that we don't care how much it will cost to stop them," he said.

Dragon Managing Director, Tony Clarke commented "We have sent the advertisement to our solicitors. We are totally opposed to any form of hiring.

"We are not seeking any sort of injunction at the moment, but we will be if the people involved do not take our advice and stop.

"There are games in their list that we have not even produced yet — *Breakout/ Middle Kingdom* for one."

A spokesman for Sinclair Research commented on Friday "As of this morning we are investigating." He declined to comment further.



Dragon to launch two computers in 1983

DRAGON Data plans two new major machine launches this year.

The machines will be aimed at very different sectors of the market and both will be more expensive than the existing Dragon 32 machine.

The lower priced machine will compete with the BBC Model B machine, according to Dragon's Managing Director Tony Clarke.

"It will have a lot more memory than the BBC," he said, "and in its high resolution mode it will still have 64K of user Ram for programming."

"With the BBC in its highest resolution mode you are down to only 3 or 4K of user memory," he added.

"We haven't costed it out fully yet, but we are hoping for a target price of under £400." Like the Dragon 32 the machine will require a separate TV or monitor.

The second machine will be substantially more expensive. "It will be a competitor for the IBM PC or Sirius," he said.

Dragon will offer this more up-market machine in a range of configurations — but all models will include built-in discs and a monitor.

The most expensive will feature a colour display and Winchester hard discs, and will have a price tag in excess of £3000. The least expensive option will be monochrome with floppy disc drives, and will sell for around £1200.

Rotten apples overturned

THE reversal of a 52-year-old court ruling by the Taiwan High Court has effectively cleared the way for Apple to continue its fight against so-called "rotten-Apples" — unauthorised copies of its computers.

This legal technicality, prohibiting certain foreign companies from initiating criminal proceedings in Taiwan, has previously halted Apple's attempts to take action against two companies, which, it was alleged, had infringed copyright in Apple computers.

● Apple (UK) has reacted to the proposed sale of an Apple software compatible microcomputer — the Peanut — reported in *Popular Computing Weekly*, March 10. Solicitors Clifford Turner, acting on behalf of Apple (UK), are investigating to see if the Peanut infringes patents or copyright registration on Apple computers.

CTA meeting

THE venue for the next meeting of the Computer Trade Association has now been fixed.

It will be at the Spider's Web Motel on the A41 at Watford (Junction 5 off the M1) on March 29 at 11 am.

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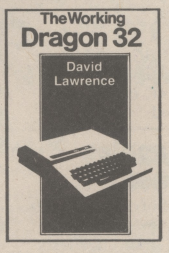
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The Working Spectrum

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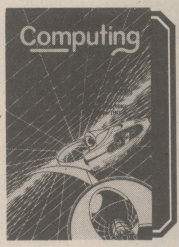
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The Working Dragon 32

This is a companion volume to The Working Spectrum and includes several new features such as a Text Editor and a Music Composer and Editor. Other programs help you use the Dragon 32 as an accountant, for more advanced high resolution graphics, as a home tutor for education and for playing games. Each of the programs and subroutines is explained line by line to help develop your own programming skills.

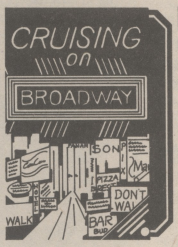
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Best of Popular Computing Weekly

Cassette
Four of the top Spectrum and ZX81 games from Popular Computing Weekly are recorded on this one cassette. The games are Laserchase for the 16K & 48K Spectrum, Kong's Revenge for the 16K & 48K Spectrum, Robot Control for the 16K ZX81 and Alien Attack, a Space Invaders type game for the 1K ZX81.

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Dragon/Tandy software converter

DECODE is a cartridge from Compusense which will convert software from the Tandy Color Computer to run on the Dragon 32 and vice versa.

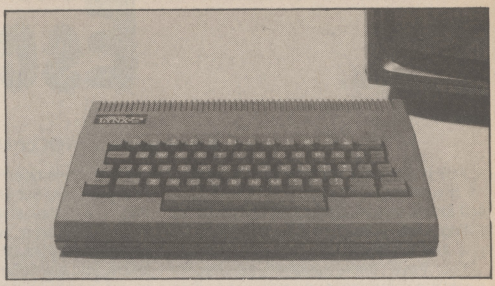
The two machines are internally very similar and both use the same version of Microsoft Basic. However, although programs keyed into either machine will Run, because of variations in the input/output routines, programs recorded on tape are not compatible.

The new *Decode* Rom offers a solution to this problem — giving the Dragon access to the wealth of software available for the Tandy in the US and also giving the Tandy access to British material being developed for the Dragon.

In both computers, Basic keywords are represented by a series of what are called 'tokens'. When a Basic word — for example, *Goto* or *Print* — is keyed in or read off tape, it is converted by the computer into a token, unique to that keyword. The problem with software conversion is that in some cases the two machines use *different* tokens to represent the same keyword. So when a program for one machine is read off tape by the other it sees the wrong Basic statements.

What the *Decode* cartridge does is to go through the program after it is loaded from tape and unscramble the tokens so that it will run.

Decode costs £18.95. More details from Compusense, PO Box 69, Palmers Green, London N13 5XA.



Lynx micros — production stepped up

LYNX microcomputers are now beginning to filter through to the shops, but the machine is still only available from a limited number of outlets.

"Dixons are still interested, but it is a bit academic with Laskys and Spectrum stores taking up our full production," said a spokesman for Lynx manufacturer Camputers.

Only 900 machines were manufactured in the month to the end of February. "Production is being stepped up, but it has taken rather longer than expected," he said.

Camputers has now sold over 2,000 Lynx machines.

Younger than he looks

WITH somewhat peculiar logic *The Guardian* has selected Clive Sinclair as Young Businessman of the Year.

Clive Sinclair, who is 42, founded Sinclair Research only four years ago. The company turned in profits of over £13m last year and, following a recent shares issue, his personal stake in the company has been valued at almost £130m.

He is the 13th person to receive the award, given each year in acknowledgement of a significant contribution to British business.



Mattel adopts aggressive approach to software market

MATTEL is showing signs of a new aggressive approach to the software market.

In late May, the company will launch a range of software titles for the Atari 2600 games machine.

"What we intend to prove is that we can write the best software," said Mattel's European Marketing Manager, Peter Fitters. "We are making sure of the future — when people begin to consider buying a new machine we want them to think of us."

The decision to launch a range of Atari programs is a development of an earlier scheme in the US called M-Network.

Like Atari, Mattel has been hit by competition in the video games market. It made a £13.5m loss in the financial quarter to the end of January.

Trans-atlantic exchange

MANCHESTER-based Terminal Software has concluded a product exchange deal with Microdigital of Webster, New York.

Under the arrangement, the American company has an exclusive right to distribute Terminal's *Skramble* and *Gridder* Vic20 games in the US. In return, Terminal will soon be distributing Microdigital's *Pinball* game, also for the Vic20.

Free ports boost to micro industry

THE decision to allow a number of British free ports, announced in the Budget last week, will give a boost to the UK microcomputer industry.

By accepting the recommendations of a recent Treasury working party report that two or three experimental free ports should be established, the Chancellor Sir Geoffrey Howe has given British manufacturers a chance to make their goods more competitive overseas.

At present companies assembling microcomputers in this country must pay a 17 per cent import duty on semiconductor chips. This duty has been heavily criticised and has been the reason for many UK companies manufacturing overseas. Acorn's Managing Director, Chris Curry, for example, has called it "thoroughly unacceptable".

By setting up free ports the government has provided a loop-hole. No duty will have to be paid on goods imported — providing they are subsequently exported.

What has still to be decided is the number of free ports that will be allowed, and their locations.

In a letter to *The Times* in February, Clive Sinclair argued for the setting up of a free port in Dundee, where his ZX81 and Spectrum machines are manufactured by Timex.

● In a separate Budget announcement the government pledged an additional £15m over the next three years to its software development grants scheme.

Game designers, not programmers

REDSHIFT is a new software house — with a different approach.

"We are the only company made up of games designers, not programmers," explained the company's Julian Fuller.

Three titles have so far been released by the North London group: *Time Lords*, *Shiva Inferno* and *Murder Ball*. Each has been developed from original board-games designed by Redshift.

Julian, who studied board-game design at college, commented: "We have a great dislike of arcade games — the micro is being done to death by people producing ever more complex versions of *Space Invaders*."

Redshift can be contacted at 12c Manor Road, Stoke Newington, London N16.

Escape

A new game for 16K or 48K Spectrum by John Durst

You have just jumped over the wall of the dreaded Stalag ZX and find yourself in the bottom right-hand corner of the Killing Area — the free fire zone between you and freedom.

You have been roughed up by the appalling Hardwehr guards and their murderous dogs, which have taken some nasty bytes out of you: bits are falling off you all the time. You have only a short time to reach help before the final Reset button in the sky is pressed . . .

There are four fences between you and your Resistance friends. (If you can once reach the Resistance, you will be Ohm and dry.)

Holes have been cut by the Resistance in the fences, but you do not know where they are. Meanwhile, the Hardwehr are raking the area with searchlights and machine-gun fire. If you get caught in the beam, you are done for — but you depend on the light to spot the holes in the fences. Your only chance is to jump into one of the round pits, scattered around the terrain; if you are in one of them, the searchlight cannot pick you out.

You stumble, crouching, on your way — helped by the keyboard cursors . . .

Notes

The game is in the form of a loop, between lines 40 and 330. For half the time, the "searchlight" (line 50, 3) is on; for the rest of the time (line 60, 3) it is off. The loop cycles 40 times in this period, at each cycle sampling the keyboard (Lines 100, 110, etc) for the player-symbol's moves, made at line 90. Blotting out of previous positions is done at lines 220, 320, 325.

Every 40 cycles, when X=0, the loop jumps back to line 40, which sets up a new "searchlight" position. This is coded in lines 120, 230 and 330.

Jumping into holes and stopping movement through the fence is done using *Screen$* at those lines where the symbols appear. The loop has to be as short as possible, so that the game does not become hopelessly slow.

Lines 1000 to 2510 look after initialising and final results. The little man is set up, as a UDG in Lines 1200 and 1230. ■



```
  1 REM      ESCAPE!
    ¦
  2 BORDER 1: PAPER 1: CLS
  3 DIM e$(32)
  5 LET x=0: LET t=20
  6 LET l=20: LET c=31
 10 GO SUB 1000
 40 LET y=3*INT (RND*6)+1
 50 LET x=x+1: BEEP .01*(x>
=20),-10: IF x=20 THEN PRINT
OVER 1; INK 8; PAPER 7;
BRIGHT 1;AT y,0;e$;e$;e$
 60 IF x=40 THEN LET x=0:
LET t=t-1: PRINT AT 0,12;
INK 7;t;" ";AT y,0; OVER 1;
INK 8; PAPER 1; BRIGHT 0;e$;
e$;e$
 65 IF t=0 THEN GO TO 2200
 70 IF SCREEN$ (l,c)="O"
THEN PAUSE 2: GO TO 100
 80 IF ATTR (l,c)=126 THEN
GO TO 2000
 90 PRINT AT l,c; PAPER 8;
BRIGHT 8; INK 6;"A"
 100 IF INKEY$="5" OR
INKEY$="8" THEN GO TO 200
 110 IF INKEY$="6" OR
INKEY$="7" THEN GO TO 300
 120 GO TO 50-10*(x=0)
 200 IF SCREEN$ (l,c-(INKEY
$="5")+(INKEY$="8"))="X"
THEN GO TO 220
 210 LET c=c-(INKEY$="5")
+(INKEY$="8")
 215 IF c=0 THEN GO TO 2500
 217 IF c>30 THEN LET c=30
 220 IF SCREEN$ (l,c+(INKEY
$="5")-(INKEY$="8"))<>"O"
THEN PRINT PAPER 8; BRIGHT 8;
AT l,c+(INKEY$="5")-(INKEY$
="8");" "
 230 GO TO 50-10*(x=0)
 300 IF SCREEN$ (l-(INKEY$
="7")+(INKEY$="6"),c)="X"
THEN GO TO 320
 310 LET l=l-(INKEY$="7")
+(INKEY$="6")
 315 IF l<2 THEN LET l=2
 317 IF l>20 THEN LET l=20
 320 IF SCREEN$ (l-1,c)<>
"O" THEN PRINT PAPER 8;
BRIGHT 8;AT l-1,c;" "
 325 IF SCREEN$ (l+1,c)<>"O"
THEN PRINT PAPER 8; BRIGHT
8;AT l+1,c;" "
 330 GO TO 50-10*(x=0)
1000 PRINT AT 0,0; INK 7;
"SETTING UP..."
1005 FOR i=0 TO 3
1010 LET q1=1+INT (RND*3):
LET q2=7*INT (RND*3)
1020 LET g=3+INT (RND*15)
1030 FOR j=1 TO g-1: PRINT
AT j,i*7+q1; INK 1;"X":
NEXT j
1040 FOR j=g+2 TO 21: PRINT
AT j,i*7+q1; INK 1;"X":
NEXT j
1080 NEXT i
1100 FOR j=1 TO 20
1110 LET x=INT (RND*25)+2:
LET y=INT (RND*18)+1
1120 IF SCREEN$ (y,x)="X"
THEN NEXT j
1150 PRINT AT y,x; INK 0;"O"
1160 NEXT j
1200 DATA 192,248,60,28,124,
72,207,0
1210 FOR j=0 TO 7
1220 READ d
1230 POKE USR "A"+j,d: NEXT j
1240 PRINT AT 0,0; INK 7;
"Time left:
1250 RETURN
2000 PRINT AT l,c; OVER 1;
FLASH 1; PAPER 2;" "
2020 FOR j=0 TO -20 STEP -1:
BEEP .005,j: NEXT j
2030 PAUSE 100: PAPER 7: CLS
: PRINT AT 10,0;"The guards
got you!"'''"Your time was ";
20-t
2040 PRINT AT 19,0;"""ENTER""
for another go..."
2050 INPUT y$: RUN
2200 PAPER 7: CLS : PRINT AT
10,0;"TIME HAS RUN OUT!"''
"You die of exhaustion..."
2210 GO TO 2010
2500 PAPER 7: CLS : PRINT AT
10,0;"You got away!"''"You
beat the guards!"''"Your time
was ";20-t
2510 GO TO 2010
5000 SAVE "escape" LINE 5010
5010 RUN
```

House of the rising Psion

***David Kelly** talks to Psion's managing director, David Potter.*

Last week Psion announced the sale of its millionth cassette tape. Not bad for a company formed less than three years ago — with an annual turnover that is now more than £5m.

Yet Psion keeps a fairly low profile — it does not court publicity and its exclusive agreement with Uncle Clive has meant the Sinclair banner dominates the packaging of their cassettes.

Reformed academic David Potter started the company up from scratch in 1980. Previously a lecturer in Microcomputer Applications at the University College of Los Angeles and Imperial College, London, David — now in his late thirties — was drawn by the energy of a new industry. "I think it is hugely exciting — computers used to be locked away for only an elite to understand — now everyone will have one. I think it is tremendously rewarding to be involved in that process and I thought it was about time I got my hands dirty!"

Psion originally produced some material for the Acorn Atom. Then came the first Sinclair programs. "We did quite a lot of stuff in the early stages for the ZX81 which was marketed mainly abroad — in Australia, France, Israel and Canada.

Psion also has a sales and distribution arm in Southern Africa. "We are the second biggest microcomputer distributor in South Africa, Zimbabwe and Botswana.

"Psion is still a very young company. Several students came with me from Imperial — and on the software side we now have a very powerful team using facilities which, I believe, are second to none."

The company now employs 16 full-time programmers — many of whom have outstanding academic careers behind them — three PhDs and five with first class honours degrees. Their specialist areas vary considerably: graphics, programming, electronics data-storage.

"I think, in contrast to some other software houses, we are a highly professional team — we don't have their schisms!"

It is certainly true that few companies can boast the programming facilities offered at Psion. The first floor of Psion's headquarters — a smallish mews warehouse just off Baker Street — is dominated by the minicomputer system used for programming. The whirr of its air-conditioning lends the white-walled room the feel of a laboratory.

"I'm sad to say we don't develop software on micros — we use our Vax system." This — a 32-bit Digital Vax II/750 costing over £130,000 — is a 10-terminal, time-sharing system with 121 megabyte hard disc storage and has been the most significant investment for Psion.

"On it we have specialised software that can simulate most of the common microprocessors. We can even simulate the working of a chip while it is still in the designer's mind and develop software for a new machine before its launch!

"We can target the machine-code written on the Vax down into the microcomputer. In the States Microsoft has this type of facility, but I don't know of anyone in the UK who does.

"To assemble our *Flight Simulation* program on the Spectrum in machine-code takes about an hour. To do the same thing on the Vax takes less than a minute." When the code is loaded from the Vax to the Spectrum and run it is controlled from the Vax. "You can actually interrupt the Spectrum from the Vax keyboard and reload from the Spectrum into the Vax to find out what is going wrong. In this way the program is very far advanced before it is tested in the actual environment of the Spectrum.

"With the Vax system we are not restricted to writing in machine-code either. Where speed is not essential in the running of the program, we can write in a high-level language. We like *C* for example. The code in *C* is then portable — whatever code we write can be applied to machines with different processors: Z80, 6502 or 68000 even."

As a result of the early ZX81 material which Psion produced and was marketed by Sinclair, the two companies now enjoy a close relationship.

"Programming is in our blood — we are code junkies!"

"We have an exclusive agreement with Sinclair — it has sole marketing rights to our ZX software. Psion has a good and strong relationship with Sinclair. We have gone out of our way to produce a very wide range of software, both for the ZX81 and the Spectrum, at the soonest possible moment. This has helped Sinclair by providing an early software base and it helps Psion by giving us a wide distribution."

The first Spectrum for software development went to Psion. "We were working at the earliest stages on the Spectrum — we had a huge amount to do." The first thing Psion wrote was the *Horizons* welcome tape. "That was at Sinclair's suggestion and it is one program we feel very pleased about.

"Apart from *Horizons* we have to produce a whole range of 11 or 12 items — games and utilities — within a very short space of time. At that time we didn't have the programming capacity, so we suggested to Melbourne House that they might like to participate. At that time we conceived a game which turned out to be



Hungry Horace and Melbourne House implemented the code in consultation with us."

Psion does not use any freelance programmers — all the software is developed in-house. "We are a wildly enthusiastic company," says David. "Nobody has ever left Psion — programming is in our blood — we are code junkies!"

Software development is carried out in groups — typically three with a project leader. The detailed design — as far as possible *a priori* for each product — is conceived by the more experienced members of the company. A team is then selected for the actual programming. "As the program evolves, the project leader oversees the detailed execution of the software. Everyone inside the company gets a chance to see it and put in their ideas. Nobody is writing in a void — the feedback is essential.

"One of the things we are always trying to do is to extend the limits of the software as the hardware develops. When the Spectrum came along it was suddenly possible to implement ideas previously considered unworkable — *Vu-3D* or the Spectrum version of *Flight Simulation* could not have been contemplated on the ZX81.

"That is how we get a lot of our ideas — the approach is 'Here is the hardware. Now, what can we do on it that would have seemed crazy before?' "

Psion has recently concluded a licencing agreement with Spears to produce a home computer version of *Scrabble*. "That's an example of the sort of project that wouldn't have been possible on the ZX81. For a start the program needs a dictionary of 10,000 words. The challenge is how to get 50,000 letters into a 48K Spectrum — not to mention the board display on the screen and the complex logic needed for the move generators.

"Yet our *Scrabble* version is going to be better than the Apple version — even with its disc storage — and have a dictionary substantially greater than 10,000 words.

"When we come up with an idea there are two important questions: What ingredients, from the user's point of view, make it an exciting game — reactivity, 3-dimensionality, strategy — and what is possible within the constraints of the hardware?

"*Space Invaders* is a good early example of reaching the best compromise — it is exciting to play and technically the game was easy to program because the invaders move in rows in a regular fashion. Random motion is much more difficult — and a Horace-type game is even more so.

"That the hardware is still developing at such a fast rate — and therefore that our products become out of date — is good. I think it would be very boring if the hardware stopped moving forward because on the software side it would no longer be possible to be creative and innovative.

"We have a whole range of Horace games"

"It will be very interesting to see where software will go in the future. My own view is that there are a whole range of game-types which in turn verge on education and on business — adventure games and simulations. And things from artificial intelligence which we can learn are very important — programs which understand English and have a dialogue with the user. In-house we have a program called *The Psychiatrist* based on Chomsky's idea that syntax is more important than semantics.

"All it does is ask you questions based on what you have already told it. It seems remarkably intelligent — of course it's a trick, but it tells us a lot. There is a whole range of artificial intelligence material that we can use in games.

"Reactive, strategic adventure games — combining the basic features of adventure games in real-time with graphics. Having to think on your feet. This kind of thing is only just becoming possible.

"Also it is a step along a long road that *Horace* has taken — interactive cartoons — Mickey Mouse where you are *actually* Mickey. We have a whole range of *Horace* games coming along. He has a chance of turning into quite an important character. I want to see him on a billboard somewhere — up in lights — or maybe on the milk bottle brought in to breakfast by the kids.

"The earliest computer games were a development from the arcades — with a big element of killing stuff from outer space. That has a place but I would be horrified to see that as a main stream. I don't think killing is a creative area! And less enduring too. People go on wanting to play a game like *Flight Simulation* because it has some subtlety. The book equivalent of a space-zap game would be like a Mickey Spillane novel — pretty hard to read more than once. We have also shown that there is a big market for applications software — *Vu-File* or *Vu-Calc*. *Vu-File* is the top US seller for the TS1000.

"It is the challenge of doing something well, I suppose, which is attractive. Without being pompous about it, we are an expanding company, we are getting people working and we export a huge amount. We are part — and pleased to be part — of one of the few industries that is growing.

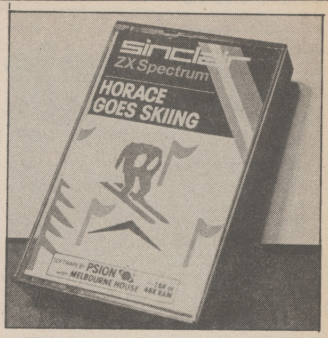
"Shortly we will sell versions of our *Vu-File* and *Vu-Calc* programs for the BBC machine. And a very major part of our effort at the moment is work on an integrated suite of business applications packages. Also we will continue to push the Spectrum.

"We have grown up in a modest span of time and we suffer growing pains like anybody else. We have a lot to do and we must pick and choose our projects. We would dearly like to do material for the Dragon. But it is better to do just a few things really well.

"Even in the last nine months, everything has moved on significantly. You need a lot of capital — the Vax, for example — and a very high degree of skill at every level of the company.

"Sinclair, for all the criticisms, has done well. He is the dominant force in Britain. In the US there are four companies — Timex/Sinclair, Atari, Commodore and Texas Instruments — all pretty substantial organisations. There is a real fight developing and it looks now like Texas has a policy of selling at a small loss to gain a market share.





"Psion has a close relationship with Timex. Our TS1000 software has done extremely well over there. Our impression was that the TS2000 was coming out in April — but now it looks as if it has been delayed until the middle of the year — and we will lose a lot of the market. The Spectrum is a tremendous machine — but it will not always be so. In a couple of years it will be superseded.

"One of the great strengths of Sinclair has been its ability to move very rapidly — and this is why the likes of Sinclair and Apple have been the forerunners and not Timex and IBM. They cannot move fast enough.

"For ourselves, we intend to become the Microsoft of Europe — that is the way we want to proceed. We intend to be in there producing good programs and flights for a long period of time yet.

"As part of that commitment, we have just set up a new company — Psion Processors — which will develop dedicated software for specific hardware applications. As hardware becomes cheaper and cheaper it makes sense to have machines for dedicated purposes. I think we will see big changes in the next five to six years.

"Our whole approach is a disciplined one but we are still small so we don't have bureaucracies, hierarchies or that sort of nonsense. Everyone has a sense of involvement and works hard. But there is the freedom to work at any time — people can be in here working at two in the morning — and sometimes they are!

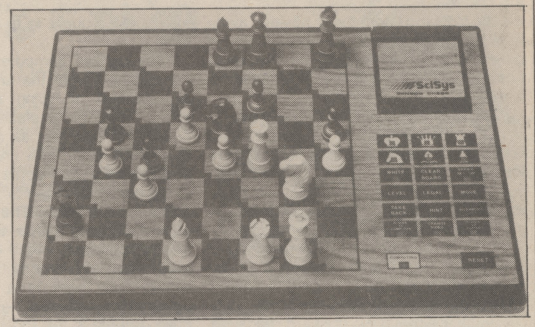
"We will stop being interesting as a company if we lose that good feeling — that sense of involvement. Frankly, for myself, I have never had so much fun in my life before.

"When I did my PhD, I used an English Electric KDF9 computer which took up the whole room and had to be protected from dust, temperature variations and humidity changes. Now the 48K Spectrum is very close in power to it. You could say I've been through the mill!

"I don't write much of the code anymore — and I miss it. I am very knowledgable of both hardware and software — but not with that honed edge. That worries me. My worth will disappear when I no longer realise just what it is possible to achieve. If I lose that I'm not much use." ■

Check-mate!

***John White** looks at some of the latest chess machines and compares them with the "Big Three".*



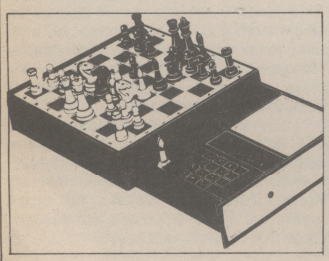
In March 1982, the Silica Chess Computer Symposium pitted two teams of human players against the best chess computers that were then available, the *Champion Sensory Challenger,* the *Chess Champion Mk V* — Philidor program — and the *Great Game Machine* with Morphy, Grunfeld and Capablanca cartridges. The *Champion Challenger* performed best, with a British Chess Federation grading of 133, the others obtaining a highly respectable grade of 122-124. An *Elite Challenger* also made a brief appearance — it did not play enough games for a grading, but scored an amazing 70 per cent success rate in five games.

Since last March, a number of new chess machines have been launched to challenge the dominance at the top end of the market of the "Big Three" machines for playing strength.

The *Mephisto II* is manufactured by the German company Hegener and Glaser and is a continuation of the older model I. *Mephisto* was launched in a blaze of publicity suggesting that it was the strongest machine on the market, a claim essentially based on games between itself and other computers. The basic price is only £200, although it is also possible to plug the machine into an electronic sensor board for an additional £250.

The *Mephisto* unit is well constructed and offers all the normal facilities that one expects these days, including a book opening library. In addition, the machine will randomly select between moves of roughly equal merit, has a quiet beep tone and permits memory storage of positions, using battery or mains operation. There are seven normal playing levels, which take from a few seconds to 20 minutes, a deep search for postal chess and a special mate-finder, which can find mates in up to five moves.

The program "thinks" while its opponent is making his move, and can provide hints for human players. *Mephisto* is undoubtedly one of the new generation of "superfast" chess computers. It searches to a depth of four half moves at tournament speeds, searching deeper into some lines and in the end-game. A minor omission is the "chopper" mechanism which ensures that automatic moves — ie, where only one legal move exists — are made at once. *Mephisto* examines all the consequences of its one move before making it.



Mephisto contains 280 opening lines. This compares with the 490 lines in the latest Grunfeld opening cartridge used with the *Morphy* program, or the nominal 64 opening lines of the *Champion Challenger;* the actual number of lines depends on how you count the sub-variations. *Mephisto's* openings can be selected in a somewhat tedious manner (it is easier with Grunfeld or CSC), and the opening lines are mostly traditional ones, rather than the odd lines found, for example, in the *Champion Mk V.* Overall, the opening library is good, and the sensor board adds a further 40 lines.

Mephisto's tactical play is very strong. It passes my standard test positions with flying colours, with one of the best scores I have yet recorded. These tests measure the effectiveness of the operating system, and the speed and depth to which the program looks in mid and end-games.

Mephisto's mid-game positional play is somewhat suspect; probably the evaluation function needs improvement. It made some weak moves at tournament speeds, including some inane king moves. *Mephisto* is also prone to suffering from isolated doubled pawns, a severe strategic weakness.

Mephisto is unusual in preferring bishops to knights — Morphy is the only other major program with this preference. The others prefer to swap their bishops for enemy knights; in the case of the *Challenger,* generally at the first opportunity.

Mephisto generally performs pretty well in the end-game, being a little better than the Morphy end-game and a little worse than Capablanca. *Mephisto* cannot win the standard king-bishop-knight versus king ending; as far as I know the *Champion Mk V* is the only program which can.

In tournaments against humans under the standard conditions of the Silica Chess Computer Symposium, *Mephisto* has done much less well then the "Big Three". But it can still be recommended as a very strong program at a moderate price.

After various tribulations, the Hong-Kong based Novag's products are now distributed in the UK by Studio Ann Carlton, who also handle the *Great Game Machine.* The present Novag range consists of *Microchess,* a small portable machine, the *Sensory IV,* an 8K program very similar to the Sci-Sys *Sensor Chess,* and the top of the range *Savant.*

The *Savant* uses a 24K program, developed from the American David Kittinger's famous *Mychess* program, with 4K of Ram for calculations. The central CPU is a Z80A running at 6MHz, faster than any of its competitors.

A very important feature is the unit's large, touch-sensitive, LCD chess board. All the pieces are displayed under a piece of clear plastic. Touching the location of any piece and a second square will move the piece to that square.

On the sample I tested, this worked very well, but I noticed two disadvantages. First, the human has to hunch over the display to avoid parallax problems in seeing the pieces. Secondly, light shining in from a window may obscure part of the screen.

The *Savant* offers all the standard features expected of a modern chess computer. It can search to a depth of 14 ply at the highest levels and gives good results playing at normal tournament speeds. There are 10 levels of play, with random selection between moves of equal merit.

"Thinks" while it is waiting

The *Savant* "thinks" while it is waiting for its opponent to move and can give hints as to what you should do. Other features include a *Cmos* memory, which will store moves without a power supply for up to three months — the *Savant* can demonstrate "Classic Games" played by grandmasters similar to the "Great Games" offered by the *Champion Challenger.*

The book opening library is quite good with 850 moves — although not in the same class as its main competitors — and the program will find forced mates in up to seven moves. Optional extras include a chess printer for the moves and a quartz chess clock which will also serve to monitor play between two humans.

The standard of play is very good, but,

like *Mephisto II*, not quite in the same class as the "Big Three". In fact, the *Savant* is also a little weaker than *Mephisto*, and is therefore the weakest of the "First Division" chess computers. In the end-game, the *Savant* permits pawn promotion to a knight as well as to a queen, unlike most of its competitors.

At £400 it is difficult to recommend the *Savant*, unless you are keen on the touch-sensitive LCD board. Readers should note that an earlier and weaker version of the *Mychess* program is also available for the Tandy and Apple microcomputers.

Sci-Sys W's *Sensor Chess* — £90 — consists of a 4K program in a replaceable Rom module, fitted into a sensory board with a fast 6502 microprocessor. Designed by the American Master Julio Kaplan, it offers eight levels of play, one of which solves mate in up to four move problems. The top normal playing level is level five, which takes an average of 2-3 minutes per move, although captures tend to be much faster. It is very likely that the program uses a different operating system to that employed by the other programs, only sketchily evaluating the higher levels after a detailed evaluation at the lowest level.

Pawn promotion can be to any piece and the machine recognises draws under the three-move repetition and 50 move rules. Most of the normal chess computer facilities are offered, but a timer is lacking, as is a move counter, an indication of the move the machine is thinking about and the ability to think on the opponent's time.

The basic module has no book openings, but will choose randomly between a few different opening moves. The module is rather a good one and its end-game play, although not outstanding, is superior to that of many similar-priced competitors. The advance of pawns is quite accurate throughout the game and the king becomes very active at the end.

The play can be improved by purchase of replacement modules. At present, these include *Hypermodern* and *Classical* — £20 each — and *Strong Play* — £15. The first two contribute a variety of shallow book openings and slightly alter the style of the play of the basic module, but otherwise there is little difference.

Strong Play, however, is a 6K program which contributes a series of book openings and greatly improves the end-game play. This module is a marked improvement over the other three and represents the strongest play presently available from a machine up to £120. It has been claimed to be as strong as the Morphy program, standing alone in the Morphy Encore, on the dubious basis of games between them. This claim is not substantiated by its performance in my tests and by play against me; Morphy is markedly stronger.

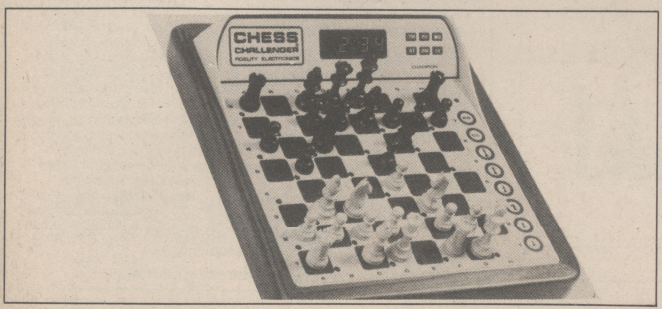
During play, *Strong Play* is somewhat prone to suffering from doubled pawns and resembles Morphy in its preference for bishops over knights. It cannot win the standard king-bishop-knight versus king ending, but deals comfortably with a king-rook versus king ending.

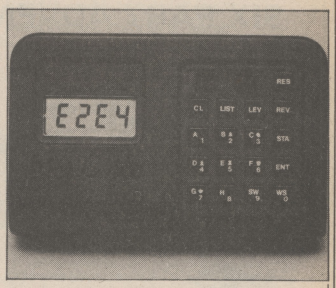
The sensor board of *Sensor Chess* is quite sensitive, but slow to react. Overall, *Sensor Chess* with *Strong Play* module must be accounted very good value indeed at £105. A good "second division" program.

The *Elite Challenger* is a magnificent Fidelity-Spracklen (Sargon-derived) program, very similar to the *Champion Challenger* but running at twice the speed with a 4 MHz 6502B CPU. Physically, the machine also closely resembles the *Champion*, except for the *"Elite"* logo, a few more book openings and a slightly improved program. The *Elite* scored a 70 percent success rate in the Silica Symposium against human players graded at BCF 110-160. But — the price at £680 is ridiculous.

Lacks the infamous Fidelity voice

The *Elite* was always in limited supply, and is now set to be overtaken by Fidelity's new *Prestige Challenger* at £860 which employs the superb auto response board — a hand-crafted wood unit — with an updated *Elite* program. The *Prestige* uses a 6502C microprocessor. I do not have space for all its features, but they are very comprehensive, and the program is modular so that it can be improved in the future. An interesting feature of the new *Prestige* program is its dynamic reassessment of the relative values of knight and bishop as the game proceeds.





The existence of Fidelity's *Challenger 9* makes the price of the *Elite* even more absurd. At only some £160, a program virtually indistinguishable from the *Elite's* has been coupled with a sensory board and a 6502 CPU to give the *Challenger 9*. This machine plays much the same as the *Champion Challenger*, with a slightly improved program and with a good book opening library, which can be increased by inserting extra plug-in modules. But it lacks the infamous Fidelity voice found on the more expensive models.

The *Challenger 9* undoubtedly offers the best strength play for the least price of any machine presently on the market; it has no real weaknesses. Potential buyers should note that *Challenger* programs tend to be the most obviously machine-like of chess programs, as well as the strongest. In a quiet position, the program will often just move a piece backwards and forwards. However, their tactical play is second to none and the end-game play of all Spracklen-designed *Challenger* programs is outstanding.

Conclusions

★ The *Prestige Challenger* is the strongest on the market. At £860, it can only be recommended to millionaire grandmasters.

★ The *Champion Sensory Challenger* is still one of the best machines available. At £330, the purchaser gets a sensory board and the Fidelity Voice.

★ The *Challenger 9* is outstanding value at £160. It lacks the voice of the *Champion* and also has no chess clock.

★ Sci-Sys W's *Chess Champion Mk V* — £280 — remains a very strong machine, and a new *Mk VI* program is available for existing purchasers on a replaceable cartridge.

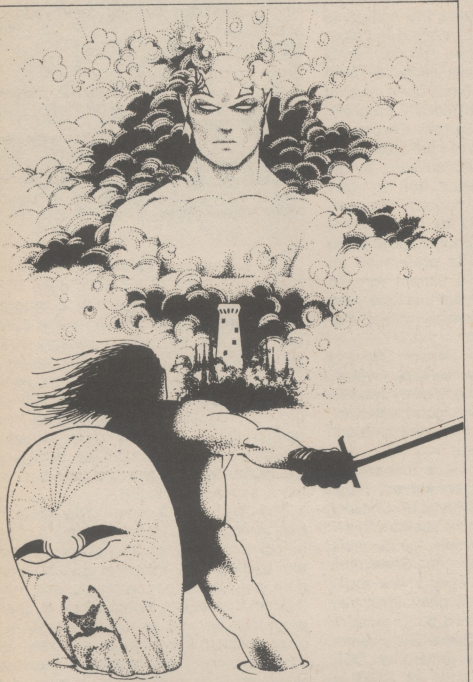
★ The *Great Game Machine* with upgraded opening and end-game modules is still one of the top machines, but rather pricey at around £470.

★ The *Mephisto II* — £180 — is good value at the price, but weaker than the machines above.

★ The Novag *Savant* — £400 — has a touch-move board display, but is rather expensive for the standard of play.

★ Sci-Sys W's *Sensor Chess* with *Strong Play* module is excellent value at only £105.

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Blitz

on Spectrum

The object of the game is to bomb the buildings by pressing any key to land safely. If you do this you are given another city to bomb.

Hint: Bomb the larger buildings first, don't lean on the keyboard.

Variables

u–If bomb is dropped u=1 if no u*0
s–Score hs–High Score
t,r–Line and column of plane
c,d–Line and column of bomb
j–no of parts of a building destroyed by a bomb

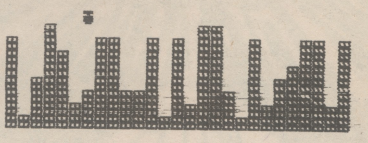
Program notes

20-210	Main program loop, prints plane and bomb
1001-1050	Prints random height buildings
2000-2060	Moves bomb
3000-3010	When plane crashes prints flashing plane
5000-5040	Prints instructions
6000-6060	Prints landed plane
6100-9040	Sets up user definable graphics
Lines 30, 3000, 6000;	user graphics a,b,c for plane
6020, 6040;	user graphics m and n
50;	user graphic o
1030	user graphic h

```
Spec Blitz © Peter Holt

   1 PAPER 5: INK 1: BORDER 5: L
ET u=0: LET s=0: LET hs=0
   2 GO TO 5000
   5 GO SUB 1000
   6 LET j=0
  20 FOR t=1 TO 20: FOR r=1 TO 2
9
  21 IF u<>1 THEN LET c=t+1: LET
 d=r
  25 PRINT AT 0,1; INK 0;"SCORE
";s;TAB 18;"HIGH SCORE ";hs
  27 IF ATTR (t,r+2)<>41 OR ATTR
 (t,r+1)<>41 THEN GO TO 3000
  30 PRINT AT t,r-1;" "
  31 BEEP .003,0
  32 IF u<>0 AND c<>21 THEN PRIN
T AT c,d;" "
  35 IF u=1 THEN LET c=c+1
  37 IF c=21 THEN LET u=0
  38 IF c=21 THEN LET j=0
  40 IF c<>21 AND t<>20 AND INKE
Y$<>"" THEN LET u=1
  45 IF u<>0 AND c<>21 AND ATTR
(c,d)<>41 THEN GO SUB 2000
  50 IF u=1 THEN PRINT AT c,d; I
NK 2;"■"
 200 NEXT r
 210 PRINT AT t,29;"   ": NEXT t
 220 GO TO 6000
1000 GO SUB 7000
1001 PAPER 5: INK 1: BORDER 5
1002 CLS
1003 PRINT AT 21,0; PAPER 6;"
1010 FOR i=3 TO 29
1020 FOR e=20-INT (RND*8) TO 20
1030 PRINT AT e,i; PAPER 6; INK
0;"■"
1040 NEXT e
1050 NEXT i
1060 RETURN
2000 LET j=j+1
2010 IF j>(3+INT (RND*3)) THEN L
ET j=0
2015 IF j=0 THEN LET u=0
2020 IF j=0 THEN RETURN
2040 LET s=s+1
2060 RETURN
3000 PRINT AT t,r-1; FLASH 1;"■
■"
3010 BEEP 5,2
3020 GO TO 5000
5000 PAPER 7: INK 1: BORDER 7
5010 CLS
5015 PRINT AT 19,7;"YOUR SCORE
";s
5017 IF s>hs THEN PRINT '"
A NEW HIGH SCORE"
5018 IF s>hs THEN LET hs=s
5019 LET s=0: LET u=0
5020 PRINT AT 0,10;"B L I T Z";
INK 2;TAB 10;"---------"
5030 PRINT ,,,,,, INK 2'"You mus
t bomb the city to land
                        Press a
ny key to drop a bomb.
                        If you
hit one of the buildings
                        you wil
l be killed instantly !!"
5032 PRINT ,,, INK 1'" PRESS A
KEY TO PLAY BLITZ "
5035 IF INKEY$="" THEN GO TO 503
5
5040 GO TO 5
6000 PRINT AT 20,27;"■■"
6010 FOR q=1 TO 10
6020 PRINT AT 20,27;"■"
6030 PAUSE 40
6040 PRINT AT 20,27;"■"
6050 PAUSE 30
6060 NEXT q
6100 PAPER 7: INK 1: BORDER 7
6110 CLS
6120 PRINT ,,,,"YOUR SCORE IS ";
s;,,,,,"   PRESS A KEY TO PLAY BL
ITZ"
6130 IF INKEY$="" THEN GO TO 613
0
6140 GO TO 5
7000 FOR y=0 TO 7
7010 READ e: POKE USR "h"+y,e: N
EXT y
7020 FOR y=0 TO 7
7030 READ e: POKE USR "o"+y,e: N
EXT y
7040 FOR t=0 TO 23
7045 READ e: POKE USR "a"+t,e: N
EXT t
7050 FOR t=0 TO 13
7060 READ e: POKE USR "m"+t,e: N
EXT t
7099 RESTORE
7100 RETURN
9000 DATA BIN 01111111,BIN 0100
0001,BIN 01001001,BIN 01111111,BI
N 01111111,BIN 01001001,BIN 0100
1001,BIN 01111111
9010 DATA BIN 01111110,BIN 01111
110,BIN 00011000,BIN 01111110,BI
N 01111110,BIN 01111110,BIN 0111
1110,BIN 00111100
9020 DATA 12+16,14+16,15+16,15+1
6,15+16,15+16,4,8,15,2,31,255,25
5,255,16,127,252,9,157,255,255,2
53,129,224
9040 DATA 16,56,16,254,16,40,68,
68,16,186,84,56,16,40,68,68
```

SCORE 8 HIGH SCORE 0



Blitz
by P Holt

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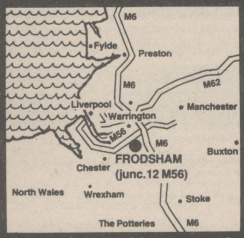
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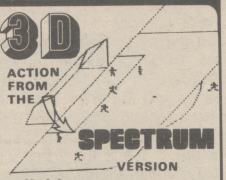
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SINCLAIR USER FEBRUARY 1983

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ZX COMPUTING FEB/MARCH 1983

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The Dragon Dungeon Club monthly newsletter, *Dragon's Teeth,* is packed with news, reviews and information for the dedicated Dragon-basher. The March issue of *Dragon's Teeth,* now out, includes both hardware and software offers and Club Members registering before March 31 will be eligible to purchase Dragon badges and sweatshirts at very special prices.
Annual membership, including *Dragon's Teeth,* £6 (six-month trial subscription £3.25).

THE DRAGON DUNGEON
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Meteor

on Ace

You are in a Space Ship where you have accidentally plunged into a meteor storm and as the Space Ship Commander you have to navigate through the storm.

The ship can withstand the impact of two meteorites and is destroyed by the third. A score is then displayed on the screen with random beeps from the computer.

The program can be run in fast or slow mode and the speed can be adjusted by altering the *Beep* in the world *Game*. The word *Point* can be useful in other programs requiring two numbers on the stack and replaces it by the ascii value of the character occupying that square.

The program is started by entering the word *Game*. The spaceship is moved from side to side using the 5 and 8 keys. After completion of the game press *Break* to stop the *Bleeps*. To play again enter *Game*.

If the program does not work and the ship does not move correctly, the error will be in the words Ship and Move. If the UFO's do not move up the screen, you will most probably have left the CR's off the end of the word UFO.

The game requires a random number generator. A routine is included from the Ace manual. The words *Seed*, *Seedon*, *Rnd* and *Rand* are used.

First set up the following characters:

```
: GR 8 * 11263 + DUP 8 + DO I C! -1+LOOP ;
: SHIP 40 124 84 124 254 186 146 0 1 GA ;
: METEOR 28 62 127 255 255 254 124 56 2 GR ;
```

This program should be tested, saved and verified, then use *Forget Gr* to allow sufficient memory for the main program.

```
: POINT AT 152388 @ C@ ;
: MOVE INKEY DUP 53 = IF x @ 1- x ! THEN 56 = IF x @ 1+ x ! THEN ;
: END 10 10 AT ." SCORE:"S @ . BEGIN 100 RND 20 + 50 BEEP 0 UNTIL ;
: SHIP 0 x @ POINT 2 = IF L @ 1- DUP L ! 0= IF END THEN 300 300
  BEEP 200 150 BEEP 250 150 BEEP 300 300 BEEP 400 700 BEEP CLS
  THEN 1 EMIT ;
: UFO 22 32 RND AT 2 EMIT CR CR ;
: SET 3 L ! 0 S ! 15 x ! CLS ;
: GAME SET BEGIN MOVE SHIP 1000 20 BEEP S @ 1+ S ! UFO 0 UNTIL ;

The following variables need to be initialised before typing in
the main program:-

15 VARIABLE X
 3 VARIABLE L
 0 VARIABLE S
```

Meteor
by G E Richards

Multiply

on Spectrum

This program calculates all the digits of large powers of two — up to 65535 for the 48K Spectrum and about 44500 for the 16K Spectrum.

The digits are stored from memory location 26000 in groups of two, the last two being at 26000.

The program first asks what power you want — this is then stored in locations 25996 and 25997. A machine code multiplication routine starting at 23760 is then called. When this is finished you are asked if you want to *Lprint* the result, *Print* the result or *Clear* the memories (this must always be done before a new calculation). If the last option is chosen the memories from 26000 to the number held in 25998 and 25999 are cleared; the program then starts again.

Powers up to 9200 are done in less than five minutes and the largest known prime number +1* in less than two hours.

The machine code works by taking all the digits of the number held from locations 26000 in turn in groups of two, doubling them and adding the carry from the previous result. Every time the number increases in size by another two digits an extra memory is allocated. When the whole number has been doubled the computer checks if the specified power has been reached; if not it doubles again.

```
   1 REM ..........
..........
..........
..........
   2 DATA 243,17,144,101,33,0,0,
229,35,34,144,101,6,0,33,143,101
,35,126,135,128,6,0,254,100,56,1
1,214,100,229,6,1,237,66,225,56,
1,19,119,167,229,237,82,225,56,2
37,225,35,229,213,237,91,140,101
,237,82,209,56,211,237,83,142,10
1,225,251,201
   3 FOR i=23760 TO 23825: READ
x: POKE i,x: NEXT i
   4 INPUT "Power?",p: POKE 2599
7,INT (p/256): POKE 25996,p-256*
PEEK 25997: PRINT "2↑";p: RANDOM
IZE USR 23760: GO TO 10
   5 CLS : LET m=PEEK 25998+256*
PEEK 25999: PRINT "2↑";p;"=";2*m-519
38-(PEEK m<10);" Places"
   6 PRINT : FOR i=m TO 26000 ST
EP -1: LET a=PEEK i: IF a>=10 TH
EN PRINT a;: GO TO 8
   7 PRINT "0";a;
   8 IF PEEK 23689=3 AND PEEK 23
688=1 AND l=1 THEN COPY : CLS
   9 NEXT i: IF l=1 THEN COPY
  10 PRINT : PRINT : PRINT "Clea
r / Print / Lprint?"
  11 LET e$=INKEY$: IF INKEY$="" 
THEN GO TO 11
  12 LET l=(e$="l"): IF e$="p" O
R e$="l" THEN GO TO 5
  13 IF e$<>"c" THEN GO TO 11
  14 FOR i=26000 TO m: POKE i,0:
NEXT i: CLS : GO TO 4
org 23760
23760 F3            di
23761 11 90 65      ld de,25000
23764 21 00 00      ld hl,0
23767 E5            push hl
23768 23            inc hl
23769 22 90 65      ld (26000),hl
23772 06 00         ld b,0
B loop
23774 21 8F 65      ld hl,25999
S loop
23777 23            inc hl
23778 7E            ld a,(hl)
23779 87            add a,a
23780 80            add a,b
23781 06 00         ld b,0
23783 FE 64         cp 100
23785 38 0B         jr c,Carry
23787 D6 64         sub 100
23789 E5            push hl

23790 06 01         ld b,1
23792 ED 52         sbc hl,de
23794 E1            pop hl
23795 38 01         jr c,Carry
23797 13            inc de
Carry
23798 77            ld (hl),a
23799 A7            and a
23800 E5            push hl
23801 ED 52         sbc hl,de
23803 E1            pop hl
23804 38 E3         jr c,S loop
23806 E1            pop hl
23807 23            inc hl
23808 E5            push hl
23809 D5            push de
23810 ED 5B 8C 65   ld de,(25996)
23814 ED 52         sbc hl,de
23816 D1            pop de
23817 38 D3         jr c,B loop

23819 ED 53 8E 65   ld (25998),de
23823 E1            pop hl
23824 FB            ei
23825 C9            ret
```

Multiply
by S Muth

Ovals

on BBC Micro

This program is for Model A or B.

What the program does is draw ovals. When you run the program you are asked for the width of the oval using the graphics planning sheet on page 495 of the user guide, then input the height. Ovals may be drawn on top of one another.

To clear the screen change 130 to *Goto* 40 after you have drawn one oval.

```
10 REM ****CIRCLE/OVAL****
20 REM *********BY********
30 REM ****DAVID  DALE****
40 MODE 1
50 VDU 29,640;512;
60 INPUT A,B
70 MOVE COS1*(A/2),SIN1*(B/2)
80 FOR X=1 TO 139 STEP 6
90 DRAW COSX*(A/2),SINX*(B/2)
100 SOUND 1,-15,255,0.25
110 NEXT
120 VDU 30
130 GOTO 50
```

Ovals
by D Dale

Bomber

on Dragon 32

Bomber is, as its name suggests, a program in which you have to bomb some nuclear reactors and thus devastate the enemy territory.

The reactors are the white cup shaped forms at the bottom of the screen, and to successfully destroy them your bomb must hit the bottom of it, not the sides. The ascending figure at the top left of the screen is the time you have taken, and the constant figure is the time you are allowed.

Take it easy with your bombs (which you release by pressing the spacebar, your only control), as each one puts the timer on by 20 units. When you have successfully bombed two sites, everything (including the timer) speeds up. When all sites are fallen you resume your task, but with less time to complete it.

Sound easy? It's not. There is a cloud of pink radioactive dust hovering above the sites and if your bomb strikes it, it is rendered useless. You must aim for the break in the cloud for your bomb to get through.

Your score is calculated according to how long you have left in each screen. So hurry — and good shoooting!

Program notes

10-110 SET UP VARIABLES
120-220 DRAW SCREEN
230-460 MOVEMENT LOOP
470-500 END OF SCREEN ROUTINE
510-630 END OF GAME ROUTINE

Variables

DD = Screen number
FS = Final score
SC = Number of bases intact
LIMIT = Time allowed for screen
TT = Timer
AERO = Aeroplane's position
CHECK = Check if a bomb is visible
BOMB = Bomb's position
BARR = Position of break in cloud barrier

The variables have been given easy to spot names so that those interested can disect the program. Note the little trick used in line 210 where I have filled the sites with *Chr*$ (144) — a black square, the same as the rest of the screen but very distinct to the computer. All you need to do then is tell your Dragon to look for it, as I did in line 310. I would advise you to remember this little trick as it can come in very useful.

PROGRAM OF THE WEEK

```
0 '***BOMBER***(C).A.DOWEY***
15 '*POPULAR COMPUTING WEEKLY*
20 DD=1
30 FS=0
40 SC=5
50 LIMIT=2250-250*DD
60 TT=0
70 POKE65494,0
80 CLS0
90 A=1024
100 AERO=1024+32
110 BARR=1024+252
120 FORI=224 TO 255
130 POKEA+I,239
140 NEXTI
150 FORI=454 TO 473 STEP2
160 POKEA+I,207
170 NEXTI
180 FORI=0TO2
190 FORJ=486 TO 502 STEP 4
200 POKEA+I+J,207
210 POKE A+J-31,144
220 NEXTJ,I
230 '**
240 TT=TT+1
250 IF TT>2250-250*DD THEN 510
260 PRINT@0,TT;"/";2250-250*DD;
270 IF CHECK=0 AND INKEY$=CHR$(32) THEN BOMB=AERO
    +32:CHECK=1:TT=TT+20
280 IF CHECK=1 THEN POKE BOMB,128:BOMB=BOMB+32
290 IF BOMB>A+511 THEN CHECK=0
300 IF PEEK(BOMB)<>128 AND PEEK(BOMB)<>144  THEN
    CHECK=0:PLAY"T10001CCCCCC":BOMB=A+511
310 IF PEEK(BOMB)=144 THEN CHECK=0 :POKE BOMB,223:
    BOMB=A+511:SC=SC-1:PLAY"T10003CDEFGABAGFEDC"
320 IF SC=0 THEN PRINT@224,"YOU DID IT IN ";TT;
    "TIME UNITS":SCREEN0,1:GOTO470
330 IF SC<4 THEN POKE65495,0
340 IF CHECK=1 THEN POKE BOMB,210
350 AERO=AERO+1
360 BARR=BARR-1
370 IF AERO>A+62 THEN POKEAERO-1,128:POKEAERO,
    128:POKEAERO-3,128:POKEAERO-2,128: AERO=A+34
380 IF BARR<228+A THEN POKEBARR+1,239:POKEBARR+2,
    239:POKEBARR+3,239:POKEBARR+4,2
39: BARR=BARR+23
390 POKE AERO-1,147
400 POKE AERO+1,147
410 POKEAERO-2,155
420 POKEAERO-3,128
430 POKE AERO,159
440 POKE BARR+4,239
450 POKE BARR,128:POKE BARR+1,128:POKE BARR+2,128
460 GOTO230
470 FS=LIMIT-TT+FS
480 DD=DD+1
490 FORYY=1TO2000:NEXTYY
500 GOTO40
510 PRINT@233,"GAME OVER";:SCREEN0,1
520 FORYY=1TO2000:NEXTYY
530 CLS8:PRINT@34,"YOU SCORED ";FS;" POINTS.";
540 IF FS>HS THEN HS=FS
550 IF HS=FS THENPRINT:INPUT"THATS THE HI-SCORE
    WHAT'S YOUR NAME?";
560 CLS8
570 PRINT@34,"YOUR SCORE- ";FS;
580 PRINT@98,"HI-SCORE-> ";HS;
590 PRINT@162,"BY ";NAME$;
600 PRINT@452,"PRESS A KEY TO PLAY";
610 SCREEN0,1
620 IF INKEY$="" THEN 620
630 GOTO20
```

Bomber
by Alison Dower

Map

on Vic20

This program allows the use of hi-resolution on the unexpanded Commodore Vic20. It uses the Vic's inbuilt facility for hi-res graphics.

The program will first draw a map (I hope everybody will recognise my country) and then will turn it in hi-resolution.

Will any British turn it to Great Britain? Just a bit of programming is necessary to do so. Good luck!

```
5000 POKE52,24:POKE56,24:CLR
5010 PRINT"J"
5020 PRINT"          AB"
5030 PRINT"         CDE"
5040 PRINT"        FGGH"
5050 PRINT"      IJ@@@@KL"
5060 PRINT"    MNOP@@@@@@QR"
5070 PRINT"   S@TU@@@@@@@V"
5080 PRINT"   WX@@@@@@@@@Y"
5090 PRINT"    Z[@@@@@@@@@£"
5100 PRINT"     ]@@@@@@@↑←"
5110 PRINT"     |@@@@@@@"CHR$(34)
5120 PRINT"     #@@@@@@@%"
5130 PRINT"      &@@@@@@'"
5140 PRINT"      (@@@@@@)*"
5150 PRINT"      +@@@@@@,-"
5160 PRINT"      .@@@@@@/0"
5170 PRINT"      1@@@@@@23"
5180 PRINT"      4@@@@@@@5"
5190 PRINT"     6@@@@789:;"
5200 PRINT"      <=>@?-◆"
5210 PRINT"        |▔▔"
5220 O=6144
5230 DIM C(52)
5240 FOR K=0TO 52:READ C(K):NEXT
5250 FOR R=0TO68
5260 READ A$
5270 FOR L=0TO7
5280 K=ASC(MID$(A$,L+1,1))-64
5290 IF K>26THEN K=K-102
5300 POKEO+8*R+L,C(K)
5310 NEXT:NEXT
5320 POKE36869,254
5330 GOTO5330
5400 DATA0,1,3,7,11,12,13,14,15,19,25,27,31,
     35,63,64,71,95,96,111,120,124
5410 DATA127,128,140,142,143,144,158,159,
     160,176,190,192,194,198,199,204
5420 DATA223,224,226,228,230,236,239,240,
     243,244,248,252,253,254,255
5430 DATA "◆◆◆◆◆◆◆◆","AHLNNVVV","@@@@WW▔◆",
     VVVNNVVV,"◆✕|◆◆◆◆◆","@@@@W| \\","@@ABCHLV
5440 DATA "V◆◆◆◆◆◆◆◆","|///▔|||◆","↗UTTUUUN",
     "@ABCA@A|","@W|◆||◆◆","@@@@R\◆◆"
5450 DATA @@@@@@@@A,@@@@@CCQ,"@@@@@@W|",LLNLL
     LLL,"↗◆◆◆◆◆◆","@@|O|OXX",BCHHCABC
5460 DATA "|Γ_◆◆◆◆◆","LZ\◆◆◆◆◆","XX◆◆◆◆◆◆",
     @AHBAAAA,"◆◆◆◆◆VVN","◆\\\\|||"
5470 DATA HBAAAA@A,"◆◆◆◆NVHH","||\\\\\\",HLJ
     BBCBB,"||||OOX","\DDDDDDD@"
5480 DATA @@@@@@@@,DBCCBBAA,"X◆◆◆◆\\|",A@@@@
     @@@,"◆◆VKBBP8","|WWXY|__",CBMIICHH
5490 DATA "||◆◆◆◆||",CBBDDDFF,"|◆◆◆◆◆◆◆","@@
     @@WW|W",FFEGGHLL,"◆|IXXXOO",W@@@@@@@
5500 DATA LLHHLLLL,"O◆◆◆◆|||",@WWWW@@@,LLLLL
     LNN,"||◆◆◆◆◆◆","@@@B\ IOO","NNNVVVV◆
5510 DATA "OXXX\\\|",@ABA@@@@,"◆◆◆◆◆ IX◆","◆◆
     ◆-BB@@","◆◆L-NHHA","◆◆|IOOOX"
5520 DATA W@@@@@@@,NCCCCB@@,"◆◆◆◆◆VNN","◆◆◆◆
     ◆VLB","\\\\\\\\\",A@@@@@@@,"▔@@@@@@@"
5530 DATA BB@@@@@@,"◆VVVVNNB","\\\\◆W@@"
```

Map
by C Aubry

Cassette

on ZX81

A program for the ZX81, or Spectrum with printer, with 16K of memory.

The program makes use of the fact that the Sinclair printer's paper is just the right width to fit into an ordinary cassette holder. The program produces a sleeve to fit into a holder, printed on which are the main title, artist's name, and the song titles for both sides of the cassette. All inputted by prompts within the program.

The sleeves can be used either for sound cassettes or computer programs. In both cases a collection of cassettes looks much neater if the sleeves are printed in this way.

```
  1 REM SLEEVE PRINTER.
      P.HARLAND.
  2 CLS
  5 PRINT AT 11,0;"INPUT ARTIST
SIDE 1"
 10 INPUT O$
 15 PRINT AT 11,18;"2"
 20 INPUT W$
 25 PRINT AT 11,0;"INPUT NUMBER
OF TITLES SIDE 1"
 30 INPUT SO
 35 PRINT AT 11,28;"2"
 40 INPUT ST
 45 LET Z=SO
 50 IF ST>SO THEN LET Z=ST
 51 IF Z>18 THEN LET Z=18
 55 PRINT AT 11,0;"INPUT TITLES
ON SIDE 1"
 60 DIM O$(Z,15)
 65 FOR F=1 TO SO
 70 INPUT O$(F)
 75 NEXT F
 76 PAUSE 50
 80 PRINT AT 11,21;"2"
 85 DIM T$(Z,15)
 90 FOR F=1 TO ST
 95 INPUT T$(F)
100 NEXT F
105 CLS
110 PRINT AT 11,0;"INPUT MAIN T
ITLE SIDE 1"
115 INPUT A$
120 PRINT AT 11,22;"2"
125 INPUT B$
130 LET T=2
135 GOSUB 250
140 LPRINT O$,W$
145 LPRINT "                "
150 LPRINT
155 FOR F=1 TO Z
160 LPRINT O$(F),T$(F)
165 NEXT F
170 LET T=18-Z
175 GOSUB 250
180 LPRINT "SIDE 1)   ";A$
185 LPRINT
190 LPRINT "SIDE 2)   ";B$
200 LET T=12
205 GOSUB 250
210 CLS
215 PRINT AT 11,0;"PRESS (N/L)
FOR NEXT SLEEVE"
220 PAUSE 4E4
225 GOTO 1
250 FOR F=1 TO T
255 LPRINT
260 NEXT F
265 RETURN
```

Cassette
by P B Holland

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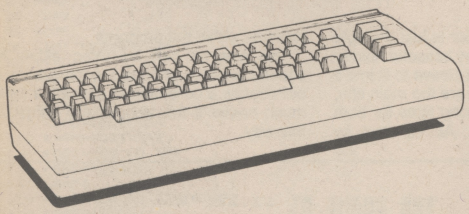
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Library

on ZX81

This is a program for all those who (like myself) gratefully snap up machine code subroutine listings in magazines such as your own to incorporate in other programs. This program allows you to set up a library which will alphabetically list the routines available and allow you to sample them within the library program.

PCW includes a subroutine on how to draw boxes in its October 7th issue. To put this into your library, load the program, request *Add,* and make an entry which reads: BOXES: PCW, 07.10.82 : 16514

Now input M/C and the ZX will ask you for a starting address for the hexloader. Input the address included under the entry above, and enter the machine code in the usual way. When you next *View* the library, an entry of 16514 will draw the box.

Program notes

Lines 1-9 are to hold machine code as required.
Lines 10-240 are a standard bubble sort, modified by lines 250-390 which allow the original set of items to be increased on future occasions.
Lines 550-560 allow the 5 digit address forming part of the library listing to call the required subroutine.
Lines 1020-1110 form a standard hex-loader.

1 REM.....
2 REM..... These lines should contain as many full stops as you can bear to put in.
3 REM.....

```
 10 PRINT "TO SET UP A NEW FILE, INPUT
    ""S/U"" "
 11 PRINT "TO ADD FURTHER ITEMS, INPUT
    ""ADD"" "
 12 PRINT "TO VIEW CONTENTS, INPUT
    ""VIEW"" "
 13 INPUT Q$
 14 IF Q$ = "S/U" THEN GOTO 19
 15 IF Q$ = "ADD" THEN GOTO 250
 16 IF Q$ = "VIEW" THEN GOTO 221
 17 GOTO 13
 18 STOP
 19 INPUT X
 20 CLS
 22 PRINT X ; " ITEMS"
 25 LET J = 0
 30 DIM A$(X,32)
 40 FOR N = 1 TO X
 50 INPUT A$(N)
 60 PRINT A$(N)
 70 NEXT N
155 FAST
160 CLS
165 FOR N = 2 TO X
170 IF A$(N - 1)>A$(N) THEN GOSUB 185
175 NEXT N
180 GOTO 205
185 LET Z$ = A$(N - 1)
190 LET A$(N - 1) = A$(N)
195 LET A$(N) = Z$
200 RETURN
205 FOR N = 2 TO X
210 IF A$(N - 1)>A$(N) THEN GOTO 165
215 NEXT N
220 SLOW
221 CLS
225 FOR N = 1 TO X
230 PRINT A$(N)
235 NEXT N
240 GOTO 500
250 INPUT Y
251 LET j = 1
255 PRINT Y; " MORE ITEMS"
260 DIM B$(X + Y,32)
270 FOR N = X + 1 TO X + Y
280 INPUT B$(N)
290 PRINT B$(N)
300 NEXT N
305 CLS
310 DIM C$(X + Y,32)
312 FOR N = 1 TO X
315 LET C$(N) = B$(N)
370 NEXT N
380 LET X = X + Y
381 DIM A$(X,32)
382 FOR N = 1 TO X
383 LET A$(N) = C$(N)
385 NEXT N
390 GOTO 155
500 PRINT AT 17,0; "TO ADD MORE ITEMS,
    INPUT""ADD"" "
510 PRINT "TO SELECT ITEM, INPUT 5 — DIGIT
    CODE"
515 PRINT "TO ENTER M/C CODE,
    INPUT""M/C"" "
520 INPUT Z$
530 IF Z$ = "ADD"THEN GOTO 250
540 IF Z$ = "M/C" THEN GOTO 1000
550 IF LEN Z$ = 5 THEN LET Z = VAL Z$
560 RAND USR Z
570 GOTO 500
999 STOP
1000 CLS
1010 IF J = 0 THEN LET K = 16514
1020 PRINT "START ADDRESS?(FIRST FREE
     BYTE =";K;")"
1030 INPUT K
1040 LET I$ =""
1050 LF I$ = "" THEN INPUT I$
1060 POKE K, 16 CODE I$ + CODE I$(2) - 476
1070 PRINT AT 20,0; K;" ";I$(TO 2)
1080 K = K + 1
1090 SCROLL
1100 LET I$ = I$ (3 TO)
1110 GOTO 1050
```

Library
by T. Gale

Kaleidoscope

on Spectrum

The screen slowly fills with dots, meanwhile, the computer happily beeps away. The dots are randomly placed **but** it mirrors the dot opposite.

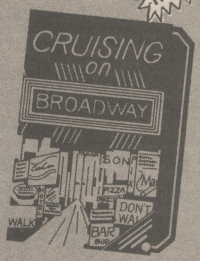
```
 1 BORDER 1: PAPER 1:
   INK 7
 2 PRINT FLASH 1;INK
   6;"KALEIDOSCOPE"
10 LET N=INT
   (RND*500)+1000
20 FOR A=1 TO N
30 LET V=INT (RND*
   160)
40 LET H=INT (RND
   *210)
50 LET RV=21+(100
   -V)
60 LET RH=31+(209
   -H)
65 BEEP .100,7
70 PLOT H,V
80 PLOT RH,V
85 BEEP .100,5
90 PLOT RH,RV
100 PLOT H,RV
110 NEXT A
120 PAUSE 9999
```

Kaleidoscope
by D Wallin

Cruising Challenge

£10 to be won

Can you beat the new high score?



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 practice. Getting through the first four levels is not easy, and that's just the beginning.

Now you can make that skill work for you. *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 Challenge
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 highest score sent in so far this month is 7743 from *Martin Shepherd* of 76 Dulverton Avenue, Westcliffe-on-sea, Essex. If you have a higher score, you could still win this month's £10 — but hurry, entries close on March 31.

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 March 31.
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 the *Cruising Challenge*.
7) *Cruising (on Broadway)* for the 16K and 48K ZX Spectrum is available through W H Smith and leading computer stores for just £4.95. It is also available mail-order from Sunshine Books Ltd, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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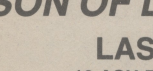
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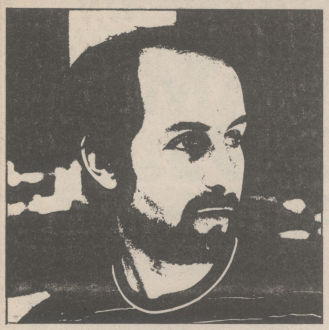
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Swamped!

Last week, we saw an adventure, written for the Atari machine, that relied mostly on graphics for its appeal. Now let's put the Sinclair ZX81 to the test, and see how it faces the challenge of graphic adventuring.

While traditional adventure games rely mostly on the "logical" approach, "graphic" adventures require a more basic response from the player — a response from the reaction level, rather than the intellectual. This is not to say that they do not test the player's reasoning powers — they often do — but that reflexes are probably more important. All generalisations, of course, can be proved to have one or two exceptions.

Let's consider a couple of the earliest programs to be offered by Sinclair's catalogue. Psion, before it became one of the first independents to come under the Sinclair banner, produced a little tape containing two adventure programs, *Sorcerer's Island* and *Perilous Swamp*. They are both "graphic" adventures, and illustrate two different facets of the *genre*.

Perilous Swamp is a pure board game, taking place on an unchanging map, using the chunky graphics of the ZX81 to delineate the landscape. Somewhere on the board is located the Princess, and your "X's" task is to rescue her and bring her off the board at the Exit. You may not move over the grey (swamp) squares.

The adventurer is catered for by the monsters that are met at every other move. You must do battle with these — or bribe them into ignoring you! You will find that your Life Points ebb away each time you move. The only way to get out of the swamp is by planning your moves well in advance, to use the least number of steps. Quickly played, and addictive.

Sorcerer's Island is a much more complicated program. You are put down somewhere on a mysterious island, and your task is to find the Sorcerer's secret. A map of the whole island is available to you, and the immediate surrounding landscape is always on display as you move about.

At every move, it seems, a monster, be it Dragon or Balrog, confronts you. A decision must be made to fight, run or bribe your way out of trouble. Bribing is accomplished with the various bits of treasure you are always stumbling across. Unfortunately, your staggering around the island is not unlimited — your Life Points, as in *Perilous Swamp*, decrease each time you move. There is, however, a little hut to which you may return if you feel faint.

Although the drawing of the map at each move is rather slow, and neither program is of arcade quality, nevertheless, these are two very good programs, and very good value for money at £4.75 for the pair. Recommended as a change from the more cerebral adventures. Another look at "graphic" adventures at a later date.

In the meantime, keep your ideas, views, likes and dislikes coming in — I hope to start giving them an airing soon. Don't forget: *Orc is just another name for . . . AAARRRGGGHHH!* ■

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.

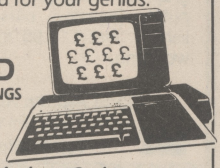
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Through the looking glass

***Peter Donn** presents a short program to show how light passes through a convex lens.*

This program is written for the BBC (any model) and demonstrates how light rays pass through a convex lens. The focal length, object distance from lens, image distance from lens, height of the object and height of the image are constantly displayed.

All these can be altered individually using the function keys (see diagram for details).

A ray diagram is also constantly displayed on the screen. The key to the display is as follows:

Red vertical line	=Object
Green vertical line	=Image
Yellow horizontal line	=Principal Axis
Yellow vertical line	=Convex lens

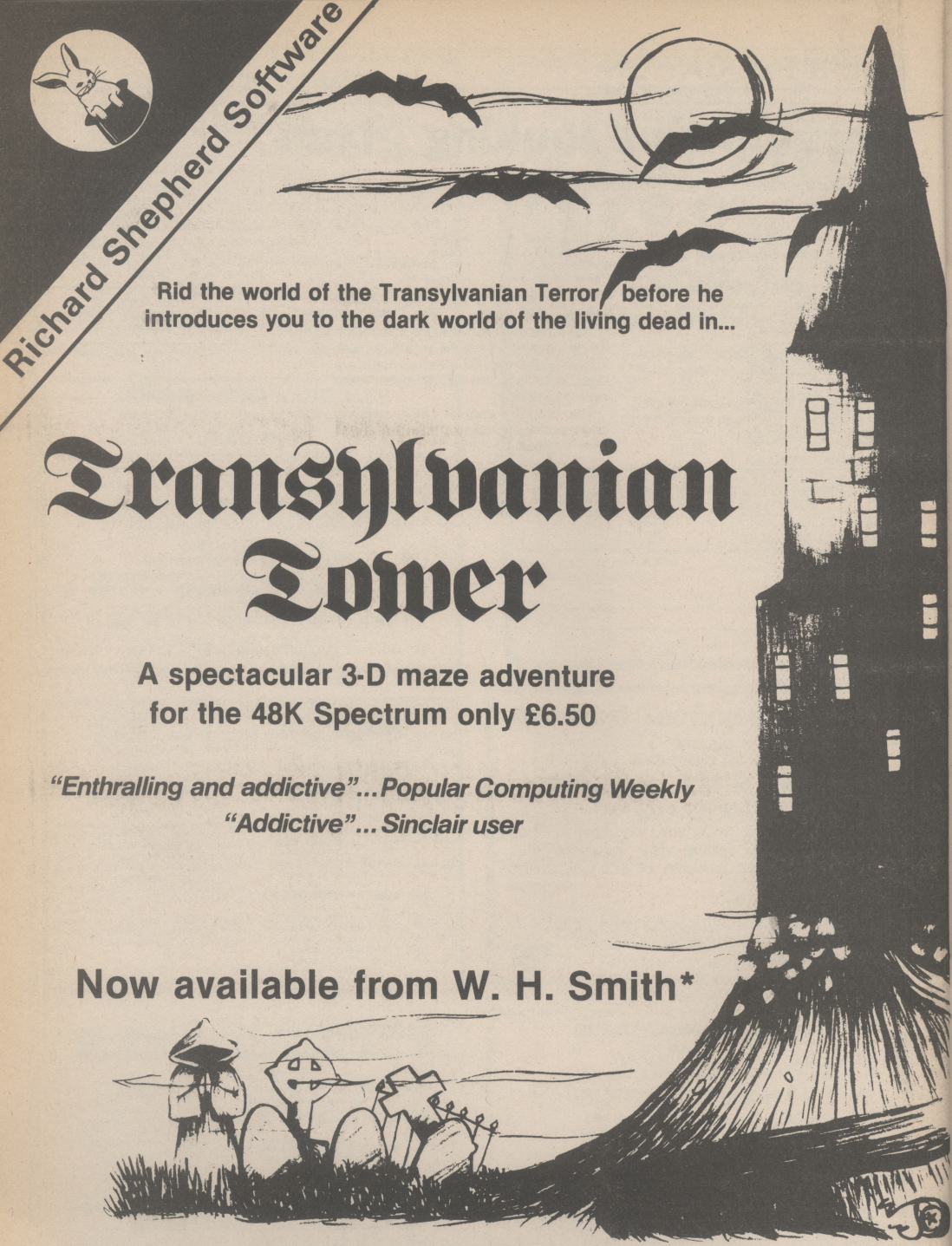
The remaining green lines represent selected light rays.

The program also shows the state of the image visually, whether it is real, vertical, upright or inverted. All measurements are taken in 'units' which can represent whatever you want.

The program can be very useful in education, being part of the Physics 'O' level syllabus.

INCREASE OBJECT DISTANCE
DECREASE OBJECT DISTANCE
INCREASE OBJECT HEIGHT
DECREASE OBJECT HEIGHT
DECREASE FOCAL LENGTH
INCREASE FOCAL LENGTH

```
10 REM LIGHT BY PETER DONN '82
20 *TV 255
30 *KEY 0 a
40 *KEY 1 b
50 *KEY 2 c
60 *KEY 3 d
70 *KEY 4 e
80 *KEY 5 f
90 F=100:O=100:OD=200
100 @%=&00000020A
110 IF OD<1 OD=OD+10:GOTO 330
120 IF O<0 O=0
130 MODE5
140 VDU19,0,4;0;
150 FOR C=1 TO 3:VDU19,C,4;0;:NEXT
160 COLOUR3
170 MOVE0,512:DRAW1280,512
180 MOVE640,312:DRAW640,712
190 GCOL0,1
200 MOVE(640-OD),512:DRAW(640-OD),O+512:
    GCOL0,2:DRAW640,O+512
210 IF OD-F=O THEN 430
220 ID=(F*OD)/(OD-F)
230 MG=(ID/OD)
240 IYC=512-(MG*O)
250 DRAW ID+640,IYC
260 DRAW 640+ID,512
270 MOVE 640-OD,512+O:DRAWID+640,IYC
280 FOR C=1 TO 3:VDU19,C,C;0;:NEXT
290 PRINT CHR$80,'"FOCAL LENGTH :";F/10;
    '"OBJECT DIS.  :";OD/10
300 IF OD-F=0 PRINT"IMAGE DIS.  :INF." ELSE
    PRINT "IMAGE DIS.  ";ID/10
310 PRINT "HEIGHT OBJECT:";O/10
320 IF OD-F=0 PRINT"HEIGHT IMAGE :NONE"
    ELSE PRINT"HEIGHT IMAGE :"
;-MG*O/10
330 *FX 15,1
340 A$=GET$
350 IF A$="a" OD=OD+10
360 IF A$="b" OD=OD-10
370 IF A$="c" O=O+10
380 IF A$="d" O=O-10
390 IF A$="e" F=F-10:IF F<0 F=F+10
400 IF A$="f" F=F+10
410 GOTO 110
420 END
430 X=640:Y=-(O*X/F)+O
440 DRAW X+640,Y+512
450 MOVE 640-OD,O+512:DRAW X+640,(Y-F)+512
460 GOTO 280
```



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Sound Controller

The Basic call to *Beep* function is located at address 1016. To program the computer to produce sound from the internal speaker you need to make a call to address 949 where variables such as pitch and duration of note can be entered directly in *h* and *de* rather than from the stack. Using the machine code loader from last week try the following:

```
LD HL NN    33 100 1   PITCH
LD DE NN    17 150 3   DURATION
CALL NN     205 181 3  CALL TO ADDRESS 949
RET         201        RETURN TO BASIC
```

The Rom routine at address 949 uses the IX register and also contains *Disable Interrupt (DI)* and *Enable Interrupt (EI)* as the first and last commands. Only the sound function is enabled — all other activities stop.

This routine may be coupled with the keyboard controller *(Popular Computing Weekly,* March 17-23) to indicate that an acceptable entry has been received. For example:

```
RST 56      255
LD A (NN)   58   8 92
CP N        254 119
dp N2 DIS   32 248
LD HL NN    33 100 0
LD DE NN    17 150 0
CALL NN     205 181 3
RET         201
```

will only respond to depressing the *W* key and will *Beep* an indication that it has done so. This can of course be extended to include a range of keys if necessary and is a very useful 'mug trap'.

Multiple *Beep* calls may be used to produce a range of notes, but require the registers to be saved before the call to *Beep*. For example:

```
LD BC NN    1 30 6     Reduction in Pitch —
                       Number of notes
LD HL NN    33 255 0   Pitch
LD DE NN    17 100 2   Duration
PUSH HL     299  )
PUSH DE     213  )     Save Registers
PUSH BC     197  )
CALL NN     20 181 3   Call BEEP
POP BC      193  )
POP DE      209  )     Recover Registers
POP HL      225  )
LD A L      125  )
SUB C       145  )     Decrease Pitch
LD L A      111  )
DJNZ DIS    16 242     Next Note
RET         201        Return to BASIC
```

Print Controller

As the Spectrum memory map is non-sequential (see how the Psion logo is built up when running the *Horizons* tape), it is not possible to *Poke* user defined graphics (UDG) or characters to a specific screen location using normal machine code methods. With the Spectrum the *Rst 16* function must be used for this purpose.

First, the accumulator is *Loaded* with the function to be performed (see Table 1) and then the value of the function. Note: *Rst 16* uses the alternative set of registers (you were able to use these registers in ZX81 machine code routines — you cannot with the Spectrum).

Enter program one. It prints a green coloured hash on a red square towards the bottom left-hand side of the screen. You may alter the values of variable *'d'* and *'e'* to correspond to any colour you wish (0-7) and the variables *'b'* (0-31) and *'c'* (0-20) to any position you require on the screen. Character changes are effected by altering the variable *'h'*. See pages 183 to 188 of your Sinclair manual for suitable alternatives.

Program two combines keyboard control, sound and graphics with colour. The program operates by waiting for you to press the *'x'* key, then it sounds a low note, prints six colours and characters in a row and then sounds a high note. ■

```
16 INK
17 PAPER
18 FLASH
19 BRIGHT
20 INVERSE
21 OVER
22 AT
23 TAB
```

Table 1

```
                                    REMARKS

LD HL NN     33   0   35      -          CHARACTER
LD DE NN     17   2    4     PAPER       INK
LD BC NN      1  16    4     DOWN        ACROSS
LD  A  N     62  16              SET FOR INK
RST 16      215
LD  A  D    122                  INK(D)INTO A
RST 16      215
LD  A  N     62  17              SET FOR PAPER
RST 16      215
LD  A  E    123                  PAPER(E)INTO A
RST 16      215
LD  A  N     62  22              SET AT
RST 16      215
LD  A  C    121                  DOWN(C)INTO A
RST 16      215
LD  A  B    120                  ACROSS (B)INTO A
RST 16      215
LD  A  H    124                  CHARACTER(H)INTO A
RST 16      215
RET         201                  RETURN TO BASIC


PROGRAM 1
```

Turn to page 30

ADDRESS	MNEMONIC	MACHINE CODE	REMARKS
23760	RST 56	255	PUT LAST KEY PRESSED INTO
	LD A (NN)	58 8 92	ADDRESS 23560
	CP N	254 120	COMPARE WITH 'X'
	JP NZ DIS	32 248	NO TRY AGAIN
23768	LD HL NN	33 100 0	PITCH
	LD DE NN	17 150 0	DURATION
	CALL NN	205 181 3	SOUND SPEAKER
23777	LD HL NN	33 6 35	NO OF TIMES LOOP CHARACTER
	LD DE NN	17 0 0	PAPER INK
	LD BC NN	1 16 2	DOWN ACROSS
23786	PUSH BC	197	SAVE REGISTERS
	PUSH DE	213	
	PUSH HL	229	
23789	LD A N	62 16	SET FOR INK
	RST 16	215	
	LD A D	122	
	RST 16	215	
23794	LD A N	62 17	SET FOR PAPER
	RST 16	215	
	LD A E	123	
	RST 16	215	
23799	LD A N	62 22	SET FOR AT
	RST 16	215	
	LD A C	121	
	RST 16	215	
	LD A B	120	
	RST 16	215	
23806	LD A H	124	
	RST 16	215	
23808	POP HL	225	
	POP DE	209	
	POP BC	193	
23811	INC B	4	NEXT POSITION ACROSS
	INC E	28	CHANGE PAPER COLOUR
	INC H	36	CHANGE CHARACTER
	DEC L	45	DECREASE LOOP COUNT
23815	JP NZ DIS	32 225	DONE NO NEXT
	LD HL NN	33 50 0	PITCH
	LD DE NN	17 0 3	DURATION
	CALL NN	205 181 3	SOUND
23826	RET	201	RETURN TO BASIC

Program 2

On the trail . . .

***Keith and Steven Brain** show you how to add cursor control to your own programmes*

At the left and right hand sides of your keyboard are the four cursor control ("arrow") keys which are very useful for controlling left and right, and up and down, movement in games. Only 'up' and 'left' are displayable characters *(Chr$(126)* and *Chr$(127)*. While the 'up' arrow can be practically used in a string comparison like:

```
10 IF A$=" " THEN . . .
```

the 'left' arrow can only be obtained by *Shift* (*Up Arrow*) so really they are best forgotten!

In general, the cursor keys are only used in programs by looking for their ASCII codes.

ASCII codes for cursor keys

	shift not pressed	shift pressed
left arrow	8	21
right arrow	9	93
up arrow	94	95
down arrow	10	91

The codes are different depending on whether you are in upper or lower case, and to avoid chaos in your games by accidentally moving into the wrong case, a 'belts and braces' approach which checks for both is best!

Mapping it out

Movement around the screen must take into account how the screen is organised ("mapped"). The Dragon text screen consists of 16 lines, each of 32 characters. It is mapped sequentially from 0 to 511 (starting from the top left corner and returning to the left of the screen at the start of each new line).

Let's start at point *P* in the middle of the screen (position 238) and think about moving left and right. All we need to do is subtract one from *P* or add one to *P* each time you press that key:

```
110 P=238
120 PRINT @ P,"*";
140 A$=INKEY$:IF A$="" THEN 140 ELSE A=ASC(A$)
150 IF A=8 OR A=21 THEN P=P-1
160 IF A=9 OR A=93 THEN P=P+1
290 GOTO 120
```

If you try that, you'll notice that if you go on far enough you move onto the line above or below.

Going the long way round is rather pointless, so lets turn our asterisk into a "turtle" which will move immediately at our command, in any of the four directions, leaving a trail behind him. To move up and down a line directly you simply subtract from, or add 32 (line length) to, *P* in the same way:

```
170 IF A=94 OR A=95 THEN P=P-32
180 IF A=10 OR A=91 THEN P=P+32
```

Doesn't that give you a feeling of power as the poor little asterisk is forced to move wherever you send it! But watch out, if you stray too far, your turtle will fall victim to an *Fc Error* as only values of *P* from *0* to *511* are allowed! You therefore need to add in a check that you have not fallen off the top or bottom of the screen:

```
190 IF P<0 THEN P=0
200 IF P>511 THEN P=511
```

There are several simple games (usually named after snakes or other creepy-crawlies!) which are based on avoiding the trail left behind you. To start with you need to look at what is already in the new print position and compare this with your own character. We can do this by *Peeking* at what is on the text screen. As the start of this (print position 0) is at memory location 1024 we need to add this number to *P*, before we look.

Unfortunately, you will find that if you print a character onto the screen, and then *Peek* to see what it is, you get rather a surprise as *Peek* may not give you the ASCII code of the character. (This is because of the way the Dragon codes characters internally, which is not ASCII.) If you want to find out the corresponding *Peek* values and ASCII codes for the whole character set, you can use this little routine:

```
500 FOR N = 1 TO 255:PRINT CHR$(N);:NEXT
510 FOR N = (1023+1) TO (1023+255):PRINT PEEK(N);:NEXT
```

The *Peek* value for *"*"* is 96, so we can use:

```
220 W=PEEK(1024+P))
230 IF W = 96 THEN 300
300 PRINT @ 0,"CRASH!"
```

To keep a record of how far you got before you crashed, add a distance variable which increments with each success:

```
270 D=D+1
310 PRINT"SCORE =";D
```

If you want to move without leaving a trail, you need to erase the last point as you print the next. You can do this most simply by adding a devastating *Cls* to wipe the screen clean in one fell swoop — *210 Cls* — but if you take a more subtle approach you can be much more selective, and leave the rest of the screen display intact. You need to remember the last print position and print a blank space there just before the new asterisk is printed. To do that we will bring in a new variable *L* (for 'last') which is set equal to *P*, before this is changed:

```
130 L=P
210 PRINT @ L," ";
```

Because of the order of program lines, the *"*"* is displayed for most of the time, as erasing only occurs when the position changes.

Hungry horror

Let's put these ideas together into a more interesting game where a strange 'Hungry Horror' must search a box for food so that it does not starve. But, it must not make the mistake of eating itself!

First we draw the box, leaving the bottom line clear so that automatic screen scroll does not occur:

```
10 CLS2
20 PRINT @ 0,STRING$(33,128);
30 FOR N = 63 TO 479 STEP 32: PRINT @ N,CHR$(128);CHR$(128);:NEXT
40 PRINT @ 449,STRING$(31,128);
```

and then a random amount of food is placed in random positions:

```
50 Q=RND(20)
60 FOR N=1 TO Q
70 FP=RND(480)-1
80 PRINT @ FP,":";
90 NEXT
```

If you do not like to see food stuck to the wall, just change these two routines around, when any food in unsuitable positions will vanish. Computer logic isn't always as good as common sense!

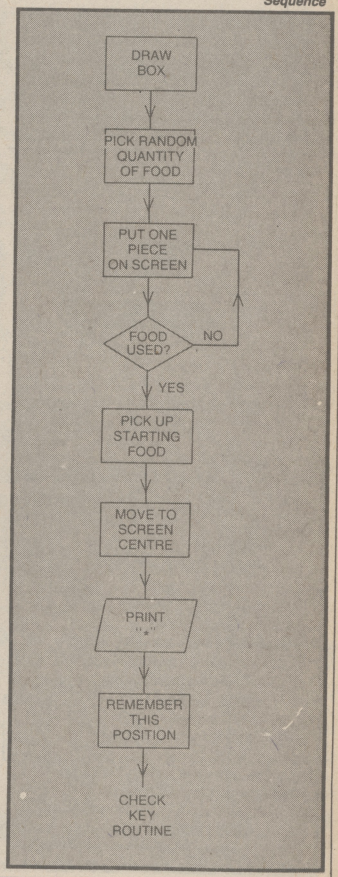
The beast starts off with a full stomach *(F=20)* and adds *10* to its food supply *(F)* every time it finds a *":"* (*Peek* value 122):

```
240 IF W = 122 THEN F=F+10
```

but it uses one food unit each time it moves, and starves if there is none left:

```
260 F=F-1
280 IF F<1 THEN 330
```

Start Sequence



```
330 CLS0
340 PRINT @ 224, "YOU STARVED AFTER";D-
    ;"MOVES!"
350 SOUND1,50
360 RUN
```

If it hits the wall of the box it loses 5 food:

```
250 IF W = 128 THEN F=F-5
```

This horror leaves a green trail if the erasing routine is left in, as the screen was cleared to yellow and *Print* *""* will give a green block of *Peek* value 96. (If you take out line 210 you will leave a trail of *"*"* of *Peek* value 106.)

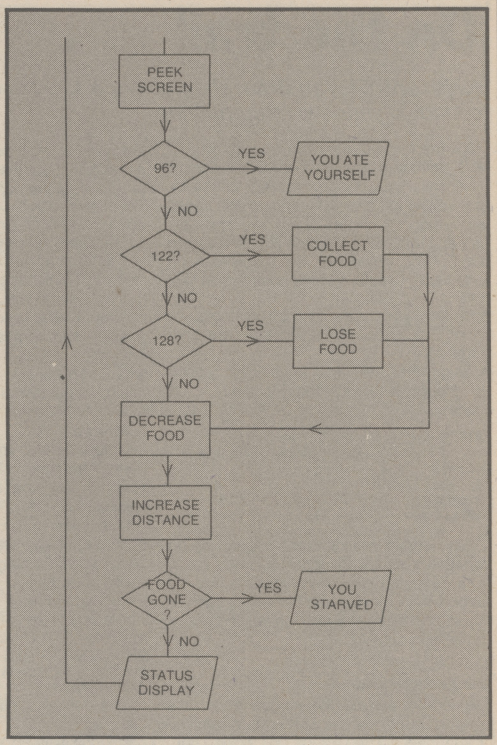
```
240 IF W = 96 THEN 300
300 CLS4
310 PRINT @224,"YOU JUST ATE YOURSELF
    AFTER",,D; "MOVES!"
320 GOTO350
```

To give you a guide to how well you are doing, we will put a food and distance status display on the bottom line by adding to line 290:

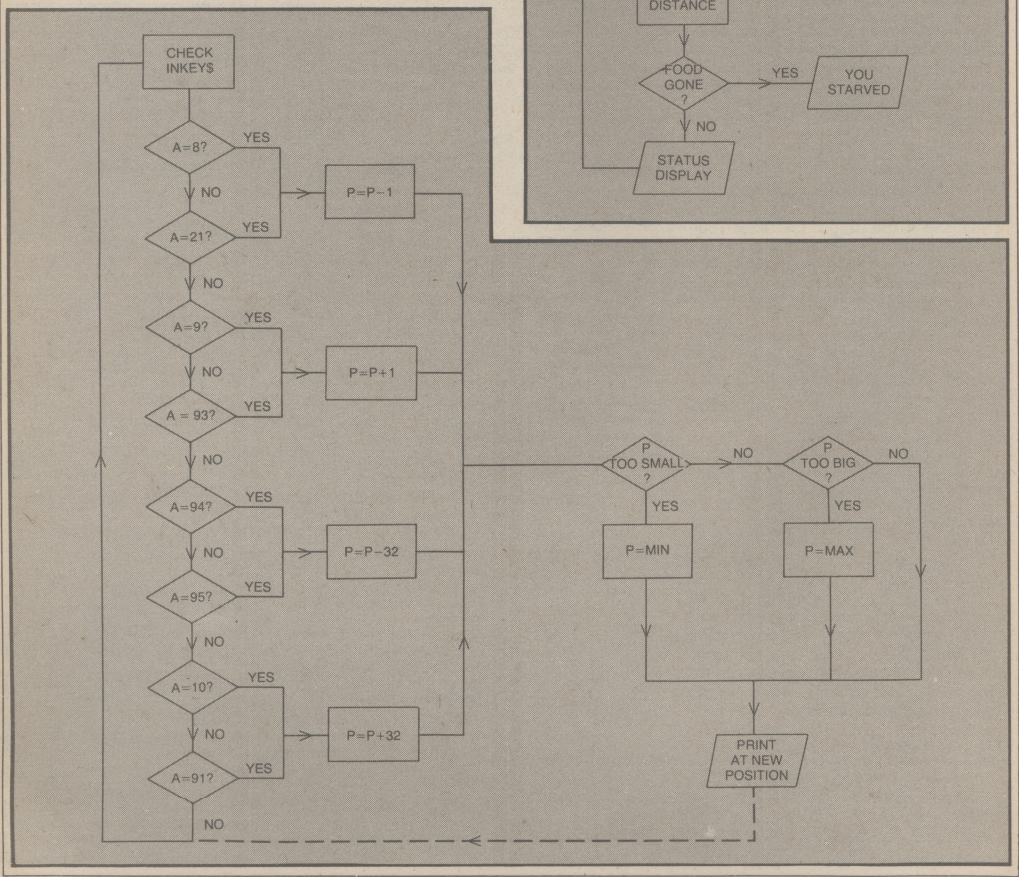
```
290 PRINT @ 480,"FOOD";F;"DISTANCE";D;:
    GOTO120
```

You will note that this game is true to life, as no matter what you do you are bound to starve to death in the end when the food runs out! ■

Screen Peek And Consequence



Cursor Control Routine



```
10 CLS2
20 PRINT @ 0,STRING$(33,128);
30 FOR N = 63 TO 447 STEP 32:
PRINT @ N,CHR$(128);CHR$(128);:NEXT
40 PRINT @ 449,STRING$(31,128);
50 Q=RND(20)
60 FOR N=1 TO Q
70 FP=RND(480)-1
80 PRINT @ FP,":";
90 NEXT
100 F=20
110 P=238
120 PRINT @ P,"*";
130 L=P
140 A$=INKEY$:IF A$="" THEN 140
ELSE A=ASC(A$)
150 IF A=8 OR A=21 THEN P=P-1
160 IF A=9 OR A=93 THEN P=P+1
170 IF A=94 OR A=95 THEN P=P-32
180 IF A=10 OR A=91 THEN P=P+32
190 IF P< 0 THEN P=0
200 IF P>511 THEN P=511
210 PRINT @ L," ";
220 W=(PEEK(1024+P))
230 IF W=96 THEN 300
240 IF W=122 THEN F=F+10
250 IF W=128 THEN F=F-5:SOUND1,5
260 F=F-1
270 D=D+1
280 IF F<1 THEN 330
290 PRINT @ 480,"FOOD";F;"DISTANCE"
;D;:GOTO120
300 CLS4
310 PRINT @224,"YOU JUST ATE
YOURSELF AFTER",,D;"MOVES!"
320 GOTO350
330 CLS0
340 PRINT @ 224,"YOU STARVED
AFTER";D;"MOVES!"
350 SOUND1,50
360 RUN
```


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BBC A/B maze. Easy to use, fun educational program. 45 simple mazes. Times for each maze and set. Keyboard, joystick. State model, £3.50. JD-Soft, Hilcote Hall, Blackwell, Derby.

ATARI 400/800 software club. Join now. Sae for details. Castle games, 44 Augusta Close, Rochdale, Lancs. Tel: (0706) 59602.

SWAP Vic20 Sargon II for any other Vic-20 cartridge. 10 Adam Close, High Wycombe, Bucks.

VIC20, 8K, 3K super expander, Introduction to Basic 1, Vic Revealed, programmer's reference guide, games, £150 ono. Preston 615397 (evenings).

UNEXPANDED VIC20 GAMES. Fruity — 100 percent machine code fruit machine simulation, four fast-spinning reels, eight 'fruits', nudge up/down, respin, hold, cancel, gamble, collect and quit. Ski — fast ski-ing simulation. Avoid trees, bumps and ice patches, manoeuvre through slalom gates. Subshot — shoot enemy ships and aeroplanes. Earn extra time for a high score. All games have excellent multicolour hi-resolution realistic graphics, sound and music, £4 for one, £7 for 2, £10 for 3. Send cheque/PO to: Shaun Southern, 76 Llwyn Road, Oswestry, Shopshire. Fast delivery.

SHARP MZ80K/A software. Ready for immediate hire from 50p. Send sae for membership details and free catalogue. K-Soft software collection, 56 Bolham Lane, Retford, Nottinghamshire.

SPECTRUM, 16K. Upgrade to 48K for Issue 2 machines, no soldering required, kit of ICs, £23.50 inc VAT, p&p, or send me your Issue 2 Spectrum for upgrade, £27 inc VAT, p&p, mail order only, by return. J. C. Brewer (Dept PCW), 7 Roseberry Terrace, Kirkcaldy KY1 1DW.

PERSONAL COMPUTERS bought for cash. Morgan Camera Co, 160 Tottenham Court Road, London, W1. Tel: 01-388 2562.

ATTENTION! Quality games software for ZX81 with/without QS Character board. Send Sae for free catalogue to: Mark Andrews, 44 Eaglesham Road, Newton Mearns, Glasgow.

INTRODUCING TOURNAMENT 1: A great new games tape for the Vic20. Will fit into any memory size (including standard machine) and has four great games: Frogmen, Automania, Astradodge, Cross-Over. Games incorporate excellent sound, colour and hi-res graphics. £3.95 inclusive. Send to Tournament Software, 63 Mansion Court Gardens, Thorne, Doncaster, S. Yorks DN8 5BH. Send Sae for details.

ARE YOU a good program writer? Perhaps selling your software from home. Want to make more money? We are looking for top quality Machine Code programs for ZX Spectrum and BBC Micro, for repackaging and the international market. Please write sending details and demo tape/disc to Gerry Smith, Dept 11, Smith Harrowdess Ltd, 39 Darnford Close, Walsgrave, Coventry CV2 2EB.

WANTED VIC SOFTWARE — especially Rabbit, Pixel, Audiogenie, Interceptor software. Wanted Voodoo Castle for Mission Impossible. Also, swap Alien cartridge for Spiders from Mars/Outworld. Phone Leeds 589465.

SPECTRUM LOGO. Learn to 'talk Turtle! Ideal language for introducing children of all ages to programming. Fully tested in school use. Cassette/manual for 48K Spectrum, £5.95. Sae for details of 16K version. Mike Treadaway, 2 New Road, Fritton, Great Yarmouth, Norfolk.

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

JUPITER ACE, as new, all leads + manual etc. Offers over £70. Tel: 0522 751324.

PHILIPS mini digital cassette system £60. Tel: Ipswich 219661, ext 225 (daytime).

VIC20 plus 8K and super expander, Invaders, Chess, Alien and Adventureland cartridges, many cassette games and books, £225. Tel: 01-808 6450.

WANTED: Dragon 32, Kong type program and others bought or royalties paid. Details to Mr Davies, PO Box 26, Port Talbot SA1 31NY.

ATARI 400/800 secondhand software bought/sold. Sae and lists to Jervis, 19 Portree Drive, Nottingham.

FLY THE DRAGON. Flight Simulation program for Dragon 32. Full colour and instrumentation cassette. Only £5.95. Mr Ratcliffe, Church Lodge, Tibenham, Long Stratton, Norfolk.

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

ATARI 400/800 OWNERS, play Super Bullion Raiders for only £5.95 inc. Cheques/PO to M. Granata, 36 Dixton Drive, Wallasey, Merseyside.

DUST COVERS AVAILABLE for any computer, printer etc. BBC TI, Epson £3.95. Dragon, Atari, Vic20 £2.95. Sharp MZ-80A-K £4.95. For others please phone or write to Sherborne Designs, Victory House, 8,A The Rank, North Bradley, Trowbridge, Wilts. Tel: 02214 4425. Also made to measure service. Dealer enquiries welcome. Access and Barclaycard.

ORIC-1, VIC20 and ZX81 software, send Sae for catalogue and free program. D. J. Wyatt, 77 Redgrave Gardens, Luton, Beds.

VERIFY FOR DRAGON 32. Machine code software to comprehensively identify and Check Basic/data and M/c cassette files without affecting current program. For listing, Basic "easy enter" and details of how to chain several Basic programs together, send £1.50 plus Sae to Klaus Allen, 10 Ashby Road, Shepshed, Leics LE12 9BS.

WORLD INFO — a database of information about the modern world. Use your 48K Spectrum as a reference book on heads of state, wars, potential wars, types of regime, human rights and much more. It's a datafile for use with Campbell Systems' Masterfile, the standard advanced database system for Spectrum, £5. PHONES keeps track of your phone bill, times calls, costs them, assigns them to person using phone. Good for flat sharers or several people using the same phone, £4.50. Send sae for more details of above programs. Wimsoft (PCW), 20 Brookside Road, Wimborne, Dorset BH21 2BL.

CASIO PB-100 pcoket personal computer, unused, in original packing, cost £70, sell £55 (or part swap for Spectrum 48K). Tel: Hemel Hempstead 54059.

WILL SWAP OR SELL Jumbo Jet Pilot, Submarine Commander, Star Raiders, Defender for PacMan or Centipede. Tel: 0602 703604 after 6 pm.

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Spectrums for sale

SPECTRUM, 48K, tape deck + tapes, £180 ono. Tel: Telford 595734 (after 6 pm).

SPECTRUM, 16K, good condition, few months old, games, quick sale, £89. Tel: Cooden, East Sussex, 5364 (anytime).

16K SPECTRUM, plus ZX printer and 5 rolls of paper, tape recorder, custom case and 5 Spectrum books, £150. Tel: Liss 3864 (Hants).

ZX SPECTRUM, 48K + printer, new, 5 rolls paper and software, value £20, £200 ono. Tel: 0432 74362 (after 8 pm).

ZX SPECTRUM 16K, brand new + cassette recorder + software + 100 listings, £100 ono. Tel: Brighton 688393.

ZX SPECTRUM 16K, boxed, all leads and manuals still under guarantee, lots of s/w involving Scramble, Space Invaders, Horace games etc and Tim Hartwell book, all for £130. Tel: 0656 721441.

5 SPECTRUM software cassettes, £18 for the five. Tel: Milton Keynes 75094.

SPECTRUM ZX 48K + Spectrum carrying case, cassette player + software + books. Hardly used, £175. Tel: York 763875.

NEW 48K SPECTRUM + £100 software, £200 ono. Tel: Bordon 2745 after 6 pm.

ZX SPECTRUM 16K, boxed, all leads and manuals still under guarantee, lots of software including Scramble, Space Invaders, Horace games etc and Tim Hartwell book, all for £130. Tel: 0656 721441.

48K SPECTRUM, with ZX printer and lots of software, console and magazines, worth £325 approximately, sell for £300 ono. Tel: 0803 22058 (Torquay).

ZX SPECTRUM 48K, four months old, £50 software, £170. Tel: 01-850 9066 after 4 pm.

ZX SPECTRUM + software for sale, worth £100 including Hobbit, also the fuller sound box. Sell separately or grouped. Tel: 01-561 6958.

16K SPECTRUM, one month old, games, books, £100. Tel: 0387 68696, Dumfries.

16K SPECTRUM + printer + sound amplifier + books, cassettes, £210. Tel: 01-802 5075.

48K ZX SPECTRUM + printer + cassette deck + games, £200. Tel: Leeds 672122.

16K SPECTRUM + printer + 5 rolls of paper + £30 software, £150 ono. Tel: 0553 62888.

ZX SPECTRUM, 16K + cassette recorder, £30 software, £130. Tel: Shere 2939.

48K SPECTRUM, as new + £70 software + cassette recorder, £190. Tel: Glasgow 041-334 1094.

ZX SPECTRUM, upgraded to 48K, boxed, as new, 9 months guarantee + £50 original software including Flight Simulation, plus sound amplifier, £150. Tel: 0767 314842 (evenings).

SPECTRUM 48K, £110 of software, £200 ono or part-exchange BBC model B. Tel: 01-464 9437 (evenings).

48K ZX SPECTRUM, complete with extensive software, £150 ono. Tel: Slough 73099.

48K SPECTRUM, printer + Abacus controller + £125 books and quality software, £225. Tel: 061-980 6565.

ZX81s for sale

ZX81, 16K Memopack, software, boxed, £45 ono. Tel: Shaftesbury 3410 (anytime).

ZX81, 16K, 10 machine code games, Asteroids etc, + dozens of others, £70 ono. Tel: Steve, Crayford 57560 (after 4.30 pm).

ZX81, 16K, leads, magazines, 11 tapes, ZX Chess II, £55 ono. Tel: 01-549 1164 (after 6 pm).

ZX81, 16K, Fuller keyboard, case, memory board, repeat, o-save, 9S character board, paddle, £100 of software, cost £300, yours for highest offer. Tel: Gregory on Alness (0349) 882026 (after 6 pm) for details.

1K ZX81 with over £30 books + software, £30 ono. P. Gower, 4 Llyffard Crescent, Newport, Gwent.

ZX81 + 16K + sound unit, £60 software, worth £165, bargain £100. Tel: 01-203 3508.

ZX81, 16K plus software, magazines and books, £55 ono. Tel: 01-897 9369 (after 4 pm).

ZX81, 64K Memo pack, real keyboard, many games and books, cost £160, sell for £80. Tel: 041-638 7332 (evenings).

ZX81, 16K, printer, £25 of software, magazines + books, cost £210, yours for £110 ono. Tel: Kelso 51180 (after 4.30 pm).

ZX81 SOFTWARE, 16K software, Nightgunner £2.50, Fantasy Game £3.50, Dodgems + Connect 4 £3.50, Adventure + Galaxions £3. Tel: Cardiff 759764.

1K ZX81, with books plus software, £35. Tel: 055 71502 (near Glasgow).

16K ZX81 + Inverse Video +Flight Simulation, Chess, Puckman, plus more, cost new £130, accept £65. Tel: 01-581 1300 (after 6.30 pm).

ZX80 + 8K, £15 ono. Tel: Brighton 688393.

ZX81 16K + ZX printer + manual, almost new, £110 ono. Tel: 01-980 5014.

ZX81 16K + ZX printer + manual, almost new, £110 ono. Tel: 01-980 5014.

ZX81, 16K, all leads and manuals, original packing + cassettes + books, guarantee, £60 ono. Tel: 061-747 4149.

ZX81, 1K, no power pack, fuller keyboards, mags, learning lab. Tel: Glasgow 041-632 9325 (5 pm).

ZX81 32K leads, manual and books, £65. Tel: 01-947 8444 (after 6 pm).

16K ZX81 + books + 8 16K arcade games, £60. Tel: 01-455 5337.

ZX81 64K, large, fuller keyboard, three tapes + magazines, £75 ono. Tel: John, Rochdale 524228 after 6 pm.

ZX81, 16K, keyboard with spacebar, software, £70 ono. Tel: Southwater (0403) 730637 (6 pm).

ZX81 16K, includes, DK Tronics keyboard + Graphics Rom, all leads + manual + mags + £75 software, worth £250, £150 ono. Tel: Staines 50522.

32K ZX81 + ZON X81 + keyboard, software and magazines. Offers around £90. Crayford 526502 after 6 pm.

ZX81 16K, £40 software, Invaders, Mazogs, 3D Defender, Flight Simulator, etc, etc, £65 ono. Tel: 01-942 9907, evenings.

ZX81, 32K + keyboard + software, £75. Tel: 0491 69788 (Oxon).

SINCLAIR ZX81, 16K, five games, Learning Lab, books, tape recorder, £70. Tel: 08894 6739.

SINCLAIR ZX81, 16K, guarantee, original 16K memory, £50 software, £50. Tel: 049525 5026.

ZX81, 16K, 6 tapes, £55. Tel: 01-446 5468.

ZX81 + 16K + manuals, books, cassette, £55. Tel: 01-609 1619 (office, ask for John).

ZX81 + 16K RAM with Fuller 42 keyboard + case, leads and manual + 3 books and software, £70 ono. Tel: 0223 842058.

ZX81 + 16K + cassette recorder + over £25 software, £60 ono. Tel: 0703 788746 (after 5.30 pm).

16K ZX81, books, magazines, manual and leads, tapes line 3D Monster Maze, Invaders etc all for £55. Ring 01-445 6194 (after 7 pm).

ZX81, 1K, no power pack, fuller keyboards, mags, learning lab. Tel: Glasgow 041-632 9325 (5 pm).

Commodores for sale

CBM PET 2001, new and old Roms, 24K, small keyboard, integral monitor and cassette, internal soundbox, Arrow fast load and save chip, tool kit, programs, games, books, £250 ono. Tel: Littlehampton 7607 (Sussex).

VIC20, cassette unit, 14in TV, Joystock, £40 software, manuals, dust cover, £170. Tel: 01-800 4994.

VIC20 + tape deck, super expander, joystick, machine package, £70 software, £211 ono. Tel: 0734 784506 evenings.

VIC20, CZN tape deck, joystick, mags, £130 ono. 01-467 5242 (6 pm).

VIC20, tape unit, 16K, 8K, 4 slot Motherboard, joystick, Basic 1 + 2, £50 of software. £400 ono. Tel: 01-200 6120 (6 pm).

VIC20, 11½K, tape deck, Vic Kit 2, joystick, light pen, books, magazines, tapes, games, worth £350, yours for £200 ono. Tel: Glossop (04574) 4203 (4 pm).

VIC20, 8K Ram, with cassette unit, joystick, £50 worth software, 2 months' old, £200 ono. Tel: Malvern 4050.

32K VIC20 + C2N + four cartridges, including 8K Ram + eight books, including P.I.G., Vic Revealed, Stack, Store Board, Vic Kit 2, lots of magazines, over 40 cassette programmes, under three months old. Offers. Tel: 01-574 4122.

VIC20 + 16K + CZN + £140 of software including 2 cartridges. Accept £260 ono or exchange for BBC Model A. Tel: (0423) 500423.

COMMODORE 64, CZN cassette + reference manual, 5 weeks old, £320. Tel: Blackburn 55161, Alan, ext 2268.

VIC20, cassette, fitted 32K Ram, Bickit Rom, M/board, cartridges, books, in custom plinth, £350. Tel: Kendal 28573.

VIC20, C2N tape deck, joystick, mags, £130 ono. 01-467 5242 (6 pm).

VIC20, CZN cassette, joystick, software, 3 months old, free delivery in East London and East Anglia, £135 ono. Tel: Peter, Elmham (036 281) 758.

PET, 64K, new Roms, integral cassette + second cassette player, Rabbit + tool kit, Roms, sound box, load of software, £295. Tel: Brentwood 231490.

VIC20, cassettes, books, magazines, offers. Tel: 01-459 2571, Willesden, NW2.

VIC20 + cassette, leads and manuals, joystick, 3 cartridges including Sargon II, Chess and programmers aid, 6 games cassettes, £180 ono. Tel: 01-340 6854 (evenings).

VIC20 + 16K, cassette deck (£160), super expander (£20), joystick, software, books, Introduction to Basic I and II, £200. Tel: 0424 216414 (anytime).

VIC20, cassette unit, speech synthesizer, mother board, program aid, super expander cartridge, four games cartridges, £50 cassette games, dust cover, £330 ono. Tel: 0920 3529.

VIC20 + cassettes, 3-slot 8K motherboard, 8K Ram, super expander, joystick, basic 1 and 2, Vic Revealed, programmers reference guide, tapes, etc, 3 months old, boxed, cost £400, accept £270. Tel: Durham 780834 Ex.8 (day).

VIC20 with 16K Ram, Super Expander, Programmers aid cartridge, Sargon II, Chess, joystick, cassette, £60 + software, intro to Basic Part I, magazines etc. £220 ono. Tel: Burton upon Trent 815293 (after 6 pm).

COMMODORE PET 2001 series, 8K, around 58 tapes with 150 programs, with sound, £190 ono. Tel: Shanklin (Isle of Wight) 6492, evenings.

VIC20 + super expander + Tellymonsters, Sargon II, Pirate Cove, Ratrace + Superlander, £60 cassette software + joystick, £190 ono. Tel: 01-656 0511.

VIC20 + tape deck, 3K, 3 games + Beginners Reference Guide + magazines + Myriad, £230. Tel: 01-580 4741, ext 82, 9.30 am to 5.30 pm, Mr C. King. Tunbridge Wells 29157 after 7.30 pm.

COMMODORE 64 + cassette player, only a few months old, £350 ono. Tel: 051-651 3394 (after 6 pm).

VIC20. Swap super expander for machine code monitor. Tel: 061-445 6630 (after 4 pm).

VIC20 + cassette unit + super expander, 4 games cartridges, lots of cassettes, joystick + books, £300, or sell separately. Tel: Stourport 6102.

VIC20, tape unit, 16K, 8K, 4 slot M/board, joystick, Basic 1 + 2, £50 of s/w. £400 ono. Tel: 01-200 6120 (6 pm).

VIC20 plus cassette unit, super expander, software worth £50, books, mags, boxed as new, worth £320, sell for £200 ono. Tel: Oxted 7495.

VIC20 + 1 year extended guarantee + £80 of software + joystick + dust cover and programmers reference guide, £200. Tel: 0636 706326 (3-5).

VIC20, 21K, cassette unit, joystick, Jelly Monsters, under guarantee, VIC programmers reference guide + other books and Vic magazines, some cassettes, £225 ono. Tel: Sittingbourne 70811.

COMMODORE 64 + cassette player, only a few months old, £350 ono. Tel: 051-651 3394 (after 6 pm).

VIC20, cassette deck + machine code programs, etc, £180 ono. Tel: 01-751 2303.

PET 2001 8K integral cassette and monitor, just serviced. Programs, manuals, CBM/PET users guide, good buy at £200. Tel: 03542 3693, Cambs.

Ataris for sale

ATARI VCS + 2 game cartridges, still under guarantee, original packaging, £85. Tel: 01-960 7735.

ATARI VCS + 5 cartridges, Asteroids, Adventure, Dragster, Kaboom and Combat. £100 or swap for Spectrum or 16K ZX81. Tel: 0978 821 780 (after 5 pm).

ATARI VCS, Space Invaders, Asteroids, Lazer Blob, Indi 500, no joysticks, £90 ono. Tel: Hatfield 63026 (6 pm).

ATARI 400, 48K, cassette deck, Basic, joystick, Star Raiders + many programs, £320 ono. Tel: Dunstable 604737.

ATARI VC, 6 cartridges, joystick + Padaly, £110. Tel: 01-556 6692.

ATARI VCS, 3 cartridges, very good condition, £80. Tel: Ingrebourne 49987.

ATARI VCS + 5 cartridges, Asteroids, Adventure, Dragster, Kaboom and Combat. £100 or swap for Spectrum or 16K ZX81. Tel: 0978 821 780 (after 5 pm).

ATARI VCS + 2 joysticks, 4 pedal controls, Combat + Space Invaders cartridges, will swap for computer or sell for £95. Tel: 0475 7055.

ATARI VCS, joysticks, paddles, touch panel, 8 cartridges including Star Raiders, Pac-Man, Cosmic Arc, Empire Strikes Back and Space Invaders, £140. Tel: 01-748 6681 (anytime).

ATARI VCS, Chess, Pac-Man, Combat, £90 ono. Tel: 01-348 5668 (after 6 pm).

ATARI VCS, nine cartridges, including Defender + Asteroids, including paddles + joystick, hardly used, good condition, £170 ono. Tel: 01-546 9379.

ATARI television game + 6 cartridges including Circus, Breakout, Maze etc, £150. Tel: 01-980 5014.

ATARI video game, £100 + 4 cartridges, or will swap for Vic20. Tel: 061-456 4181.

ATARI VCS, as new, boxed with joysticks + paddles + Combat, Defender, Berserk, Empire Strikes Back. Unwanted gift, £120. Tel: 651 3863 after 4 pm.

ATARI VCS + 16 cartridges including Asteroids, Defender, Superman, Star Raiders and Pac-Man, cost over £450, £200 ono. Tel: Slough 20735 (after 6 pm).

ATARI 800 48K with Basic cartridge, tape deck and disc drive, 2 months old, £550 ono, complete with manuals, boxed. Tel: 0703 582322/581431.

ATARI 400/800, software, cassette + cartridges, many different. Tel: Derby 764595 for details.

ATARI VC, 6 cartridges, joystick + Padaly, £110. Tel: 01-556 6692.

ATARI 400/800: Firebird and Termoil Rom cartridges, cost £25 each, sale price £15 and £10 respectively. For details of these brilliant arcade quality games phone (05827) 69152.

ATARI VCS, 3 cartridges, very good condition, £80. Tel: Ingrebourne 49987.

ATARI television game + 6 cartridges including Circus, Breakout, Maze etc, £150. Tel: 01-980 5014.

ATARI VCS + 10 cartridges, including Chess, £120. Tel: 01-591 4248.

ATARI 800 16K, cassette recorder, joysticks, paddle, books, listings, £380. Tel: 01-393 0116.

ATARI VCS, six cartridges, £80. Tel: 061-437 7569.

ATARI, VCS, + Combat cartridge, good condition, £45. Other cartridges available. Tel: 01-669 7590 (after 6 pm).

ATARI 800 48K, disc drive, recorder, 822 printer and 100 + games, value £3,000, will sell for £1,250 or will exchange games. Tel: 063-336 4646.

Tandys for sale

TANDY 4K, with tape recorder, black and white monitor, power suppiy, 2 tapes, £110. Tel: 01-591 1790 after 6 pm.

TANDY COLOUR COMP 32K, joystick, case, CCR tape, software + hardware + books, etc. Cost £670, accept £570 ono. Tel: 061-370 2162, 6pm to 7.30 pm.

GENIE, 17 months old, fitted with the Rom, sound unit, plug-in joysticks, in original box, with cover, manuals, books, tapes + software., £150. Tel: 01-653 7079 (evenings/weekends).

TANDY TRS80 80, level II, 16K, manual, £220. Tel: Carterton 844170.

TRS80 MODEL III, 2 internal disc drives, tape deck, all manuals, leads, much software on disc + cassette, £1,400. Tel: 01-572 2917.

TRS80 MODEL I, level II, 16K, Tandy tape recorder, Adventure + arcade games + books, £150, no offers. Tel: 01-891 2761.

TANDY TRS80 POCKET COMPUTER + printer, interface, as new, £80. Tel: Ongar 363947.

TANDY TRS80 80, level II, 16K, manual, £220. Tel: Carterton 844170.

VIDEO GENIE, VG 3003, excellent condition, £100 + £15 worth of software, £150 ono. Medway (0634) 573 531.

GENIE I 32K plug-in Roms, Base II printer, 200 programs, books + magazines. Offers over £400. Tel: 0923 44193.

Acorns for sale

ATOM, software, floating point Rom, Toolkit Rom, £200 ono. Tel: Stamford 6409 (6 pm).

BBC MODEL B, complete with all manuals and leads + box, £350 ono. Tel: 01-644 0433.

BBC MODEL A, 32K, 6522 chip, £80 software, £350. Tel: 01-888 1181.

ATOM, s/w, floating point Rom, Toolkit Rom, £200 ono. Tel: Stamford 6409 (6 pm).

BBC MODEL B, 11 weeks old, cassette recorder, leads, software plus NEC 30 hr Basic, plus mags. Will deliver/meet within 150 miles Leicester. Offers around £360. Tel: 0455 611072.

BBC MODEL B. Good condition + software, £330 ono. Tel: 041-881 1342.

ATOM 12K + 12K, floating point Rom, PSU, manuals, leads, tape deck, Acornsoft software II, swap for Spectrum or sell for £130 ono. Tel: 01-789 4260, 6 pm.

BBC MODEL B + disc drive, printer. Tel: Boston 51537.

ACORN ATOM, floating point, 12K, leads, 14 professional games, books, best offer over £100. Tel: 01-366 5777 (after 4 pm).

ACORN ATOM, 12 + 12, power supply and Chess game, £120. Tel: Ripley (Derbyshire) 48870.

BBC MODEL B, 1-2 op. system, £380, inc delivery. Tel: 0473 53161, after 6 pm.

BBC MODEL B. Good condition + £220 ono. Tel: 041-881 1342.

For sale

DRAGON 32, 3 months old, new, boxed, £80 of extras, joysticks, Ghost Attack, tapes, £175 ono. (I have to buy new car). Tel: Eastbourne 846129 (anytime).

SWAP: Spectrum Chess + Planetoids for Flight Simulator + Hungry Horace. Tel: Cobham, Surrey, 3503 (after 5 pm).

SHARP MZ80A, unwanted Christmas present, £100 software, still in box, £495. Tel: Dewsbury 465392 (5 pm to 9 pm).

DRAGON 32 with colour TV, 1 joystick, 2 manuals, £350 ono. Tel: Hertford 52755 (after 5 pm).

SWAP. 16K RAM PACK or sell for £20. Tel: 01-903 0794 (after 5 pm).

DRAGON 32, 4 months old, £150. Tel: 021-378 0174.

SWAP. Pac-Man + Breakout for £20 or Pitfall or Raiders of the Lost Ark or Dragon Fire. Tel: Ashbank 3435.

COMMODORE VIC20, Tomb of Drewan, needs 16K expansion + Asteroids. Sell or swap for Gorf or Choplister. Tel: Odiham 3445.

VIDEO MASTER, Chess Champion, 6 levels, 40 computing magazines, £35 ono. Tel: 01-267 6201 (after 4.30 pm).

VIC20 GAMES, Trax and Border Attack and Moons of Jupiter etc, £10 for all 3. Tel: 01-885 1207 (after 4 pm).

SWAP: Chinon CE4S camera with flash + power and flash, worth £200, want Seikosha printer for BBC B. Tel: Hull 506133 (anytime).

ZX PRINTER, £40. Tel: 01-958 9442.

5 ROLLS ZX PAPER, £8 including P&P. Tel: Bolton 691887 (anytime).

DRAGON 32, 2 months old, manual and cassette leads, £150. Tel: 01-508 6200 after 6 pm.

FOR SALE. Introduction to Basic Parts 1 and 2 for the Vic20, £15 the two; Voodoo Castle and Alien cartridges, £10 each; 3 programming books, £4; 3 cassettes, Trader £4, Panic £3, Goldrush £4. Tel: Nottingham 233955.

SWAP COMMODORE Mission Impossible adventure cartridge for the Count or Pirate Cove. Tel: 0570 470362 (anytime).

COMPLETE SET of *Popular Computing Weekly*, Vol. 1 to Vol. 2 No. 6, offers. Tel: Nottingham 703604.

VIC20 Road Race cassette £4. First letter received accepted. Send no cheques. Write to M. Valentine, 101A Underdale Road, Monkmoor, Shrewsbury, Shropshire, SY2 5EF.

VIC20 SOFTWARE. Will swap Adventureland cartridge for the Comet or Voodoo Castle. Tel: 041-942 8146 evenings.

DRAGON 32, boxed, as new + joystick, Star Ship cartridge, Computer Voice, Crazy Kong, lots of software, £190. Tel: 01-843 1092.

PIRATE COVE adventure game for Vic20, two months old, £20. Tel: Mark, 0933 678078.

GORF 8K RAM for Atari, £20. Tel: 01-550 0806 (evenings).

ADVENTURE LAND for Mission Impossible or any other Scott Adams Adventure cartridge. Tel: 01-515 4696.

INTEL SBC 80/10B single-board computer, new, £150. Tel: Garston 78733, Ken.

VU-FILE, Chess (48K) and five rolls of printer paper for the ZX Spectrum, £20. All items new. Tel: 01-574 8583, 7 pm to 8 pm.

COMMODORE 64 games, £7.95 each. Tel: 01-450 4858.

COMMODORE O Level revision programs in Physics and Chemistry, mint condition, £7.50 each. Ring: Johnston (Renfrewshire) 21586 (after 5 pm).

OHIO SUPERBOARD II, Intamon 8K, 15 games, all leads, in case. Originally £270, sell for £110. Ring: Bolton 41691.

LYNX 48K COMPUTER, still in box, £220 ono. Ring: Philip on 061-652 0051.

INTELEVISION CARTRIDGES, £10 and £15 each, Voicebox £35. Ring: 0403 60069.

CROWN CST 980 portable hi-fi, cost £170, 2 months old, swap for 48K Oric or Spectrum. Tel: 061-483 9121 after 2 pm.

JUPITER ACE, complete, unused, with 5 blank tapes, £65 ono. Tel: 0734 665570 evenings.

COMMODORE 64 games, £7.95 each. Tel: 01-450 4858.

Wanted

WANTED, ZX PRINTER. Tel: 061-97[illegible] 9728.

BBC MODEL A/B. Still under guarantee. Tel: 01-455 6370 after 4 pm.

CASSETTE UNIT for Vic20. Tel: Macclesfield 32637.

WANTED: 48K SPECTRUM, £135 or 16K at £100. Tel: 01-688 5632 (6 pm).

WANTED. Spectrum 14K or 68K, £120 ono or will swap for Dual manual home organ. Tel: Bedworth (0203) 316704.

WANTED: BBC Micro B for £300–£320. Tel: Crowthorne 4161 anytime.

WANTED: ZX80 with all leads, £15. Tel: Maidstone 861664 (any time).

WANTED Introduction to Basic, Part 1. Tel: Stevenage 61765, John.

BBC MODEL B, less than three months old. Tel: Earls Colne 3557.

WANTED: BBC Micro A. Tel: Guildford 38560 (4 pm).

48K SPECTRUM WANTED for ZX81 + 16K and £117.59 worth of software Possibly settle for 16K Spectrum. A Munro, 70 Meadow Park Street, Dennistoun, Glasgow G31 2ST.

VIC20 Cloudburst or Satellites/meteorites cartridge in exchange for other games. Tel: 0438 811634.

SPECTRUM, IN EXCHANGE FOR MATTEL INTELLIVISION 3D computer games machine (as new), with cartridges, superb graphics. Cost £180. Tel: 01-845 2244.

WANTED. Vic20 + 16K Ram + cassette + cartridges required, exchange for OM2N + 200mm telephoto lens and flash. Tel: 0594 23534 evenings.

WANTED. ZX81 internal 32K or 64K Ram. Tel: 01-236 9049 day, 0268 685071 eves. Ask for Morgan.

WANTED. Home computer or Dragon printer plus software. Exchange for sound projector and silent cine camera plus screen. Tel: Telford 581237.

WANTED: Vic20 tape unit, good condition, Tel: 01-890 6510, Feltham.

DRAGON 32 + Centronics printer. Swap for NewBrain + accessories. Tel: 01-856 1198.

WANTED, SPECTRUM 48K, offers ZX81 1K in part exchange. Tel: Boston 723516.

DRAGON 32 for around £170. Offers to: Jim Monahan, Waterford 82253 (Ireland) after 7 pm.

BBC, Model B, 1.2 MOS (preferably). Tel: Hull 849517.

BBC, Model B, offers. Tel: 01-530 2800.

WANTED: VICMEN CASSETTE + joystick. Tel: St Athan 750696.

PRINTER FOR PET. Dual drive floppy discs for Pet. Tel: Brentwood 231490.



MYSTERY TOUR

J M Danes of Northfield, Birmingham, writes:

Q I have a ZX Spectrum, which is my first computer, and I am enjoying learning all the mysteries. One thing that I am interested in is any way of running ZX81 programs on the Spectrum.

A Almost without exception, ZX81 programs can be run on a Spectrum, but some alterations are needed — see *Popular Computing Weekly*, January 13, Letters, for details. Also, the 16K Spectrum only has 9K of usable memory, so some 16K ZX81 programs may take up too much room.

SHY SINCLAIR

Malcolm Singh of Westgate, Dartford, Kent, writes:

Q Please could you tell me if the microdrive for the Sinclair Spectrum will (when released on the market) be usable for the Dragon.

A I have this funny idea for a Sci-Fi story where the hero buys a home computer, called the Binnatone Electron, that has coupled ZX microdrives . . .

I am still getting a lot of questions about the microdrive, but Sinclair is still very reticent, as he has been for the last nine months. The brackets in your questions are very apt.

However, with the recent announcement that a special interface will be needed to use the microdrives with the Spectrum, I think it would be wise to stop regarding the microdrives as a ZX add-on, and class them much more as a general computer peripheral. I remember saying four or five months ago, that *if* the microdrives turn out to be all they are cracked up to be, then they would be more important to the computer market than the Spectrum.

I guess that when the microdrives are eventually released, they will be aimed at a range of home micros. Once they have proved themselves reliable, I am sure a range of interfaces will appear.

For all those who have asked when the microdrives will appear, I am afraid I do not know. The microdrive case was shown at the Earls Court show last April, but there has been little sign of it since then. Perhaps it will appear at the next Earls Court Show in June.

BLACK AND WHITE

M J Vale of Coleshill Road, Hodge Hill, Birmingham, writes:

Q I am thinking about buying a Newbrain microcomputer. Will I be able to use its 80 column display and high-res graphics (640 x 250) on a normal 625 line, black and white, television?

A Yes. A normal television should be able to deal with any resolution that can be accessed by a normal microcomputer. The only limit is size — an 80 column display on a small screen will be harder to see, but all the information will be there.

CARD SHARP

Andrew Simpson of Stretford, Manchester, writes:

Q I hope to be getting an Oric soon, as it looks to be as good as the Spectrum and cheaper. I am new to computing, but I would like to know if there is any way I could write a games program (eg, a card game), where each hand was shown on a different television screen. I have looked through several magazines and no one seems to have mentioned it, though I am sure that it would be very useful. I know that more than one joystick can be used, so why not more than one television?

A In short, you cannot use more than one television because you only have one video output and one set of video circuitry in the computer. This is true of all the home micros and many larger machines as well. To get the effect that you want you would have to connect two computers together, though one would have to be used as the master.

As for joysticks, they control input, not output. In fact, the multiplexer used for two or more joysticks does not put a signal in at the same time from each joystick, rather the input from each is read alternatively. But this is so fast it cannot be detected by the human eye.

BUZZ, BUZZ!

E C De Corte of Barmby Moor, York, writes:

Q When switched on, my Spectrum prevents reception on a transistor radio in an adjoining room, since it causes the latter to emit a loud pitched buzz. Is this a fault of the individual machine, or is it a problem with the Spectrum in general? If it is a general characteristic, then have you any ideas how I can overcome the problem?

A Normally it is the Spectrum that buzzes, so this is a change. This should not happen and the Spectrum is at fault.

Unlike America, where there is a complex web of law governing any form of extraneous broadcasting, there is little on the statute books in this country governing the shielding of appliances. However, in this case it is probably a good thing, as the interference is indicative that there is something wrong with your Spectrum. I would suggest that you send it back as soon as possible.

The fault might well lie with the power supply — this sort of effect is possible if it is being overloaded. Alternatively, it might be something in the video circuitry. It might be useful to see whether it causes the same problem on other radios. I suggest that you attach a brief note to the machine stating that the problem is interference with a radio.

AUSTRALIAN RELEASES

Richard Herbert of Harris Street, Laurenceton, Tasmania, Australia, writes:

Q I would like to know if some of the latest releases on the British computer market, namely the Spectrum, Lynx, Oric and Dragon, are going to be released in Australia. I would like to know the release date and the cost in Australian dollars.

A I telephoned the various people involved. They were all quite helpful, but not everyone could give me a definite answer and no-one a price.

The Spectrum will certainly be available within the next two to three months, from all the usual outlets. The Lynx and Oric will be available at some time, but there are no definite dates. Computers, manufacturers of the Lynx, are negotiating with potential dealers now and Oric will be starting soon.

Dragon were the most positive and gave me April as the launch month in Australia. The dealership will be through the Hanimex Organisation, Brookvale, New South Wales. However, a price has not yet been finalised.

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.

Top 10

Books

1	(1)	Enter the Dragon, *Carter*	(Melbourne House)
2	(6)	Creative Graphics on the BBC Micro, *Cownie*	(Acornsoft)
3	(2)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)
4	(4)	The Working Dragon 32, *Lawrence*	(Sunshine)
5	(5)	Compute!'s First Book of Vic, *various authors*	(Compute!)
6	(3)	Spectrum Machine Language for the Absolute Beginner, *Tang*	(Melbourne House)
7	(—)	Programming the Z80, *Zaks*	(Sybex)
8	(9)	Vic Programmer's Reference Guide, *Finkel*	(Commodore)
9	(—)	Vic Innovative Computing, *Ramshaw*	(Melbourne House)
10	(—)	Compute!'s Second Book of Atari, *various authors*	(Compute!)

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

Ziggurat



The square root of −1

Not long ago, I touched on logarithms, and some of the ways in which a knowledge of them could help in understanding certain aspects of computers and mathematical functions.

What I found to be very interesting about the logarithm article was the reaction from the more venerable members of society (ie, those over the age of 20). Many expressed the considered opinion that the whole piece was a waste of time. Apparently it said nothing new, and "everybody knows about logarithms".

My protestations that the application of logarithms to exponentiation and the numerical accuracy of computers was new, were treated with pity. I then asked around amongst my young friends (ie, less than 20 years old) to find out what they knew of logarithms.

Most, I found, had no experience of logarithms before the third year in secondary school — and one third-year pupil still had not encountered such esoteric topics. Asking what they *did* know was more revealing, for few had any true understanding of the potential of logarithms.

Until recently, logarithms were an important part of any secondary school maths syllabus: they had to be used for calculations of any complexity in maths or science.

Because they were used in so many different applications we learnt their limits quite well. Now that calculators are so common, the need for logarithms in calculation has nearly vanished.

But the true power of logarithms goes beyond their mechanical use, and that seems to be disappearing.

The importance of application in the learning of logarithms is only one facet of a wider problem — understanding is helped by use.

Program writers find that for complex graphics effects, for example, they need to be able to use trigonometrical functions. Functions which at school were consigned to the rubbish heap of useless and pointless knowledge. Is this inability to provide people at school with any feeling of relevance a new problem? I think not.

Seymour Papert (he of *Mindstorms*, and the *Monkey Puzzle*) was featured on a television programme recently. Papert argued that mathematics should be taught in a *concrete* way. His way was via the use of the programming language Logo, and Turtle Graphics.

The program was very interesting, but — I think — rather wrong-headed. Children were learning to manipulate turtles on screens, and on the floor; but — I then wondered — how would they learn in the turtle-maths world about the power of logarithms, as the turtle world is geometrical?

Earlier that same evening (on a different channel) there was a programme aimed at helping people to work out the money they should be given in change: I wondered if Turtle Graphics would help here. Just because there is an increasing use of calculators and electronic tills, should we let our minds vegetate?

There seem to be many things wrong with our present (and past) methods of education — but those problems will be worsened by a facile attempt to duck the basic problem, by saying we can do it with pictures. The basic problem seems to be that many people have a total lack of understanding of numbers.

Seymour Papert says of sums "These absurd little repetitive exercises have only one merit: They are easy to grade."

But, if people were more experienced, they would not *try* to find the square root of −1 (even if the calculator allowed them to so do) . . . ■

Boris Allan

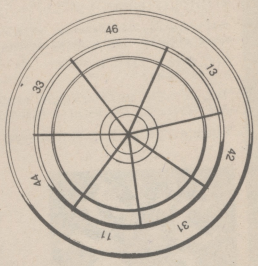
Puzzle

Bull's-eye!

The village of Muddlecombe has its own peculiar game of darts played on the 'Muddlecombe' board consisting of only seven numbered sections. There is no bullseye, but doubles and trebles can be scored as on a standard dartboard. The winner is the first player to score *exactly* an agreed total.

You are playing in the final of the inter-village championship and your opponent needs only a throw of 46 to win. However, it is your throw and you have to score exactly 118 points to win the match.

You have three darts. Which numbers would you aim for?



Solution to Puzzle No 43

The program tests all possible values of the number of paints and brushes bought. The balance of the 100 items is then assessed and the total cost found. If this equals 10,000F then the value is printed.

```
10 FOR P=1 TO 98 20 FOR B=1 TO 98 30 LET C=
100-(P+B) 40 LET COST = P*300 + B*700 +C*50
50 IF COST = 10000 THEN PRINT "Number of
paints=";P;" Number of brushes=";B;" Number of
crayons=";C 60 NEXT B 70 Next P
```

This shows that the only possibility is 7 paints, 5 brushes and 88 crayons.

Winner of Puzzle No 43

The winer is: Phil Allen, Flambard Avenue, Christchurch, Dorset, who receives £10.

Top 10

Atari

1	(1)	Defender	(Atari)
2	(3)	Miner 2049er	(Big Five)*
3	(9)	Star Raiders	(Atari)*
4	(—)	Ghost Encounters	(J + V Software)
5	(—)	Astro Chase	(First Star Software)*
6	(10)	Wizzard of Wor	(Rocklan)*
7	(2)	Fort Apocalypse	(Synapse)*
8	(—)	Gorf	(Rocklan)*
9	(—)	Stratos	(Adventure International)
10	(—)	Space Invaders	(Atari)*

*Cartridge. †32 cassette.

(Figures compiled by Calisto Computers; Birmingham 021-632 6458)

Spectrum

1	(7)	Black Crystal	Carnel)*
2	(2)	Time Gate	(Quicksilva)*
3	(1)	Penetrator	(Melbourne House)*
4	(4)	Arcadia	(Imagine)
5	(6)	Frogger	(A&F)
6	(8)	Master File	(Campbell Systems)
7	(9)	Vu-3D	(Psion)*
8	(—)	Galaxians	(Artic)
9	(5)	Scramble	(Mikrogen)
10	(10)	Hobbit	(Melbourne House)*

*Requires 48K.

(Figures compiled by Buffer Micro Shop, London 01-769 2887)

ZX81*

1	(1)	Black Crystal	(Carnel)
2	(6)	Kong/Dracula	(Tony Roberts)
3	(—)	Galaxians	(Arctic)
4	(3)	Flight Simulation	(Psion)
5	(4)	Sea War	(Panda)
6	(5)	3D Defender	(JK Greye)
7	(8)	Trader	(Pixel)
8	(10)	Fantastic Voyage	(Foilcade)
9	(2)	Gulp II	(Campbell Systems)
10	(—)	Protector	(Abacus)

*All 16K.

(Figures compiled by Buffer Micro Shop, London 01-769 2887

Vic20

1	(2)	Abductor	(Llamasoft)
2	(—)	Laser Zone	(Llamasoft)
3	(1)	Grid Runner	(Llamasoft)
4	(6)	Arcadia	(Imagine)
5	(5)	Andes Attack	(Llamasoft)†
6	(3)	Frog	(Interceptor Micros)
7	(—)	Krazy Kong	(Interceptor Micros)
8	(7)	Quackers	(Rabbit)
9	(10)	Traxx	(Llamasoft)†
10	(—)	Night Crawler	(Rabbit)

†Requires JK or 16K.

(Figures compiled by Vic Centre, London 01-992 9904)

BBC*

1	(—)	Wordwise	(Computer Concepts)†
2	(—)	Chess	(Computer Concepts)
3	(—)	Logo II	(Computer Concepts)
4	(—)	Hitch-hiker	(Computer Concepts)
5	(—)	Algebraic Manipulation	(Acornsoft)
6	(3)	Planetoids	(Acornsoft)
7	(—)	Monsters	(Acornsoft)
8	(5)	Castle of Riddles	(Acornsoft)
9	(9)	Snapper	(Acornsoft)
10	(—)	Tree of Knowledge	(Acornsoft)

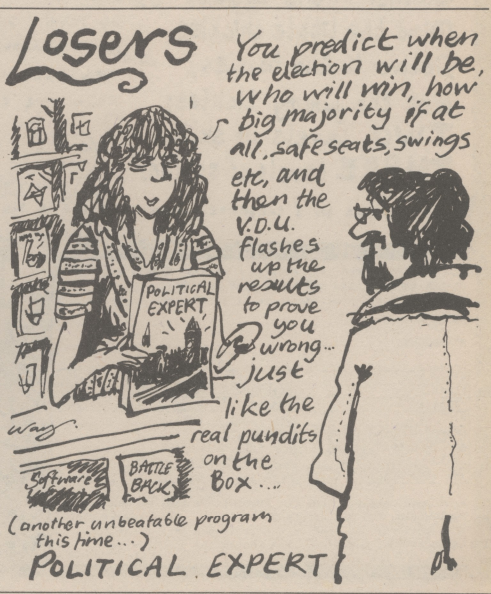
*All Model B. †Cartridge.

(Figures compiled by Micro Management, Ipswich 0473 59181)

Dragon

1	(1)	Planet Invasion	(Microdeal)
2	(2)	Dragon Trek	(Salamander)
3	(7)	Space Race	(Compusense)
4	(3)	Scarfman	(Microdeal)
5	(6)	Alcatraz II	(Microdeal)
6	(4)	Invaders Revenge	(Microdeal)
7	(5)	Ghost Attack	(Dragon Data)
8	(8)	Fun and Games	(Shards)
9	(—)	Games Pack 2	(Abacus)
10	(—)	Lion Heart	(Peaksoft)

(Figures compiled by Dragon Dungeon, Ashbourne 0335 44626)



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