40 Rock

POPULAR Computing WEEKLY

35p 4 November 1982 Vol 1 No 29

This Week

New Dragon page

Starting this week, a regular page for Dragon 32 programming skills. See page 25

Schools software

How many of the advertised programs are good enough for you? Find out in our review of ZX81 educational software on page 12.

Guy Fawkes

Pit your wits against the guards in this major new game for the ZX Spectrum. See page 8

Vic20, ZX81, BBC, Spectrum programs and games in *Open Forum*. See page 14

News Desk

Some of the few Spectrums in use in primary schools.

Spectrum shunned in education scheme

THE Sinclair Spectrum may receive only limited use in primary schools, according to information just received.

Since the Department of Industry announced its 'Micros in Primaries' grants scheme in July it has received 422 applications. Of these, 322 are for the Acorn BBC Model B, 97 for the Research Machines 480Z and only three for the Sinclair Spectrum.

Most local education authorities have issued guidelines to their schools indicating which of the three machines in the scheme should be adopted.

US launch for BBC micro in Spring '83

ACORN plans to launch the BBC range of microcomputers in the USA in the first quarter of 1983.

The machines were shown there for the first time at the Info '82 trade exhibition, held at the Coliseum, New York, on October 11-14.

The go-ahead to exhibit at the show came after the decision to set up an American office to market the Acorn computers. "Chris Curry and John Coll went over to the show to make initial market contacts and to sort out a dealership network for the BBC machines" explained Acorn's Jane Aldrich. "US prices have not yet been finalised as they will be subject to discussions with whoever will become the distributor."

The production difficulties which have plagued the machine's progress in the UK seem finally to have been solved, allowing the American launch to be contemplated. It is only in the last two months that the micros have been freely available through Acorn dealers in Britain.

Classified

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Continued on page 28

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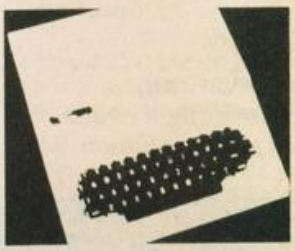

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POPULAR Computing WEEKLY

4 November 1982 Vol 1 No 29

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How to submit articles
Articles which are submitted for publication should not be more than 1,000 words long. The articles, and any accompanying programs, should be orginal. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

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

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Editorial

Clive Sinclair is in grave danger of becoming The Yesterday Man. The ZX Spectrum, which was widely expected to become the market leader when it was first launched in April, is already being overtaken by the Dragon 32.

The Spectrum's eclipse is not due to any technical pre-eminence on the part of Dragon. Pound for pound the Spectrum still offers one of the best deals in the microcomputer market.

But, the Dragon 32 is available. It is possible to buy the Dragon 32 off the shelf in many high-street stores. There are no four-month waiting lists.

Quality control on the Spectrum also leaves something to be desired. While it is impossible to gather comprehensive figures, an alarming number of Spectrums are being returned — either because they did not work when they were delivered or because they crashed within hours or days of being switched on.

With the launch of the ZX81, Clive Sinclair became the undisputed leader in the micro field. That lead is now being challenged.

There is still time for Sinclair to come back. But he needs to solve his production problems and quickly.

Sinclair has already lost an immense amount of goodwill. He cannot afford to lose much more.

Next Thursday

Are you a radio ham? Log your calls with QSO — a radio directory program for the 16K ZX81 by Anthony Briggs.

Also next week, a review of some of the latest Commodore software for the Vic20. Mike Grace takes a look at Mastermind, Quizmaster and English Language Revision.

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If you can reach his hide-out, then he will give you the elixir of life. Travel through the jungle, the ghost town of Sham and find the secret entrance to the temple in which the wizard hides. Once in the temple you will need all your skills and determination to avoid the dangers awaiting you. You may meet the wizard in the end, but we doubt it . . .

THE FOURTH KIND
Can you manage to communicate with the extra-terrestrials and obtain from them the universal medicine for eternal life? This is not only an adventure but will test also your skills in trying to overcome what would seem to be impossible communication problems.

THE 7 CITIES OF CIBOLA
These famous cities, where the Spanish Jesuites found their gold, are situated somewhere in the South-American jungle. Their whereabouts have been lost for several centuries, and nobody has found them ever since. Can you survive in this exhausting climate and find at least some treasure? And, if you find it, will you still be strong enough to get back with your gold? There is not only the climate: indians, poisonous animals, secret religious sects and many more.

THE DOMED CITY
You are travelling through unmapped territory and your way is blocked by a giant ant heap. By a freak mutation these ants are as big as you and there is only one way open: through the ant's lair. Some ants are friendly, others are aggressive, and your weapons are not much help: your survival depends on skill, anticipation and cunning. Will you succeed?

THE TOWER OF BRASHT
One member of your expedition has been taken prisoner by the Kharrs, a cruel tribe living near the edge of civilisation. You must choose a few companions from your team, and try to get the prisoner out. Success or failure will depend on whom you choose and how they are equipped. This D&D type adventure is difficult and will take you some time to play. It can be used as a roleplaying adventure, with as many players as there can be members of the team.

THE GHOST OF RADUN
In the old, half ruined castle of Radun, a large treasure is buried. Many have tried to find it, but none have ever returned to tell the tale. It is rumoured that the treasure is guarded by a ghost, who appears when least expected, and makes sure that the treasure hunter can no longer return. This adventure is definitely not for the weak-hearted and we strongly advise not to play it after nightfall, especially not when you are alone in the house.

ADVENTURES FOR THE VERY YOUNG:

There is no longer any need for very young children to gaze wistfully at a computer they are not allowed to touch.
This new series of adventures is mainly based on graphics, but follows the traditional pattern of an adventure game. There are some elementary instructions for which a bit of help from the grown ups may be needed. If you want to see some little eyes light up . . .

PETER RABBIT AND THE MAGIC CARROT
Peter Rabbit goes on a quest for the magic carrot. It is rumoured that any rabbit taking one bite of that carrot gets an extra twenty years of life.
Peter has to go through the big forest, meets nice (and not so nice) friends, deals with a dwarf, gets help from old man oak, etc . . .
Will he get to the cave and find the magic carrot?

PETER RABBIT AND FATHER WILLOW
Father Willow has been damaged by vandals, and is now in a bit of a state. Peter Rabbit goes in pursuit of the vandals. They know and try not only to escape but to stop Peter Rabbit from following them. Luckily the latter gets help from the other trees, who heard about the story. But will he find the vandals and have them locked up?

PETER RABBIT AND THE NAUGHTY OWL
Jimmy the Owl has been unsufferable of late. The Council of the Meadows sends Peter Rabbit on an expedition to find the Master of the Owls, in order to have Jimmy taught some manners. The Master lives very far away and its quite an adventure getting there. Will Peter Rabbit come back without having seen the Master and thus Jimmy remain a nuisance?
It now transpires that the Peter Rabbit Adventures can be dangerously addictive to grown ups . . .

FRUSTRATION
Frustration is more a puzzle than an adventure. It looks like a program full of bugs and nothing seems to work. It will be difficult to get to the end, but if you do (and don't go mad with frustration!) then there is a reward. The first ten correct answers received by us will be allowed to choose three of our games. FREE!

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All these games are available for ATARI 16K and SPECTRUM 16K
Some of the games will load different programs successively and are thus much larger than 16K.
All C.P.S. Games, except those for children, are priced at £9.50. The Peter Rabbit and Tummy Digs games are now £4.50.

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LEAs favour Acorns and Research Machines

THERE are several reasons why the Sinclair Spectrum is not being selected for the Department of Industry's education scheme.

The 'Micros in Primaries' programme is an extension of the earlier secondary schools' scheme — in which a Sinclair machine was not included.

LEAs taking part in the earlier scheme will have standardised their secondary schools on either the Research Machines or Acorn BBC computers — and most of these have opted for the same machine in their primaries.

The Inner London Education Authority has selected the RM480Z under both grants offers. Derek Esterson of its computer department said: "We feel that standardisation is absolutely essential to enable us to provide any kind of sensible support for the schools."

Both Hampshire and Manchester LEAs have chosen the BBC machine for primaries and secondaries. A spokeswoman for Manchester LEA commented: "The need for standardisation is obvious if you look at software. What we buy must be compatible with as many machines as possible."

Whilst the ZX Spectrum at £175 appears to have a substantial price advantage over its nearest rival — the BBC at £399 — this is not entirely relevant in the DoI scheme. By the time you add on the price of a colour monitor to the package the proportional saving is reduced. The Spectrum then becomes £472 compared with the £650 of the BBC. Nigel Searle — Sinclair's Computer Division head — admits that this 'narrowing of the gap' is one of the reasons for their recent £15m schools discount offer. Because the DoI offer is applicable to only one machine per school, the price advantage offered by the Spectrum becomes a less important consideration.

The much publicised production and delivery problems have not helped.

Derek Esterson reckons that "the Spectrum is just not up to the battering it will get in schools."

East Sussex Authority which made the decision to standardise on Commodore Pets as long ago as 1978 has still to decide on the machine for its primary schools. Gordon Holmes, its equipment buyer, has not been able to evaluate either the Sinclair or Research Machines options. Griffin and George Ltd, appointed to distribute the Sinclair machines in schools, has no Spectrums to demonstrate.

Hampshire is firmly recommending the use of the BBC machine to its schools. In a letter from Mr Bothwell of its County Education office it advises against adoption of the Sinclair Spectrum: "It is disappointing that several computer specialists who have recently evaluated the machine are less than enthusiastic about its performance and handling properties." The document is critical of the multi-function keyboard, picture quality, screen mapping system, and "idiosyncratic" version of Basic. The letter continues: "It is therefore with considerable reluctance that the decision has been taken not to place orders with the DoI for this machine.

"Schools are strongly urged to consider cancelling unfulfilled orders for the Sinclair Spectrum which may have been placed in anticipation of a different decision."

Spectrum deal not 'queue-jumping'

FIVE HUNDRED Spectrum microcomputers have been promised within 28 days to people who order through an Observer Newspaper special offer, announced on October 17.

A Sinclair spokesman emphasised that there was no question of queue jumping. "It does seem unfair, but the deal was set up three months ago," he said. "Orders from the offer will be treated the same as any other order. By the time the Observer orders come in we will be on a 28-day delivery pattern, anyway," he added.

An Observer spokesman confirmed that the first 500 orders would be dispatched within 28 days. "We have had a fantastic response to the offer, but we may run into delivery difficulties after the first 500," she said.

Sinclair Research is confident that the delivery back-log of normal mail-orders will be cleared by mid-November, and has begun to readvertise the product.

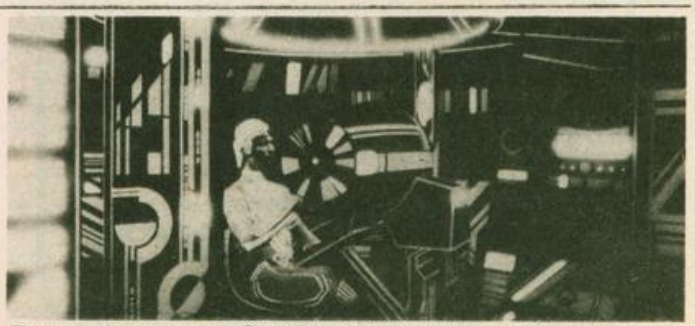
Unleashing of the Lynx

CAMPUTERS will launch its Lynx microcomputer in the second week of November. It will include 48K Ram and will cost £225 including VAT.

Three other versions of the Lynx, with 96K, 128K and 192K Ram, should follow in the next few months. The 96K machine will cost £295.

Tron In Town

TRON, the video-game movie from Disney, opened in the UK on October 22 at the Odeon Cinema, Leicester Square. It will go on general release from December 27. The film stars Jeff Bridges, David Warner and Cindy Morgan, and is directed by Stephen Lisberger.



Tron warrior in control: © MCMLXXXII Walt Disney Productions.

Three new micros from Sanyo

SANYO will launch three new microcomputers in the UK in January 1983.

Called the PHC-10, PHC-20 and PHC-25, they are aimed at the home user and range in price from £60 to £150.

With 16K Ram, high resolution graphics, three voices and nine colours the Z80A-based PHC-25 is the most advanced. It will be priced at £150. It runs a version of Microsoft Basic similar to that of the Dragon. There are four graphics modes: text only, monochrome; 64 x 64, nine colours; 192 x 128, nine colours; and 256 x 192, three colours. Cursor keys are separate and four user-definable keys are provided. The PHC-25 is fitted with a Centronics port, cassette output and both tv and monitor outputs.

The PHC-20, to cost around £100, has 4K Ram and is monochrome only. The PHC-10, planned for £60, is better powered, has 4K Ram, 16-character LCD display. It has no tv output and runs in integer-only Basic.

Oric: set back but enhanced

LAUNCH of the Oric 1 16K and 48K microcomputers has been put back one month. Production problems have meant that the first 1,000 machines are now planned for release in mid-December.

The 48K version, still at £169, will now be bi-lingual. Forth will be offered on the machine — provided as a free cassette with every unit.

Also planned are an Extended Basic — providing a structured programming capability — scheduled for release at under £40 early in the New Year, and a version of Pascal.

ZX81 Workstation...

. . . is a stylish and ergonomic plinth for the ZX81. It raises and tilts the TV to avoid eyestrain, holds the 16K RAM in place and hides the wiring and power supply. This very professional unit costs £15, a built-in power switch is £3, plus postage at £1.50, inc. VAT.

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Mazeman: A fast action m/c game that reproduces the spirit of the original. The Spectrum version includes excellent graphics.
16K ZX81 £4.45 – Spectrum £4.95

Adventure 1: Based on the original game by Crowther, this game was the start of the Adventure craze. Reviewed Sinclair User, issue 2. Features Save game routine as the game can literally take months to complete.
16K ZX81 £8.95 – 48K Spectrum £9.95

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Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

An inspired exhortation

I have been prompted to write to you after having read a letter from Stephen Kelly, *Popular Computing Weekly*, September 2. As he quite correctly states, the *Screen$* function returns a null string for the graphic characters and the user defined set, although I would not go so far as to say that this function/symbols are pointless in games.

However, there is a way of using user defined characters and having the *Screen$* function return the code. This involves changing the character set pointer to an address in Ram. The following routine will change Ram top, copy the character set to Ram and then alter the pointer.

```
1 LET B = 15616
2 CLEAR 31831
3 FOR A = 31832 TO 32599
4 POKE A, PEEK B
5 LET B = B + 1
6 NEXT A
7 POKE 23606,88
8 POKE 23607,123
9 STOP
```

This having been done, it will now give you an extra 96 user defined characters, starting from code 32 (space) to code 127 (copyright symbol) plus the normal 21 user defined graphics. There are now a total of 117 characters that can be redefined.

It is important to note, however, that you cannot define the characters by *Poke Usr* "A" etc. The start address of a given character has to be worked out beforehand. This is done by: address + (character *Code* * 8). The resulting address followed by the next 7 have to be *Poked* in the normal way. To *Save* the character set on tape, just enter *Save* "name" *Code* 31832,768.

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Infinite Improbability

Have you noticed that although Sinclair Research is based in Cambridge, orders have to be sent to Camberley for a computer assembled in Dundee?

The computer then arrives from Aldershot, made from components bought from Japan, Portugal, Ireland, America and France. Has the infinite improbability of receiving a ZX Spectrum caused Sinclair Research to be everywhere in the universe at the same time?

Bill Longley
388 Ipswich Road
Colchester
Essex

My Guardian Angel lives

The great thing about the ZX Spectrum is that it doesn't suffer from the dreaded Ram-pack wobble of its predecessor, does it? I mean, programs won't just vanish in front of your very eyes, will they?

So there I was, two hours into typing my first program into my shiny new Spectrum (which sounds as though a wasps' nest has inadvertently been trapped inside it) when I noticed strange blue blobs spattering themselves rapidly over the screen.

'Do something safe' I thought; but before I could do anything — aaarrrgh!! It 'newed'. All by itself. Sinclair's done it again!!

Ah well — I'll send it back and with a bit of luck I won't see the thing again this year.

P Gleave
39 Clanson Ave
Northolt
Middx

A star over Bethlehem

I regularly read your brilliant magazine. I am a proud owner of a 3.5K Vic20 and the first headline in *Popular Computing Weekly*, October 7, that caught my eye was Vic20 adventure games tested.

Eagerly I flicked to page 12 as I've never bought an adventure. The review was well written and I was prepared to go out and buy the first adventure I could find, but not if they were too expensive for me.

How much is a cartridge? By Christmas will the prices be lowered because of rival competition from companies such as Sinclair? Do they need memory expansion, and which one would you recommend for the beginner? Meanwhile, keep up the high standards in your magazine.

Paul Grove (13)
2a Grove Wood Hill
Coulsdon
Surrey

Each of the adventure games costs a lot at £24.95 and is available from Commodore, Commodore dealers or through the Vicsoft mail-order magazine. Commodore claims that there is little chance of the price coming down to a more reasonable level before Christmas.

Breaking the Möbius strip

In Volume 1 No 23 the Cover story program Tunnel does not run properly. The m/c breaks into the variables area. Two changes to the program will stop this.

```
1) POKE 16572, 79
2) Line 115 should read:
LETA = A + (A<O) - (A>16 AND W
= 2) - (A>18 AND W = 1)
```

I hope that this will be of some help.

M Snowdon
109 Kimberley Road
Solihull
West Midlands

Can I claim top score?

After programming Scramble into my Vic20 computer I was interested to read that the highest score was 820. Now after a week of practice at the game I have achieved a score of 900. Has anyone done any better?

Stewart Douglas
11 George Street
Sherburn
Durham

Give us the explanation

I typed in the excellent Spectrum Disassembler from the September 23 issue of your magazine. It works very well except when it comes across certain Z80 instructions.

As you can see from the copy I made of the screen it does not correctly disassemble address 69. It does this whenever it encounters a code value of 253 or 221. These codes have something to do with the prefixing of instructions using the IY and YX registers.

I have checked my listing and can find nothing wrong with it. Would it be possible for you to perhaps print something in your magazine confirming (or not) that your listing is correct, so that I will then know where the problem lies.

```
46 RST 56
47 RST 56
48 PUSH BC
49 LD HL, (23649)
52 PUSH HL
53 JP 5790
56 PUSH AF
57 PUSH HL
58 LD HL, (23672)
61 INC HL
62 LD (23672), HL
65 LD A,H
66 OR L
67 JR NZ,72
69 ? 253 CLEAR
     52 4
71 LD, B,B 64 @
72 PUSH BC 197 OR
73 PUSH DE
```

Keith Robertson
Gilfach
4 Digney Close
Holyhead
Anglesey
Gwynedd
LL65 2PW

We think the listing was correct. Does anyone else have an explanation?

And little bugs have littler bugs

The following bug is present in all ZX81s. The bug is that the Spectrum and the ZX81 both think that ½ is unequal to .5 (.5 is however equal to ½).

The fault (in the '81) is that the binary value of .5 is one bit short, so it's not surprising that a comparison with ½ (which it calculates correctly) will fail.

The following line of Basic will illustrate the fault on both machines.

```
IF ½ <> .5 THEN PRINT "OOPS"
```

G M Margetson
3 Bransdale Close
Baildon
Shipley
W. Yorks
BD17 5DQ

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.

COVER STORY

Guy Fawkes

A new game for 16K Spectrum
by Matthew Bramble

The 5th of November is Guy Fawkes night in Britain each year, an occasion for celebration with fireworks, children begging "a penny for the guy" and the burning of effigies of Guy Fawkes.

Guy Fawkes was an early seventeenth century English soldier, exiled in the Spanish army. He was brought back to Britain by the organisers of the Gunpowder plot, for their attempt to blow up the Houses of Parliament, and King James I, on November 5, 1605.

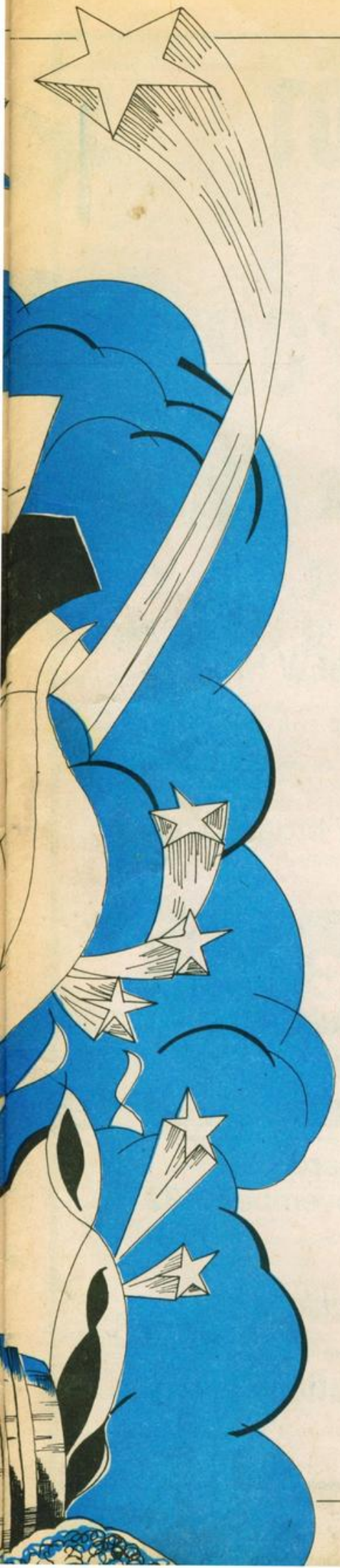
The conspirators were all Roman Catholics and the assassination attempt was directed as a protest against the increasing repression of Catholics under James I.

One of the conspirators leaked the details of the plot. The barrels of gunpowder, hidden in the cellars under the Houses of Parliament were discovered on November 4. Guy Fawkes was tortured and then executed near Parliament in 1606.

In this program, by Matthew Bramble, for the 16K Spectrum, you can re-play the last days of the conspiracy. The object of the game is to travel across a maze and collect a barrel of gunpowder. It is a race against time and the guard chasing you.

Once you have collected the gunpowder you have to carry it back across the maze, deposit the gunpowder inside the Houses of Parliament and then race back through the maze to your safe house before you run out of time, are caught by the guard, or Parliament blows up.

Your score, displayed as the time you have left, is shown throughout the game. Full instructions on which keys to use to work your way through the maze are given in the program.



```
  1 REM ---------------------
  2 REM
  3 REM       Guy Fawkes
  4 REM
  5 REM     © M. Bramble
  6 REM
  7 REM        1982
  8 REM
  9 REM ---------------------
 10 RESTORE
 11 GO SUB 5025
 13 REM The CAPITAL letters in
lines    1000 to 1230,1510,1520
and Line 5035 are got by going
into GRAPHICS mode and pressing
the appropriate key
 15 RESTORE
 16 LET Bomb=0: LET Ret=0
 17 LET a=12: LET b=16
 18 LET Time=99: LET x=20: LET
y=7
 60 GO SUB 9800
 61 BEEP 0.05,0
 990 BORDER 1: INK 1: PAPER 6: C
LS
1000 PRINT "          EE     EEE
  EEEEEEEEE"
1010 PRINT "        E     EE EEE
E   E   E"
1020 PRINT "        EEEE
EEEEEE  E E E"
1030 PRINT "        E     EEEE E
  E  E E E"
1040 PRINT "        E EEEEE   E
EEEE E   E  "
1050 PRINT "          E     E
  E EEEEEE "
1060 PRINT "EEEEEEEE E  E E EEEE
EE E    EE   "
1070 PRINT " EEEEE    E E  E
  E E EE EE"
1080 PRINT "  EE     E   E EEE E E
EEEE E E     "
1090 PRINT " E  E EE EEE EEE E E
    E   EE"
1100 PRINT "   EE EE     EEE   E
 EE EE E E  "
1110 PRINT "EEE   EEE EEEEEE EEE
 EE EE E   E"
1120 PRINT "    EEE
 EE    EE EE"
1130 PRINT " EE EEE EEEEEEEE EEE
 EEEEEE   EE"
1140 PRINT "  E   E  E       E
  E   E E EE"
1150 PRINT "E E E EE E EEEE L  E
E  E E E E   "
1160 PRINT "  E E E  E       E  E
  E E    E  "
1170 PRINT " EE   E EEEE E EEE E
E  EEEEE E "
1180 PRINT " EE E   E    E  EE E
E EE E E   "
1190 PRINT "   EEE     EEEE    E
E EE E E    "
1200 PRINT "EEE      EE E   E E
   E E E EE"
1210 PRINT "EEEEEEE EE   E   EEE
EEE   E  EE"
1211 PRINT AT 0,0; INK 2; PAPER
7;"FFFFFFF";AT 1,0;"FDFDFDF";AT
2,0;"FFFFFFF";AT 3,0;"FDF FDF";A
T 4,0;"FFF FFF"
1220 PRINT AT x,y; INK 2;"A"
1229 PRINT AT a,b; INK 3;"B"
1230 PRINT AT 1,30; INK 0;"C"
1235 PRINT AT 21,7; PAPER 4;" "
1240 PRINT AT 0,23; INK 6; PAPER
1;"Time:";Time
1490 REM
1500 REM      Main loop
1505 LET Time=Time-1: PRINT AT 0
,28; INK 7; PAPER 1;"  ": PRINT
AT 0,23; INK 7; PAPER 1;Time: IF
 Time=0 THEN GO TO 2000
1510 PRINT AT a,b; INK 1;"B"
1520 PRINT AT x,y; INK 2;"A"
1530 IF x=a AND y=b THEN GO TO 5
000
1601 IF x=3 AND y=3 AND Bomb=1 T
HEN GO SUB 3500
1602 LET xx=x: LET yy=y
1603 IF x=21 AND y=7 AND Ret=1 T
HEN GO SUB 4000
1610 LET x=x+(INKEY$="6" AND x<2
1)-(INKEY$="7" AND x>0)
1620 LET y=y+(INKEY$="8" AND y<3
1)-(INKEY$="5" AND y>0)
1623 IF y>21 AND x<1 THEN GO SUB
 3000
1625 IF SCREEN$ (x,y)="" THEN GO
 SUB 3000
1627 PRINT AT xx,yy;" "
1630 LET aa=a: LET bb=b
1635 IF RND>.5 THEN GO TO 1650
1640 IF a<x AND a<21 THEN LET a=
a+1
1645 IF a>x AND a>0 THEN LET a=a
-1
1647 IF RND>.5 THEN GO TO 1660
1650 IF b<y AND b<31 THEN LET b=
b+1
1655 IF b>y AND b>0 THEN LET b=b
-1
1660 IF SCREEN$ (a,b)="" THEN GO
 SUB 1700
1670 PRINT AT aa,bb;" "
1675 GO TO 1500
1700 LET a=aa: LET b=bb: RETURN
2000 GO SUB 9990: BORDER 0: PAPE
R 0: INK 6: CLS
2010 PRINT AT 0,9;"Guy Fawkes";A
T 2,9;"© M.Bramble";AT 6,3;"You
have run out of time      and
have been blown up by      the
bomb. Press ""p"" to      pl
ay again or ""i"" for
Instructions"
2020 BEEP 0.01,10: BEEP 0.01,20
2021 IF INKEY$="p" THEN GO TO 15
2022 IF INKEY$="i" THEN RUN
2023 GO TO 2020
3000 IF ATTR (x,y)=48 THEN GO TO
 3100
3010 LET x=xx: LET y=yy: RETURN
3100 BEEP 0.33,10: LET Time=55:
LET Bomb=1: RETURN
3500 BEEP 0.33,0: LET Time=80: L
ET Bomb=0: LET Ret=1: RETURN
4000 INK 2
4001 PRINT AT 0,0;"          ";AT 1
,0;"          ";AT 2,0;"          ";AT
 3,0;"          ";AT 4,0;"          "
4037 FOR a=15 TO -15 STEP -2
4039 FOR b=32 TO -22 STEP -5.5
4040 BEEP 0.03,-30: BEEP 0.03,-2
0
4041 PLOT 24,155: DRAW b,a
4043 NEXT b
4045 NEXT a
4046 FOR n=1 TO 500: NEXT n
4047 BORDER 0: PAPER 0: INK 6: C
LS : PRINT AT 2,9;"Guy Fawkes";A
T 4,9;"© M.Bramble";AT 7,3;"Cong
ratulations you did it      with
 ";Time;" units left": PRINT '""
  Press ""p"" to play again or
    ""i"" for instructions"
4048 BEEP 0.01,-10: BEEP 0.01,0:
 BEEP 0.01,10
4049 IF INKEY$="p" THEN GO TO 15
4050 IF INKEY$="i" THEN RUN
4051 GO TO 4048
5000 GO SUB 9990: BORDER 0: PAPE
R 0: INK 6: CLS : PRINT AT 2,9;"
Guy Fawkes";AT 4,9;"© M.Bramble"
;AT 7,2;"The guard caught you. Y
ou       have been found guilty
of       treason and have been
         beheaded.": PRINT '""  P
ress ""p"" to play again or
  ""i"" for instructions"
5010 BEEP 0.01,0: BEEP 0.01,10
5011 IF INKEY$="p" THEN GO TO 15
5012 IF INKEY$="i" THEN RUN
5013 GO TO 5010
5025 GO SUB 6000
5030 PRINT '" You are Guy Fawkes
 and you      have to blow-up the
 houses of    parliment. You must
 try to get   to a bomb which is
in the right hand top corner of
the maze.     You only have a lim
ited amount  of time in which to
 do this     and there is also a
 guard who   you must avoid bein
g caught by."
5031 PRINT " Once you have the b
omb you      will be given more t
ime. The     next objective is to
 reach       the houses of parlim
ent."
5032 PRINT '''AT 20,3; FLASH 1;"P
ress a key to continue"
5033 IF INKEY$="" THEN GO TO 503
3
5034 GO SUB 6000
5035 PRINT '" Again you must avo
id running   out of time and bei
ng caught    by the guard. Once
you reach    the house you must
move into    the door. On doing
so you will  be given more time
in which     to return home."
5036 PRINT ' INK 2;"A"; INK 6;"-
-------------- You": PRINT INK 1
;"B"; INK 6;"-------------- Guard
": PRINT "C-------------- Bomb"
5037 PRINT """5""--------------Le
ft": PRINT """8""-------------Rig
ht": PRINT """7""--------------
Up": PRINT """6""-------------Do
wn"
5038 PRINT AT 21,5; FLASH 1;"Pre
ss a key to start"
5039 IF INKEY$="" THEN GO TO 503
9
5040 RETURN
6000 PAPER 0: INK 6: BORDER 0: C
LS
6010 PRINT AT 0,10;"Guy Fawkes";
AT 1,10;"----------";AT 2,9;"© M
. Bramble";AT 4,2; INK 4;"Instru
ctions"
6020 RETURN
9799 RETURN
9800 REM        U.D.G
9810 FOR n=0 TO 7
9815 READ udg: POKE USR "a"+n,ud
g: NEXT n
9900 FOR n=0 TO 7
9910 READ udg: POKE USR "b"+n,ud
g: NEXT n
9920 FOR n=0 TO 7
9930 READ udg: POKE USR "c"+n,ud
g: NEXT n
9932 FOR n=0 TO 7
9935 READ udg: POKE USR "d"+n,ud
g: NEXT n
9936 FOR n=0 TO 7
9937 READ udg: POKE USR "e"+n,ud
g: NEXT n
9938 FOR n=0 TO 7
9939 READ udg: POKE USR "f"+n,ud
g: NEXT n
9949 RETURN
9950 DATA 28,28,8,62,8,20,20,54,
92,92,72,126,72,64,20,54
9955 DATA 0,28,16,56,124,124,56,
0,230,131,194,129,128,129,128,18
7
9960 DATA 0,255,255,255,255,255,
255,255,238,187,238,187,238,187,
238,187
9990 BEEP .6,0: BEEP .4,0: BEEP
.2,0: BEEP .6,0: BEEP .4,3: BEEP
.2,2: BEEP .4,2: BEEP .2,0: BEE
P .4,0: BEEP .2,-1: BEEP .6,0: R
ETURN
```

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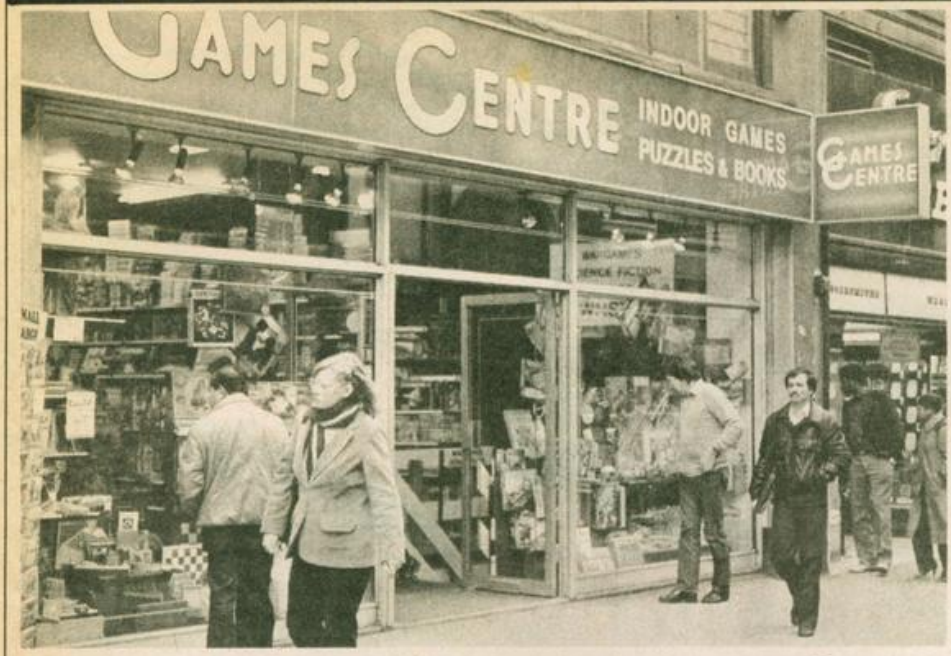


Play up, play up and play the game

***David Kelly** talks to Graeme Levin of the Games Centre*

Through the small door at the back of the Games Centre shop in London's Oxford Street and up four floors. Past piles of games of every conceivable size and type crowding out into heaps on the landings. And up to the small, paper festooned office on the top floor, from where Graeme Levin runs his chain of games shops.

He is a likeable, slightly nervous individual. Any conversation with him is certain to be punctuated by a succession of enforced halts while he sorts out some problem or other on his constantly ringing phone.

At the moment he is preoccupied with the final arrangements for the opening of his seventh shop — in Birmingham.

Graeme first came to this country from South Africa eleven years ago. He began what he describes as a 'publishing venture' out of which was born the idea of a shop that would specialise in selling games. He has been an avid games player and inventor for many years — he co-invented the game Speculate. More recently he has been instrumental in bringing some games — such as Survive and Conspiracy — on to the market.

The first Games Centre opened in 1974 at a little shop in Hanway Street, tucked away behind Oxford Street and Tottenham Court Road. Four years later a second shop was added in Charing Cross Road and the Hanway Street business was moved to new prestige premises in Oxford Street.

In the last twelve months four more shops have opened with two more, including the Birmingham store, to open shortly. Graeme says "We spent some time getting the formula for the shops right. Now is the right time to expand because we are seeing a greatly increased demand for our goods — not just for our video games and computers, but for our whole range of games, puzzles, books and toys.

"We now stock over 15,000 lines and included in those is what is certainly the world's largest selection of games. The highest turn-over of any group of products is shown by the video games and computers. Within this group the Atari software cartridges sell best.

"We can offer what none of the normal high-street retail chains can — expert advice. If I was going to spend two or three hundred pounds on a machine I'd want to be given proper help to choose the right system for me. The Games Centre may not be the cheapest place to buy a microcomputer but it prides itself on being able to help customers to make that right choice. And it continues to offer good after sales advice and assistance."

At the moment the Games Centres sell the Atari range of products, the ZX81, Mattel Intelevision and the Dragon-32. Future plans include the Sinclair Spectrum as soon as it goes retail — possibly by January — and the Commodore 64 — hopefully in November.

"By this time next year we intend to have the largest range of software available in a shop for these machines" says Graeme. "It is a big ambition — we are still learning — but we are going to try very hard to achieve it.

"Software is very important. What we found when we started to sell the Atari system was that hardware sales were slow until we established a good spread of software. After that both the software and hardware sales took off.

"So when we took on the ZX81 we bought small quantities of every cassette we could find to try out. From that we were quickly able to build up a comprehensive collection of the good ZX81 software. The same sort of approach will be adopted for both the ZX, Spectrum and the Commodore 64.

"There are now so many microcomputers either here or about to be here that it is not easy to decide which will sell and which will not. The future of home computers is intimately connected with those of games and leisure, but I would make a distinction between games and hobbyist computers.

"The Mattel Intelevision and Atari are games machines first and foremost. The Dragon-32 and Commodore-64 are primarily hobbyist machines — they are games machines second. It was a difficult decision for us to stock these two latter, but we feel sure that they will do well. They are both such interesting machines that the games software is bound to be developed for them."

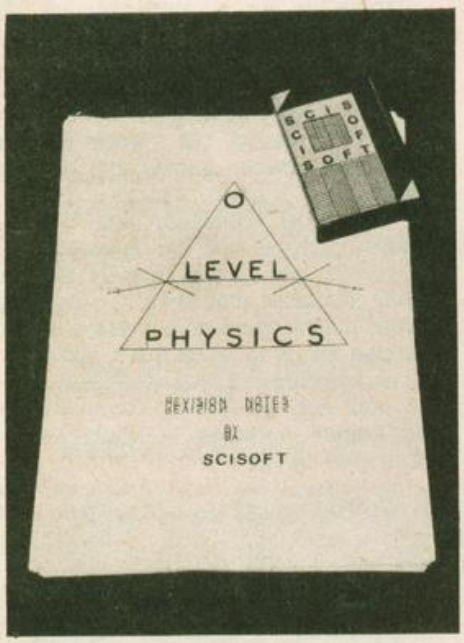
Reviews
Chalking up the A grades

***Tony Bridge** looks at the latest educational software for the ZX81.*

THE SCENE: a crowded first-grade classroom. Each pupil has a microcomputer on the desk in front of him, with a monitor.

COMPUTER: "Good morning, children"
PUPILS (in chorus): "Good morning, ZX95"
COMPUTER: "After the register, we will begin the day with arithmetic"
PUPILS (in chorus): "Groaaan . . ."

Fanciful? Well, yes, but one pole of opinion holds that computers will eventually supplant, if not teachers, at least all textbooks



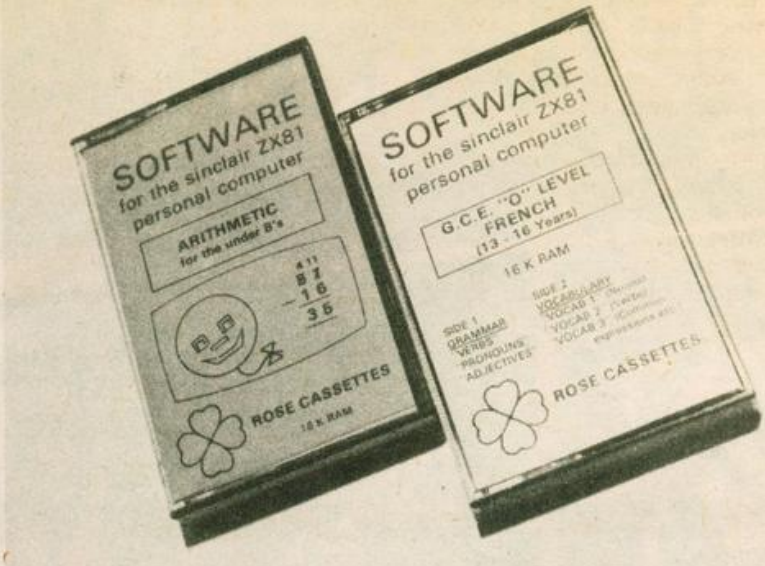
and pen and paper in the classroom.

The opposite pole, of course, believes that computers should be kept out of the classroom completely, and taught as a subject like any other on the curriculum.

The truth no doubt lies somewhere between the two. After all, radio, tv, and the VCR have all been assimilated painlessly into the classroom. But it is a fact that there are a great number of misconceptions about the subject.

Software for education is at the sharp end of what must be a well-judged exercise in easing the fears of many parents and teachers.

The Sinclair ZX81 is not the ideal computer for school use. It is cheap, yes, but the keyboard, together with the easily-jogged Ram pack and mains lead, and the slow access time are all major drawbacks to acceptance. However, many schools already have the computer, and there is a multitude of software available for education purposes.



Let's start this review with Sinclair's own contribution to the field. ICL has produced a series called *Fun-to-Learn* for Sinclair Research. The series includes titles such as Music, History, Geography and Inventions. The whole package was reviewed in these columns in issue No 10.

At £6.95, the tapes are over-priced, and in their present format really only of use as General Knowledge quizzes on long winter evenings with the family. Many of the questions contained within the programs are interesting, but, unfortunately, there is no supporting documentation. Sinclair must be serious about its involvement in education, and a modest investment in well-planned textbooks to go with each tape must be high on its list of future releases.

Of the two programs received from Rose Cassettes, one is for the under-eights, and the other for GCE O-level students. *Arithmetic* for the under-eights tests the pupil in addition, subtraction, division and multiplication. Extra-large characters are used in the sums which would be of great use in the classroom.

As a correct answer is input, a feature is added to the face on a balloon. When the face is complete, the balloon rises into the sky. A very good program, this, which makes a sometimes unpopular subject more interesting and amusing to the younger pupil.

The *French* tape is aimed at 13-16-year-old students of the language. Side one tests on grammar, with side two setting questions on vocabulary. The pupil is given a word or phrase in either French or English, and asked to translate. A good, solid program.

Rose Cassettes have released a number of educational programs, and if they are all of such a high standard as the two represented here, they can be safely recommended. A lack of supporting literature again, however, reduces Rose Cassettes' potential.

Philip and Joy Lawton, as AZEP (Computer Training Consultants), have released a number of tapes at a very reasonable £1.95 per topic. The topics, for A-level students and undergraduates, include such simulations as *Motor Bike* — acceleration, speed, distance, *Resistor* — inductor circuit, transients and 10 other equally exotic titles. Study booklets for each topic are a further £1.95, and VHS videocassettes are also available for just £19.95.

THIS IS WHAT YOU ARE HEADING FOR

The tape submitted by AZEP was *Electronic Chalk and Talk*, an awkwardly-named demonstration of the ZX81's use in CAL (Computer-Assisted Learning). The program is impressive in use, but the documentation supplied is very confused, and completely unenlightening. However, purchasers of the other tapes may rest assured that the booklets are very well-written and useful.

Tasman Software, of Leeds, has a couple of educational programs in its small catalogue (in fact, they represent two-thirds of Tasman's output). *Tasimeq* helps acquaint students with simultaneous equations. Good but restrained use of graphics (no races or games), and good, progressive teaching make this an ex-

tremely useful program. If the correct answer is given, a harder problem is set, while an incorrect answer prompts another problem of equal difficulty. Thus the student is helped along at the correct pace for his ability. The examples are all worked through step-by-step, and makes learning very much easier.

Tas-trig, as you may deduce from the title, teaches basic trigonometry using sines, cosines and tangents. A calculator is necessary whilst using the program, but again, the good use of graphics, and a scoring system, make the tape very useful.

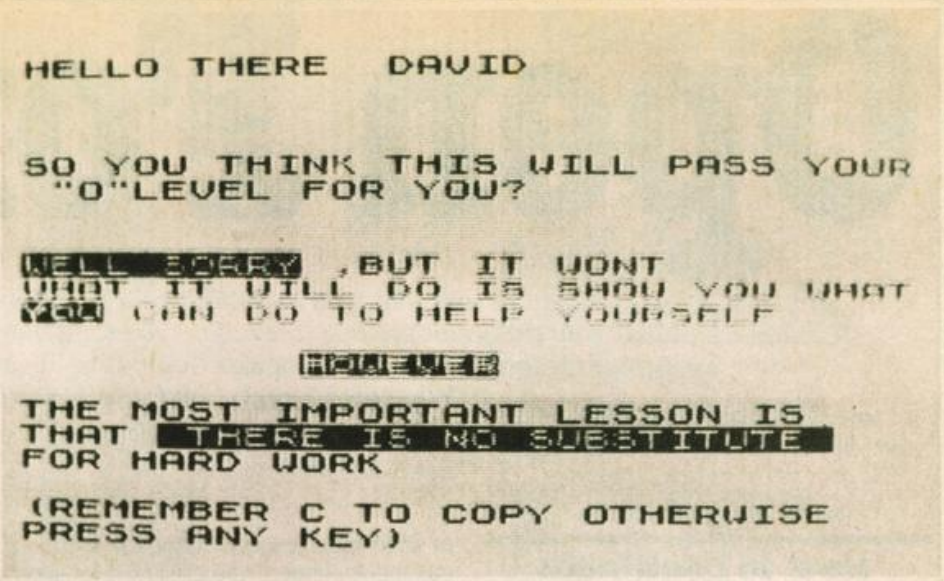
Let us hope that Tasman release more educational software in the future — they are very good at it.

Finally, let us look at software from Sci-Soft of Nottinghamshire. This company has an extensive catalogue of exclusively educational programs. Titles include *Maths 'O' Level, Biology, Physics,* and *Chemistry 'O' Levels,* and also programs for younger students, including *Jungle Maths* and *Magic Spell.*

The tapes for the younger pupil rely, naturally, rather heavily on graphics, but are none the worse for that. **KJ,** in this column in *PCW* No 7, was not taken generally with *Jungle Maths,* finding the graphics good, but the coding wanting. *Magic Spell,* however, works rather well. The teacher types in ten words, and speaks the same words on to tape. The pupil then listens to the tape and attempts to spell the word he or she is hearing.

Scores are given to each pupil (more than one may take part in each round) and then the words misspelt are conjured out of a shiny top-hat on to a Magic Board. The younger children loved this program. The same result could probably be obtained by using ordinary pencil and paper, but the program is great fun, and could be given a place in a busy classroom.

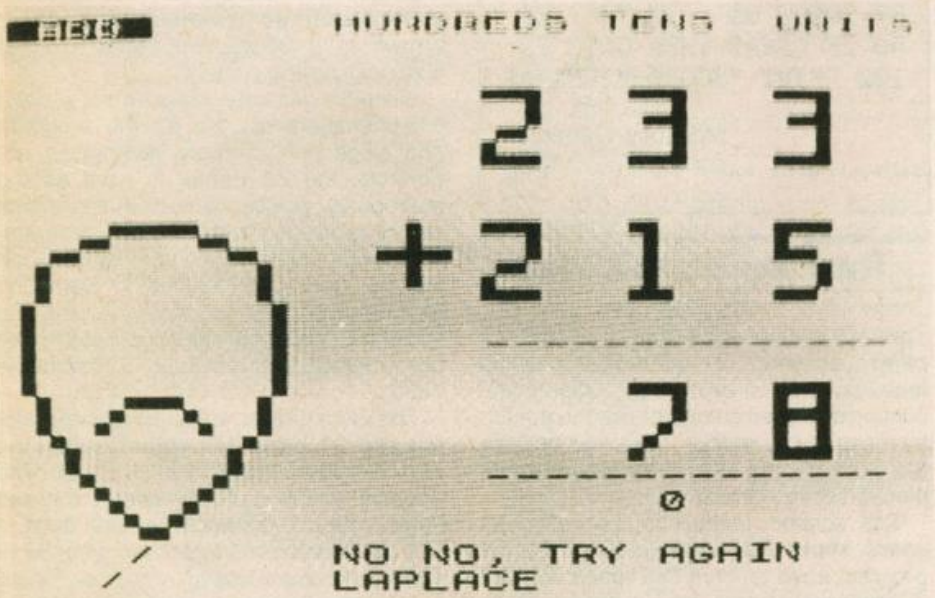
The *Teachers Markbook* is an electronic aid for the busy teacher. Pupils' marks are input, and rank-ordered for future examination. As Sci-Soft says, this program would prove extremely useful at a parent's evening, as a novel way of showing parents how their child is progressing. For day-to-day use, however, the teacher could probably do just as well with pencil and paper.



The main bulk of Sci-Soft's release, however, is aimed at older students about to take their GCE 'O' Levels in one of several subjects. The *Revision* tapes are all pretty similar, containing seven or eight long programs. The first one in each case is *Revision,* which guides the student through the last few weeks leading up to the exam.

Although the program admits it won't pass the exam for you, it does give you sound advice. This advice sometimes gets a little whimsical, as for instance, "try praying"! The same advice could be given in the accompanying book, but is no less sound coming from the TV screen.

The following programs on the tapes concentrate on setting specific questions on the subject in hand. Although the questions contained in the program are excellent, alternative questions may be inserted. Very good graphics are used, and scores are also given. Once the student has gained 10 points (certainly not easy), the program declares that he or she will "probably pass the exam." This format is adhered to throughout the *Chemistry* and *Physics* packages, and we imagine, the others.



The most outstanding feature of these excellent packages, however, is the supporting literature, which consists, in each case, of some 50 pages of densely-packed revision material such as diagrams, formulae and so on. This literature really lifts this series of software head-and-shoulders above the rest and should serve as an example to other aspiring educationalists.

Summary

Most of these programs would work rather better in the home than the classroom. Rose Cassettes' *Arithmetic for the Under-Eights,* with its chunky graphics, might be an asset in the busy classroom, but tapes like the ICL collection, or Sci-Soft's Revision packages are obviously of more use in the home.

Few of the programs auto-ran, and in none of them was the *Break* key disabled, making them difficult to use in unsupervised conditions. More seriously, however, most of the packages lacked any kind of supporting literature. At the risk of labouring this point, we must stress that well-written textbooks, such as Sci-Soft's, are a necessity.

After all, a child's education is a sensitive matter, and should be approached responsibly. To this end, we were glad to see that most of the programs were written by, or with the help of, qualified teachers.

So, despite many faults, all the programs reviewed, in one way or another, accomplished their professed aim: to educate.

Open Forum

Open Forum is for you to publish your programs and ideas.
It is important that your programs are bug free before you send them in. We cannot test all of them.
Contributions should be sent to: Popular Computing Weekly, *Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.*

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.
(The usual fee is £5.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Memory Game

on ZX81

Here is a program that takes only a couple of minutes to type in yet can supply hours of frustratingly enjoyable moments. It is an ideal game for those who do not yet know their way round the ZX81 as no graphics are used.

A letter appears in the top left-hand corner and is displayed for about two seconds then the screen goes blank. You now have to type in the letter you saw. Note there is no time limit. If you get it right another letter will be added to the first, and again you type in the letters and so on. If you should get any of the letters wrong the number of letters you reached is displayed.

If at the end you wish to see the correct answer, then add this line:

```
110 PRINT "IT WAS";A$
```

If you think the time allowed is too long or short then you can change line 60 to a suitable number. If you still find it too easy, try changing line 20 to:

```
20 LET B= INT (RND * 36) + 28
```

then you get numbers as well!

If you wish to keep the highest score on the game then add the following:

```
  5 INPUT H
 95 IF LEN A$ > H THEN LET H = LEN A$
105 PRINT "HIGHEST SCORE = ";H
115 INPUT Z$
120 CLS
125 GOTO 10
```

When first run enter 0 as highest score. Enter highest score all other times. Highest score held by me is 14 using letters only.

```
10 LET A$=""
20 LET B=INT(RND*26)+38
30 LET B$=CHR$ B
40 LET A$=A$+B$
50 PRINT A$
60 PAUSE 100
70 CLS
80 INPUT C$
90 IF C$=A$ THEN GOTO 20
100 PRINT "SCORE=";LEN A$
```

Memory Game
by Ian McGrath

Ramtop/Atomic Nos

on ZX81

This program is for a 16K ZX81 with a printer attached. It has two interesting features, the first being that it uses some custom designed characters on the printer, by means of a modified *Copy* routine from the *Rom*, and an alternative character set placed above *Ramtop*.

The second feature is that although space above *Ramtop* is required by the program it will reserve this space for itself by resetting *Ramtop* without clearing *Ram*. The routine that does this is contained in Line 8095. It does not used *Usr* 1040 because it doesn't work.

The routine will reset *Ramtop* and reconfigure Basic to the address *Poke*d into the bytes at 16507 and 16508. Since this involves moving the Z80 machine stack and Basic's *Return* stack for *Gosubs*, anything that might alter these stacks during the move would cause a crash, and so *Ints* and *Nmis* must be prevented by running the routine in *Fast* mode.

The program itself computes and draws an electronic configuration diagram of an atom on being given an Atomic Number between 1 and 112. Such a diagram shows the levels, sub-levels, and orbitals in which the electrons are arranged in an atom.

The diagram will appear on the printer as a series of boxes arranged in rows with a label for each row. The first number in the label is the level number, the letter is the type of orbital arrangement, followed by the number of electrons in that sub-level. The higher the level the more room there is for orbitals and therefore the more sub-shells in the level.

Each sub-shell has a particular arrangement of orbitals (S, P, D, F) containing 1, 3, 5 and 7 orbitals respectively, and each orbital can hold up to two electrons. Since electrons have spin, and this spin is important, the electrons are represented in the diagram as up-arrows and down-arrows in a convention found in most textbooks on the subject.

Since Sinclair characters do not support the characters needed for the program, and since only software techniques are portable, the ZX Printer is used as the main output device, as custom characters can be produced on it using only programming techniques. This works by duplicating the *Rom Copy* routine in *Ram* and altering one byte to make it use the address 32256 as the base address for the character-generator instead of the normal 7680.

The *Rom* C-Gen. is copied above *Ramtop* and 32 bytes are altered, redrawing four Graphics characters (1 to 4). The diagram is drawn on the screen first and then *Copy*ed to the printer by Line 8001.

If you haven't a printer then alter S$ to "space-/inverse- less-than/inverse-greater-than"; T$ to "space-/inverse- less-than/ inverse space"; I$ to "space/inverse space/inverse space". You won't need Line 305:8000 to 8130.

Format 1 is the diagram, format 2 is simply a list of the labels.

The first step in entering the program is to enter program one to compile the

machine code *Rem*s and the character-generator. On *Running*, the program will ask you to enter the contents of table one after it has finished doing the *Copy* routine, and when this is done it will run the *Ramtop* routine to reset *Ramtop* and then transfer the *Rom* character-generator to the newly protected area.

It will then ask you to enter table two to alter some of the characters. That done it will stop, requesting you to delete the program except for the *Rem*s, and to alter the line numbers as indicated. Then enter the main program.

When all is done the first thing is to *Goto* 8040. This will read the char-generator into Q( ) to be *Save*d with the program, so that on being *Loaded* the program will *Run* automatically resetting *Ramtop* and building the char-generator from Q( ).

Program notes:

Lines

20-40 N ( ) is the level number, L ( ) is the sub-shell type.

50-56 E ( ) is the full electron number, S$ is a full orbital, T$ is a half empty orbital, and I$ an empty orbital. The graphic characters are altered for the printer, and no Sinclair characters will give a sensible screen display anyway.

305 *Gosub* 8000 is the routine that *Copy*s, the screen to the printer.

470-500 Subtract a full sub-shells-worth of electrons from the Atomic number, till the remainder R is zero or less. As long as R is positive a full row of orbitals containing two electrons each, may be printed. C is the number of electrons, and if R is less than zero not all the orbitals will be full, and C is reduced accordingly.

605 Prints the sub-shell label.

610 B is the number of orbitals (boxes) in the current sub-shell. T is the number of full orbitals if one or more, if T = B then all the orbitals are full. If T is negative, some orbitals must be empty.

650 B – *Abs* T gives the number of half-empty orbitals.

675 T now gives the number of empty orbitals.

700-799 Formats the label list and prints it.

8040-8080 Store the character generator (above *Ramtop*) in Q ( ) to *Save* it on tape with the program.

8091-8092 16507 and 16508 are where the *Ramtop* routine expects to find the new value for *Ramtop*.

8094 Adds five to the value of *Nextlin* system variable to get the start of machine code routine in the next line of Basic. (*Ramtop* routine).

8100 Transfer the character generator to above *Ramtop*.

```
      MAIN PROGRAM

    1 REM 1.5.2.2.5.2.2.P.6.3.5.2
.3.P.6.4.S.2.3.D.10.4.P.6.5.S.2.
4.D.10.5.P.6.6.S.2.4.F.14.5.D.10
.6.P.6.7.S.2.5.F.14.6.D.10
    2 FAST
   15 REM LINE 10 IS EQUIVALENT T
O "DATA" STATEMENT
   20 DIM N(20)
   30 DIM L$(20)
   40 DIM E(20)
   50 LET S$=" ▪ ▪"
   55 LET T$=" ▪▄ "
   56 LET I$=" ▄▄ "
   60 LET PC=16514
   65 GOTO 150
   70 FOR V=1 TO 18
   75 REM GOSUB 9000 IS EQUIVALEN
T TO "READ" AND READS FROM LINE
105 REM(DATA) STATEMENT
   80 GOSUB 9000
   90 LET N(V)=VAL D$
  100 GOSUB 9000
  110 LET L$(V)=CHR$ CODE D$
  120 GOSUB 9000
  130 LET E(V)=VAL D$
  140 NEXT V
  145 GOTO 300
  150 CLS
  155 PRINT
  160 PRINT "  THIS PROGRAM WILL
CALCULATE"
  170 PRINT "THE NUMBER OF ELECTR
ONS IN EACH"
  180 PRINT "ENERGY LEVEL OF AN A
TOM, GIVEN"
  190 PRINT "THE ATOMIC NUMBER."
  191 PRINT "  THE PROGRAM OBEYS
 "'HUNDT.S    RULE"" IN FILLING O
RBITALS, I.E.  IT PUTS ONE ELECTR
ON IN EACH     ORBITAL UNTIL LACK
 OF EMPTY      ORBITALS CAUSES EL
ECTRONS TO     DOUBLE UP."
  200 PRINT "THE RESULT CAN BE DI
SPLAYED IN"
  210 PRINT "ONE OF TWO FORMATS:"
  220 PRINT
  230 PRINT "  1. ENERGY LEVEL DI
AGRAM"
  240 PRINT "  2. ELECTRONIC CONF
IGURATION"
  250 PRINT
  270 PRINT "THE PRINTER SHOWS TH
E BETTER OUTPUT."
  275 GOTO 70
  300 SCROLL
  305 GOSUB 8000
  310 PRINT "ENTER AN ATOMIC NUMB
ER (1-112)"
  320 INPUT A
  330 IF A<1 OR A>112 THEN GOTO 3
00
  340 SCROLL
  350 PRINT "FORMAT ? (1 OR 2)";
  360 INPUT F
  370 IF F<1 OR F>2 THEN GOTO 340
  380 LET A=INT A
  390 LET F=INT F
  400 LET V=1
  410 LET Z=5
  420 LET H=0
  430 LET J=21
  440 LET U=0
  442 LET Q=0
  444 LET Y=0
  450 CLS
  455 PRINT
  456 PRINT
  460 PRINT "ATOMIC NO.= ";A
  470 LET X=E(V)
  480 LET R=A-X
  490 LET G=R(=0
  500 LET C=X+G*R
  510 GOSUB F*100+500
  520 LET A=R
  530 LET V=V+1
  540 IF G=0 THEN GOTO 570
  550 PRINT AT 21,0;
  560 GOTO 300
  570 GOTO 470
  600 IF C=0 THEN RETURN
  605 PRINT AT 21-V,1;N(V);L$(V);
E(V)+G*R;AT 21-V,16-3*X/4;
  610 LET B=E(V)/2
  615 LET N=C
  620 LET T=N-B
  625 IF T<1 THEN GOTO 645
  630 FOR M=1 TO T
  635 PRINT S$;
  640 NEXT M
  645 IF T=B THEN RETURN
  650 FOR M=1 TO B-ABS T
  655 PRINT T$;
  660 NEXT M
  670 IF T>=0 THEN GOTO 699
  675 LET T=ABS T
  680 FOR M=1 TO T
  685 PRINT I$;
  690 NEXT M
  699 RETURN
  700 IF C(=0 THEN RETURN
  705 PRINT AT Z,H;
  710 IF V(=6 OR Q=1 THEN GOTO 75
0
  720 LET Z=7
  725 LET H=0
  730 PRINT AT Z,H;
  740 LET Q=1
  750 IF V(=12 OR U=1 THEN GOTO 7
90
  760 LET Z=9
  765 LET H=0
  770 PRINT AT Z,H;
  780 LET U=1
  790 IF V(=18 OR Y=1 THEN GOTO 7
95
  791 LET Z=11
  792 LET H=0
  793 PRINT AT Z,H;
  794 LET Y=1
  795 PRINT " ";N(V);L$(V);E(V)+G
*R;
  796 LET H=H+5
  799 RETURN
8000 RAND USR (PEEK 16425+256*PE
EK 16426+5)
8001 REM --EERND7/▌-"5URNDLN SCR
OLL "VAL FAST ▌?PEEK CLS LPRINT
LN ???▌SPEEK CLS INT £(= CLS ▄ I
F THEN ▌K INPUT FAST STR$ ? RETU
RN "▄▄▄▄???? RETURN
A276 B▄▄AZAC5 =▄?AC5 )▌▌?▄▌?AC5
"3?(= CLS 3K CLS ?PEEK CL5 ( LET
 LPRINT /STR$ (= CL5 3K CLS ??PE
EK CLS 5GN 0AC5 ?C▌AT +4▌▄ PEEK
CL5 LN ▌AT 5?RND9
8008 ( CL5 ?AC5 COPY M5RNDTAN
8009 REM THIS ROUTINE (8001) IS
A MODIFIED ▌▌▌▌▌ FROM ROM, AND
USES CHARACTER-MATRICES PLACED A
BOVE ▌▌▌▌▌▌▌.
8010 RETURN
8040 CLEAR
8050 DIM Q(512)
8060 FOR A=1 TO 512
8070 LET Q(A)=PEEK (A+32255)
8080 NEXT A
8085 PRINT "PRESS ▌▌▌▌▌▌▌ WHEN
RECORDER IS RUNNING"
8086 INPUT A$
8087 CLS
8090 SAVE "G-LEVEL▌"
8091 POKE 16507,0
8092 POKE 16508,126
8093 FAST
8094 RAND USR (PEEK 16425+256*PE
EK 16426+5)
8095 REM E▄RND▌ GOSUB ??? GOSUB
??RNDE▄RND CLEAR ?▄ CLEAR ?▌.F G
OSUB ▌(E "RND▌ GOSUB ??? FOR RAND
 ▌ GOSUB ? CLEAR ?" CLEAR ?"TAN
8099 REM THIS ROUTINE (8095) RES
ETS ▌▌▌▌▌▌▌▌ AND ALTERS ▌▌▌▌▌▌▌
 USE OF MEMORY TO MATCH, WITHOUT
 CLEARING RAM IN ANY WAY.
8100 FOR A=1 TO 512
8110 POKE A+32255,Q(A)
8120 NEXT A
8130 RUN
```

PROGRAM OF THE WEEK

```
9000 LET D$=""
9010 LET D$=D$+CHR$ (PEEK PC)
9020 LET PC=PC+1
9030 IF PEEK PC<>27 AND PEEK PC<
>118 THEN GOTO 9010
9040 IF PEEK PC=27 THEN LET PC=P
C+1
9050 IF PEEK PC=118 THEN LET PC=
PC+5
9070 RETURN
```

THIS PROGRAM WILL CALCULATE THE NUMBER OF ELECTRONS IN EACH ENERGY LEVEL OF AN ATOM, GIVEN THE ATOMIC NUMBER.
THE PROGRAM OBEYS "HUNDT.S RULE" IN FILLING ORBITALS, I.E. IT PUTS ONE ELECTRON IN EACH ORBITAL UNTIL LACK OF EMPTY ORBITALS CAUSES ELECTRONS TO DOUBLE UP.
THE RESULT CAN BE DISPLAYED IN ONE OF TWO FORMATS:

1. ENERGY LEVEL DIAGRAM
2. ELECTRONIC CONFIGURATION

THE PRINTER SHOWS THE BETTER OUTPUT.

```
ATOMIC NO.= 112
 6D10  ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣
 5F14  ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣
 752      ▣▣ ▣▣
 6P6         ▣▣ ▣▣
 5D10  ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣
 4F14  ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣ ▣▣
 652      ▣▣ ▣▣
 5P6         ▣▣ ▣▣
 4D10     ▣▣ ▣▣ ▣▣ ▣▣
 552      ▣▣ ▣▣
 4P6         ▣▣ ▣▣
 3D10     ▣▣ ▣▣ ▣▣ ▣▣
 452      ▣▣ ▣▣
 3P6         ▣▣ ▣▣ ▣▣
 352      ▣▣ ▣▣
 2P6         ▣▣ ▣▣ ▣▣
 252      ▣▣ ▣▣
 152      ▣▣ ▣▣

ATOMIC NO.= 21
 3D1      ▣▣ ▣▣ ▣▣ ▣▣ ▣▣
 452      ▣▣ ▣▣
 3P6         ▣▣ ▣▣ ▣▣
 352      ▣▣ ▣▣
 2P6         ▣▣ ▣▣ ▣▣
 252      ▣▣ ▣▣
 152      ▣▣ ▣▣

ATOMIC NO.= 21

 152  252  2P6  352  3P6  452

 3D1
```

```
   1 REM PPPPPPPPPPPPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPP
   2 REM PPPPPPPPPPPPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
   5 FAST
  10 FOR A=0 TO 139
  20 POKE A+16514,PEEK (A+2153)
  30 NEXT A
  40 POKE 16578,63
  50 PRINT "ENTER FROM TABLE ONE
:"
  60 FOR A=0 TO 51
  70 PRINT AT 10,5;A;" = ";
  80 INPUT B
  90 PRINT B
 100 POKE A+16660,B
 110 NEXT A
 120 POKE 16507,0
 130 POKE 16508,126
 140 RAND USR 16660
 150 FOR A=0 TO 511
 160 POKE A+32256,PEEK (A+7680)
 170 NEXT A
 180 CLS
 190 PRINT "NOW ENTER FROM TABLE
TWO:"
 200 FOR A=0 TO 31
 210 PRINT AT 10,5;A;" = ";
 220 INPUT B
 230 PRINT B
 240 POKE A+32264,B
 250 NEXT A
 260 PRINT ,,"NOW DELETE THE PRO
GRAM EXCEPT   FOR THE REMS, THEN
 ALTER LINE 1 LINENUMBER TO 8001
;AND LINE 2 TO 8095."

LINE 1 REM CONTAINS 140 "P"S.
LINE 2 REM CONTAINS 52 "P"S.
```

TABLE ONE (RAMTOP ROUTINE)

205	35	15	42	4	64	175	237
114	66	77	237	91	123	64	42
4	64	253	115	4	253	114	5
27	43	237	184	19	42	2	64
175	237	114	66	77	235	249	175
237	74	253	117	2	253	116	3
205	43	15	201				

TABLE TWO (CHARACTER SET)

0	255	136	152	184	136	136	255
0	255	17	17	29	25	17	255
0	255	128	128	128	128	128	255
0	255	1	1	1	1	1	255

IF YOU HAVE NO PRINTER :

```
 50 LET S$=" ▪ "
 55 LET T$=" ▄ "
 56 LET I$=" ▄ "
```

Ramtop
by Michael Sims

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POC1

Kaleidoscope

on ZX81

This is a program for the ZX81 with at least 2K of *Ram*. The functional part of the program is written in machine code and gives a very effective kaleidoscope display. Each time the program is run a different display will be produced, and you can exit from the machine code using the break key.

Program notes:

Line 1 is used as a 'safe' place to store the machine code.
Lines 10-105 set up the code in the string A$.
Lines 110-150 *Poke* the code into the *Rem* statement.
Lines 170-220 *Print* the Screen (24 × 24 characters).
Line 170 allows a screen display of 32 × 24 characters to be used.
Lines 230-240 produce a delay.
Line 260 calls the machine code routine.

At lines 180 and 200 the number after the word *Graphic* refers to the key on which the graphic may be found, i.e., line 200 contains the graphics on key eight followed by 23 inverse spaces.

The machine code incorporates a random number generator and uses the *Unplot* routine held in the 8K *Rom*.

```
  1 REM 00000000000000000000000000
0000000001111111111111111111111
1111111122222222222222222222222
2222222233333333333333333333333
3333333344444444444444444444444
44444444
  2 REM
  5 FAST
 10 LET A$="2A3240545D292919292
929197CAD223240C9"
 20 LET A$=A$+"3E0C824F43D5CDB2
0BD1"
 30 LET A$=A$+"3E0C834F42D5CDB2
0BD1"
 40 LET A$=A$+"3E0C834F3E289247
D5CDB20BD1"
 50 LET A$=A$+"3E0C824F3E289347
D5CDB20BD1"
 60 LET A$=A$+"3E34924F43D5CDB2
0BD1"
 70 LET A$=A$+"3E34934F42D5CDB2
0BD1"
 80 LET A$=A$+"3E34934F3E289247
D5CDB20BD1"
 90 LET A$=A$+"3E34924F3E289347
D5CDB20BD1C9"
100 LET A$=A$+"3EA0323040006025
CD8240FE2930F957"
101 LET A$=A$+"D5CD8240FE2930F9
D15FCD9440323032"
105 LET A$=A$+"3040C110E23A2540
FEFF28D4C9"
110 LET L=16514
120 POKE L,CODE A$+16+CODE A$(2
)-476
130 LET L=L+1
140 LET A$=A$(3 TO )
150 IF A$<>"" THEN GOTO 120
170 POKE 16418,0
180 PRINT AT 23,4;"GRAPHIC 2,
23*GRAPHIC 7"
190 FOR F=0 TO 22
200 PRINT AT F,4;"GRAPHIC 8,
23*INVERSE SPACES"
210 NEXT F
220 POKE 16418,2
225 SLOW
230 FOR F=1 TO 50
240 NEXT F
250 LET L=USR 16525
270 STOP
```

Kaleidoscope
by Ian Reynolds

Egghead

on Vic20

This program is based entirely on the *Circle* command and written for a Vic20 with a Super Expander cartridge fitted. When the program is run the user inputs the width of the gap between each circle. Then the egg (circle) is drawn and then when it has been drawn the user hits any key to re-run the program.

Program notes:

Lines 10-50: input step (width) of egg.
Lines 60-80: setting up screen and character colours.
Lines 90-110: drawing of egg.
Line 120: waiting for an input.
Line 230: clear the screen.
Line 140: re-run the program.

```
 1 REM VIC ALARM CLOCK
 2 REM BY PHILIP EDWARDS
 3 REM OF ALTRINCHAM
 5 PRINT"(CLR)"
 7 POKE36879,123
 10 PRINT"(RVS ON) THIS IS ALARM CLOCK (RVS OFF)"
 20 PRINT"(10CD)(10CR)PLEASE WAIT"
 21 PRINT"(7CD)(7CR)┌─────┐"
 22 PRINT"(7CR)│ 12  │"
 23 PRINT"(7CR)│  |  │"
 24 PRINT"(7CR)│ 9 \ 3│"
 25 PRINT"(7CR)│  6  │"
 26 PRINT"(7CR)└─────┘"
 27 POKE56,24:POKE55,0:CS=6144
 30 FORI=CSTO7678STEP2:Z=PEEK(32768+(I-CS)/2)
 35 POKEI,Z:POKEI+1,Z:NEXT
 40 POKE36879,25:POKE36867,(PEEK(36867))OR23
 45 POKE36869,254:POKE36881,24
 46 PRINT"(CLR)"
 47 POKE36878,0
 48 POKE36879,25
 50 PRINT"(CYAN)*****(RED)ALARM CLOCK(CYAN)******
    (RED)"
 60 INPUT"CORRECT TIME";TI$
 70 INPUT"(CD)ALARM TIME";AL$
 80 PRINT"(CLR)"
 90 PRINT"(CYAN)*****(RED)ALARM CLOCK(CYAN)******
    (RED)"
100 PRINT"(6CR)(2CD)TIME IS"
105 PRINT"(6CR)";LEFT$(TI$,2);":";MID$(TI$,3,2);
    ":";RIGHT$(TI$,2)
110 PRINT"(6CR)(1CD)ALARM IS"
115 PRINT"(6CR)";LEFT$(AL$,2);":";MID$(AL$,3,2);
    ":";RIGHT$(AL$,2)
120 FORR=1TO6000:NEXTR
130 PRINT"(CLR)"
131 PRINTCHR$(158)
132 POKE36879,8
140 PRINT"(HOME)(6CD)(6CR)";LEFT$(TI$,2);":";
    MID$(TI$,3,2);":";RIGHT$(TI$,2)
150 IFAL$=TI$THEN165
160 GOTO140
165 PRINT"(HOME)(RED)(3CD)(8CR)TIME"
168 PRINT"(HOME)(6CD)(6CR)";LEFT$(TI$,2);":";
    MID$(TI$,3,2);":";RIGHT$ (TI$,2)
170 POKE36878,15
180 FORI=135TO239
190 FORH=1TO100:NEXTH
200 POKE36879,I
210 POKE36876,I
220 NEXTI
230 GETA$:IFA$="s"THEN46
240 GOTO165
```

Alarm Clock
by Philip Edwards

```
0 REM     EGGHEAD
1 REM(C) R.HAYNES 1982
10 INPUT"■■■WIDTH OF GAP";W
20 IFW<501ANDW>0THEN60
30 PRINT"■■■■(0 TO 500 ONLY)"
40 FORDE=1TO2000:NEXTDE
50 GOTO10
60 GRAPHIC3
70 C=1+INT(RND(1)*6)
80 COLOR0,0,C,C
90 FORX=0TO511STEPW
100 CIRCLEC,511,511,X,X
110 NEXTX
120 POKE198,0:WAIT198,1:POKE198,0
130 SCNCLR:GRAPHIC0
140 GOTO10
```

Egghead
by Robin Haynes

Open Forum

Alarm Clock

on Vic 20

This is an alarm clock for the unexpanded Vic20. First of all it asks you the correct time, then what time you wish the alarm to go off. Then it prints the time until it equals the alarm time and then . . .

Lines
27 to 45 Doubles up the characters.
50 to 115 Receives data for clock.
131 to 168 Prints Clock.
170 to 240 Makes chime.

Red = control red.
Clr = clear screen.
Cr = cursor right.
Cd = cursor down.
Home = cursor home.

```
10 PRINT"JINPUT START"
20 INPUTS
25 FORF=STOS+100
30 X=PEEK(F):Y=INT(X/16):Z=X-Y*16
40 IFZ>9THENZ=Z+7
50 IFY>9THENY=Y+7
60 Z=Z+48:Y=Y+48
70 PRINTCHR$(Y);CHR$(Z);" ";
80 NEXTF:PRINT
90 PRINT"[illegible]ANY KEY TO RESTART"
100 PRINT"[illegible]OR'SPACE'TO CONTINUE"
110 GETA$:IFA$=""THEN110
120 IFA$=" "THENS=F:PRINT"J":GOTO25
130 RUN
```

Blockloader
by Ian Hegerty

VicBlock Loader

on Vic 20

This program shows 100 bytes of memory (you specify the starting address at the start of the program) in hex — useful for you machine code programmers. When the block of hexadecimal has been displayed, you are given two options — restart or continue. If you restart, you respecify a new address, but if you continue, the next 100 bytes are displayed.

Program notes:
Lines 10 to 20 — *Input* starting point and clear screen.
Lines 25, 80 — Loop for 100 bytes.
Lines 30-70 — *Peek* bytes and turn into hexadecimal.
Lines 90 to 130 — wait for input and restart or continue.

Astrosmash

on BBC Micro

This program, called Astrosmash, for the model A or B BBC Micro, plays a simple version of the popular arcade game Asteroids. It runs in *Mode* 4, so is only in black and white. It makes some use of the Beeb's special features, which take it one step ahead of its close competitors, eg, user definable graphics, enveloping, etc. The asteroids move up the screen in a scrolling motion.

In the game, you only have one life to play with, so quick finger on the button reactions are needed to stay alive.

When the program is run, you will be given instructions on which keys to use. The game itself runs in just over 2K.

```
 10 REM **** ASTROSMASH (C) By David Potter
 20 ENVELOPE1,8,1,0,0,1,0,0,127,-5,-1,-8,128,0
 30 ENVELOPE 3,2,-1,0,0,50,0,0,120,-1,0,-1,120,80
 40 VDU 23,225,56,124,63,31,12,6,3,1
 50 VDU 23,226,28,62,252,248,48,96,192,128
 60 VDU 23,227,3,15,31,63,63,127,255,255
 70 VDU 23,228,224,240,240,252,252,254,255,255
 80 VDU 23,229,255,255,63,127,63,31,7,7
 90 VDU 23,230,255,254,254,240,248,248,224,224
100 VDU 23,231,28,126,127,255,254,127,254,60
110 A$=CHR$(227):B$=CHR$(228)
120 C$=CHR$(229):D$=CHR$(230)
130 G$=CHR$(225):H$=CHR$(226)
140 E$=CHR$(231)
150 SC=0:HI=0:MODE 4
160 CLS:VDU 4:VDU 23;8202;0;0;0;
170 PRINTTAB(11,2);"A S T R O S M A S H"
180 PRINTTAB(11,3);STRING$(19,"-")
190 PRINTTAB(4,8)"(C) By David Potter, 13 Years old
200 PRINTTAB(4,9);STRING$(33,"-")
210 PRINTTAB(15,11)"CONTROLS:-"
220 PRINTTAB(5,13)"Left arrow key moves ship left"
230 PRINTTAB(5,15)"Right arrow key moves ship right
240 PRINTTAB(12,17)"Spacebar to fire"
250 PRINTTAB(12,24)"ANY KEY TO PLAY"
260 Q$=GET$:XS=640:YS=800:CLG
270 *FX 4,1
280 IF SC>HI HI=SC
290 VDU 5
300 PROCPOINT:PROCSCORE
310 A=INKEY(0)
320 IF A=32 PROCFIRE
330 IF XS>30 AND A=&88 XS=XS-30
340 IF XS<1200 AND A=&89 XS=XS+30
350 *FX 15,0
360 GCOL0,1:MOVE XS,YS:PRINTG$;H$
370 PROCPOINT
380 VDU 4:X=RND(38+1):Y=28
390 IF RND(1)>0.50 PRINTTAB(X,Y);E$:GOTO 410
400 PRINT TAB(X,Y);A$;B$;TAB(X,Y+1);C$;D$
410 VDU 5:MOVE XS,YS:GCOL 0,0:PRINTG$;H$
420 PROCPOINT
430 VDU 4
440 IF RND(1)>0.90 THEN 290
450 PRINTTAB(0,31);SPC(40):GOTO 290
460 DEFPROCPOINT
470 P=POINT(XS+30,YS-32):IF P=1 PROCCRASH
480 P=POINT(XS,YS):IF P=1 PROCCRASH
490 P=POINT(XS+60,YS+2):IF P=1 PROCCRASH
500 ENDPROC
510 DEFPROCFIRE
520 MOVE XS,YS:GCOL 0,1:PRINTG$;H$
530 SOUND 0,3,1,5
540 MOVE XS+15,YS-30
550 XB=XS+15:VDU 5
560 FOR YB=YS-30 TO 0 STEP-30
570 GCOL 0,1:MOVE XB,YB:PRINT "*"
580 PO=POINT(XB,YB-20):IF PO=1 PROCHIT
590 PO=POINT(XB+20,YB-20):IF PO=1 PROCHIT
600 GCOL 0,0:MOVE XB,YB:PRINT "*"
610 NEXT YB:ENDPROC
620 DEFPROCHIT
630 SOUND 0,1,4,2:VDU 5
640 GCOL 0,0:MOVE XB,YB:PRINT E$
650 MOVE XB,YB:PRINT A$;B$
660 MOVE XB,YB-30:PRINT C$;D$
670 SC=SC+40:ENDPROC
680 DEFPROCSCORE
690 VDU 4
700 PRINT TAB(3,1);"SCORE = ";SC
710 PRINTTAB(20,1)"HISCORE = ";HI
720 VDU 5:ENDPROC
730 DEFPROCCRASH
740 MOVE XS,YS:GCOL 0,1:PRINTG$;H$
750 SOUND 0,1,-3,8:CLG
760 *FX 15,0
770 PROCEND:ENDPROC
780 DEFPROCEND
790 PRINTTAB(8,10);"YOUR SCORE WAS *** ";SC;" ***"
800 IF SC>HI HI=SC
810 PRINTTAB(6,12);"THE HIGH SCORE IS *** ";HI;" ***"
820 PRINTTAB(10,16);"ANOTHER GAME (Y/N) ?"
830 *FX 15,0
840 Z$=GET$
850 IF Z$="Y" SC=0:GOTO 160
860 *FX 4,0
870 CLS:VDU 4:END
880 ENDPROC
```

Astrosmash
by David Potter

```
 5 CLS
10 ONERRORGOTO100
20DIMC(30),F(30),D(30):Z=0:A=0
30 INPUT"1)ENTER 2)PLAY 3)DISPLAY",F:ON F GOTO40,70,80
40 A=Z:INPUT"1)DEL. 2)ADD",B:ON B GOTO50,60
50INPUT"DELETE HOW MANY",N:A=A-N:Z=A:GOTO30
60A=A+1:INPUT"Ch,Fr,Du "C(A),F(A),D(A):IF C(A)=9:A=A-1:GOTO30 ELSE 60
70Z=A:FOR Q=1TOZ:SOUNDC(Q),-5,F(Q),D(Q):NEXTQ:CLS:GOTO30
80Z=A:FOR Q=1TOZ
90PRINT"SOUND";C(Q);"LOUD";F(Q);" ";D(Q):NEXTQ:GOTO30
100REPORT:PRINT" ";ERL:FORN=1TO3000:NEXTN:GOTO30
```

Music Development
by Carol Bowerman

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Music Development

on BBC Micro

Recently many music programs in which the songs are entered in musical-type notation, have been published. Their main drawbacks are:

1. Musical knowledge is essential.
2. The "noise" channel is hard to cater for in this way.
3. The numbers indicating the frequency used by the sound command are not displayed and such programs can not be used to develop musical effects for games etc.

I thus wrote a short, simple program which allowed the easy manipulation of sound effects.

The menu on line 30 allows songs to be entered and notes deleted using option 1, songs to be played option 2, or displayed option 3.

In enter mode the channel number, the frequency and the duration are entered (loudness is fixed at −5) in that order. To exit enter mode, a dummy note 9,0,0 is entered.

To delete notes enter edit mode (option 1) and then choose the *Del.* option. Respond to the prompt by indicating the number of notes to be deleted.

All note synchronisation, flushing and continuation controls are available. The hexadecimal number for the channel should be worked out and this should be entered as the channel number, after having been converted to decimal.

For example, to play a note immediately, regardless of the queue, on channels 2 and 12, loudness, frequency, duration is normally entered: this should be entered as decimal 18, L,F,D.

Battleships

on BBC Micro

This program is based on the well-known game of Battleships and runs on both the Model A and B. Four naval ships are placed on a 10x10 square by the operator and the computer randomly places it's own fleet.

Ship positions

The positions of your ships are shown on the screen, and then you and the computer alternatively try to sink each other's ships.

When one of your ships has been destroyed it is replaced by an asterisk and a list is maintained at the top of the screen as to what has been sunk.

The computer begins at a random number working its way around the board systematically, never firing upon the same square twice. Inbuilt checks are made to ensure that no two ships are placed on the same square.

```
 10 REM ******************************
 20 REM *                            *
 30 REM *   B A T T L E S H I P S    *
 40 REM *                            *
 50 REM *            B Y             *
 60 REM *                            *
 70 REM *       M A T T H E W        *
 80 REM *                            *
 90 REM *       K E E L I N G        *
100 REM *                            *
110 REM ******************************
120 CLG
130 CLS
140 PRINTTAB(0,2)"ON A GRID TEN BY TEN YOU CAN PLACE THREE SHIPS
 AND A SUBMARINE .EG. 9 ACROSS AND 2 UP WOULD BE TYPED IN AS
 '9,2'. WHEN THE POSITIONS HAVE BEEN CHOSEN THE GRID WILL BE
 DRAWN AND THE SHIPS PLOTTED."
150 PRINTTAB(0,9)"WHERE DO YOU WANT TO PLACE THE ...."
160 PRINTTAB(0,11)"SUBMARINE  "
170 VDU 11:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:
 VDU 9:VDU 9:VDU 9
180 INPUT S,SS
190 IF S > 10 OR SS > 10 PRINT"PLEASE STATE THAT AGAIN":INPUT S,SS:
 GOTO 190
200 PRINT"BATTLESHIP "
210 VDU 11:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:
 VDU 9:VDU 9:VDU 9
220 INPUT B,BB
230 IF B = S AND BB = SS PRINT"YOU HAVE GOT THE SUBMARINE THERE":
 VDU 7:GOTO 220
240 IF B > 10 OR BB > 10 PRINT"PLEASE STATE THAT AGAIN":INPUT B,BB:
 GOTO 240
250 PRINT"FRIGATE   "
260 VDU 11:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:
 VDU 9:VDU 9:VDU 9
270 INPUT F,FF
280 IF F = S AND FF = SS PRINT"YOU HAVE GOT THE SUBMARINE THERE":
 VDU 7:GOTO 270
290 IF F = B AND FF = BB PRINT"YOU HAVE GOT THE BATTLESHIP THERE":
 VDU 7:GOTO 270
300 IF F > 10 OR FF > 10 PRINT"PLEASE STATE THAT AGAIN":INPUT F,FF
 GOTO 300
310 PRINT"AIRCRAFT CARRIER"
320 VDU 11:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:
 VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9:VDU 9
330 INPUT A,AA
340 IF A = S AND AA = SS PRINT"YOU HAVE GOT THE SUBMARINE THERE":
 VDU 7:GOTO 330
350 IF A = B AND AA = BB PRINT"YOU HAVE GOT THE BATTLESHIP THERE":
 VDU 7:GOTO 330
360 IF A = F AND AA = FF PRINT"YOU HAVE GOT THE FRIGATE THERE":
 VDU 7:GOTO 330
370 IF A > 10 OR AA > 10 PRINT"PLEASE STATE THAT AGAIN":INPUT A,AA
 GOTO 370
380 LET SC = RND(10)
390 LET SSC = RND(10)
400 LET BC = RND(10)
410 LET BBC = RND(10)
420 IF BBC = SSC AND BC = SC GOTO 400
430 LET FC = RND(10)
440 LET FFC = RND(10)
450 IF FC = SC AND FFC = SSC GOTO 430
460 IF FC = BC AND FFC = BBC GOTO 430
470 LET AC = RND(10)
480 LET AAC = RND(10)
490 IF AC = SC AND AAC = SSC GOTO 470
500 IF AC = FC AND AAC = FFC GOTO 480
510 IF AC = BC AND AAC = BBC GOTO 490
520 MODE 1
530 FOR D = 0 TO 650 STEP 65
540 MOVE 0,D
550 DRAW 650,D
560 NEXT
570 FOR D = 0 TO 650 STEP 65
580 MOVE D,0
590 DRAW D,560
600 NEXT
610 COLOUR 1
620 PRINTTAB(A*2-1,(10-AA*2-2)+24)"A"
630 LET P = 0
640 PRINTTAB(S*2-1,(10-SS*2-2)+24)"S"
650 PRINTTAB(B*2-1,(10-BB*2-2)+24)"B"
660 PRINTTAB(F*2-1,(10-FF*2-2)+24)"F"
670 Q = RND(99) + 10:U = Q
680 FOR G = 10 TO 109
690 U = U + 1
700 IF U > 108 U = U - 99
710 C = U DIV 10
720 CC = U - (C * 10) + 1
730 COLOUR RND(3)
740 IF C > 10 OR CC > 10 C = C - 10 : CC = CC - 10
750 PRINTTAB(0,2)"WHERE DO YOU WANT TO SHOOT"
760 PRINTTAB(0,3)"                                "
770 PRINTTAB(27,2)""
780 INPUT Z,ZZ
790 IF Z = SC AND ZZ = SSC PTINTTAB(0,8)"  YOU'VE HIT MY SUBMARINE":
 SC = 99:SSC = 99:SOUND 0,-15,6,10
800 IF Z = BC AND ZZ = BBC PTINTTAB(0,9)"  YOU'VE HIT MY BATTLESHIP"
 :BC = 99:BBC = 99:SOUND 0,-15,6,10
810 IF Z = FC AND ZZ = FFC PTINTTAB(0,10)"  YOU'VE HIT MY FRIGATE":
 FC = 99:FFC = 99:SOUND 0,-15,6,10
820 IF Z = AC AND ZZ = AAC PTINTTAB(0,11)"  YOU'VE HIT MY AIRCRAFT
 CARRIER":AC = 99:AAC = 99:SOUND 0,-15,6,10
830 IF SC = 99 AND SSC=99 AND BC= 99 AND BBC= 99 AND FC= 99 AND
 FFC= 99 AND AC= 99 AND AAC= 99 PROCC
840 IF C = S AND CC = SS PRINTTAB(0,4)"  IV'E HIT YOUR SUBMARINE":
 PRINTTAB(C*2-1,(10-CC*2-2)+24)"*":S = 99:SS = 99:
 SOUND 0,-15,6,10
850 IF C = B AND CC = BB PRINTTAB(0,5)"  IV'E HIT YOUR BATTLESHIP":
 PRINTTAB(C*2-1,(10-CC*2-2)+24)"*":B = 99:BB = 99:
 SOUND 0,-15,6,10
860 IF C = F AND CC = FF PRINTTAB(0,6)"  IV'E HIT YOUR SUBMARINE":
 PRINTTAB(C*2-1,(10-CC*2-2)+24)"*":F = 99:FF = 99:
 SOUND 0,-15,6,10
870 IF C = A AND CC = AA PRINTTAB(0,7)"  IV'E HIT YOUR AIRCRAFT
 CARRIER":PRINTTAB(C*2-1,(10-CC*2-2)+24)"*":A = 99:AA = 99:
 SOUND 0,-15,6,10
880 IF S = 99 AND SS =99 AND B = 99 AND BB = 99 AND F = 99 AND
 FF = 99 AND A = 99 AND AA = 99 PROCH
890 NEXT
900 END
910 DEF PROCC
920 CLS
930 PRINTTAB(10,10)"YOU'VE WON"
940 GOTO 1010
950 ENDPROC
960 DEF PROCH
970 CLS
980 PRINTTAB(10,10)"I'VE WON"
990 GOTO 1010
```

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```
1000 ENDPROC
1010 TIME = 0
1020 REPEAT
1030 UNTIL TIME > 100
1040 CLG
1050 CLS
1060 PRINTTAB(0,10)""
1070 INPUT"DO YOU WANT ANOTHER GO?"X$
1080 IF X$ = "YES" OR X$ = "Y" GOTO 10
1090 IF X$ = "NO" OR X$ = "N" GOTO 1110
1100 GOTO 1040
1110 FOR A = 0 TO 10
1120 PRINT"SPOIL SPORT . . . . ."
1130 NEXT
1140 TIME = 0:REPEAT:UNTIL TIME > 100:CLG
1150 CLS
```

Battleships
by Matthew Keeling

Scribble

on Spectrum

We've all seen *Draw* programs for the ZX81 and Spectrum: these usually involve a constant-velocity cursor drawing straight lines. This program, however, operates on an entirely different principle.

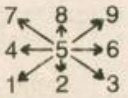
When a cursor key (1→9) is pressed, an acceleration is applied to the cursor in the specified direction (fig. 1). Thus, the longer a key is pressed, the faster the cursor moves.

Once the cursor has acquired momentum you can apply acceleration at an angle to the direction of movement, causing it to curve around. By manipulating the accelerations carefully, you can create a scribble-like design of loops and curves.

If you wish to halt the cursor dead (e.g. if it is heading towards the screen edge too fast to stop), push key 0.

Once 240 moves have been made, the screen will go blank and your design will be re-traced at high speed — an effect which looks very much like a pen scribbling on the screen.

Fig. 1



Cursor directions:
5 lets the cursor carry on in a straight line.
0 stops the cursor dead.
Variables.
X and Y — displacements for *Draw* in line 40; these act like velocity component vectors.
P(2,240) — holds successive x & y values to be re-drawn in the loop starting at line 100.
W — holds the *Inkey$* value for cursor control.

```
10 PLOT 118,80 : LET x=0 : LET y=0
11 DIM p(2,240)
20 FOR c=1 TO 240
30 IF INKEY$="" THEN LET w=5 : GO TO 30
40 IF INKEY$<>"" THEN LET w=PEEK 23560-48 : DRAW x,y
45 LET p(1,c)=x : LET p(2,c)=y
50 LET x=x+(w=3 OR w=6 OR w=9)-(w=1 OR w=4 OR w=7)
60 LET y=y+(w=7 OR w=8 OR w=9)-(w=1 OR w=2 OR w=3)
70 IF INKEY$="0" THEN LET x=0 : LET y=0
80 PAUSE 2
90 NEXT c
95 CLS
97 PLOT 118,80
100 FOR d=1 TO 240
110 DRAW p(1,d),p(2,d)
120 NEXT d
```

Scribble
Anonymous

Holocaust

on Spectrum

This game tests one's tactics under pressure as well as one's quick reactions. Instructions are supplied in the program.

Program notes:
The array a(10,2) contains the positions of the enemy tanks.
5-60 set up screen and variables.
70-135 move tanks and introduce various checks.
500-660 aim, shoot and check bombs.
1000-1230 instructions.
As the instructions are rather lengthy, they can be omitted, if preferred, to save time, but this will detract from the visual presentation.

```
  1 GO SUB 1000
  5 LET sc=0
 10 DIM a(10,2)
 20 FOR f=1 TO 10: LET a(f,1)=f
*2: LET a(f,2)=30: NEXT f
 30 FOR f=1 TO 21: PRINT AT f,5
;"|";AT f,31;"*": NEXT f
 35 PRINT AT 1,5;"**************
**************"
 40 PRINT AT 21,5;"**************
**************"
 50 FOR f=1 TO 1*4: PRINT AT RN
D*16+2,RND*22+6;"†": NEXT f
 60 FOR f=1 TO 5: PRINT AT RND*
18+2,RND*5+8;"C": NEXT f
 70 FOR a=1 TO 10: LET f=a
 71 PRINT AT 2,0;"B"a;AT 4,0;
"lft=";AT 6,0;b;" "
 72 PRINT AT 0,4;"U"
 73 PRINT AT 10,0;"Sca";AT 12,0
;sc;"  "
 74 IF sc=10 THEN GO TO 500
 75 IF a(f,2)=0 THEN NEXT a: GO
TO 70
 80 PRINT AT a(f,1),a(f,2);" "
 90 LET a(f,2)=a(f,2)-3
100 IF a(f,1)>2 THEN IF a(f,1)<
20 THEN LET a(f,1)=a(f,1)-1: IF
RND>.5 THEN LET a(f,1)=a(f,1)+2
105 IF RND>.75 THEN LET a(f,2)=
a(f,2)-1
110 IF SCREEN$ (a(f,1),a(f,2))=
"†" THEN LET a(f,2)=0: BEEP .2,0
: LET sc=sc+1: GO TO 140
120 IF SCREEN$ (a(f,1),a(f,2))=
"C" THEN LET b=b-10: BEEP .5,30:
FOR t=32 TO 144: PRINT AT a(f,1
),a(f,2);CHR$ t: NEXT t: PRINT A
T a(f,1),a(f,2);"†": LET sc=sc+1
: LET a(f,2)=0: GO TO 140
130 IF a(f,2)<=5 THEN GO TO 400
135 PRINT AT a(f,1),a(f,2);"("
140 IF INKEY$="1" THEN GO TO 50
0
150 NEXT a: GO TO 70
400 PRINT AT 10,10; FLASH 1;"WE
WIN"
405 PRINT AT a(f,1),a(f,2);"■"
410 FOR h=1 TO 200: NEXT h: PRI
NT AT 21,0;"Press any key"
420 IF INKEY$="" THEN GO TO 420
430 RUN
500 PRINT AT 0,4;" "
510 LET b=b-1: IF b<0 THEN GO T
O 700
520 FOR f=5 TO 30
530 PRINT AT 0,f-1;" V"
540 FOR d=1 TO 3
545 IF INKEY$=" " THEN GO TO 57
0
550 NEXT d: NEXT f
560 LET f=30
570 FOR v=1 TO 20: NEXT v: FOR
s=2 TO 20
580 PRINT AT s,4;">"
585 FOR d=1 TO 3: IF INKEY$=" "
THEN GO TO 600
590 NEXT d: PRINT AT s,4;" ": N
EXT s
595 LET s=20
600 IF SCREEN$ (s,f)="(" THEN B
EEP .2,0: GO TO 650
605 IF SCREEN$ (s,f)="C" THEN L
ET b=b-10: FOR t=32 TO 144: PRIN
T AT s,f;CHR$ t: NEXT t: PRINT A
T s,f;"†";AT 0,f;" ";AT s,4;" ":
BEEP .5,30: GO TO 150
610 FOR q=1 TO 40: PRINT AT s,f
;"■";AT s,f;"†": NEXT q: PRINT A
T 0,f;" ";AT s,4;" ": LET s=0: L
ET f=0: GO TO 150
650 FOR q=1 TO 10: PRINT AT s,f
;"■": IF a(q,1)=s AND a(q,2)=f T
HEN LET sc=sc+1: LET a(q,2)=0
660 PRINT AT s,f;"†": NEXT q: G
O TO 610
700 PRINT AT 10,10; FLASH 1;"NO
BOMBS-WE WIN"
710 GO TO 410
800 PRINT AT 10,10; FLASH 1;"YO
U WIN": GO TO 410
1000 CLS
1010 PRINT "   NUCLEAR HOLOCAUST
"
1020 PRINT '"This war game is se
t in the nearfuture and nuclear
war has been declared throughout
 the world.  You have a high pos
ition in     terms of power for
you operate  one of the bombing
sites. Your  task is to destroy
the oncoming Russian tanks by bo
mbing them byeither direct hits
or by forcing"
1030 PRINT "them to move into a
nucular footprint. If they move
into a foot print then they are
killed by    the high radiation l
evels. If    they hit one of your
 citys then some of your bomb su
pply will becut off. If the tank
s manage to cross the war area a
nd hit your defences then you wi
ll be killed"
1040 PRINT ' FLASH 1;"PRESS ANY
KEY"
1050 PAUSE 0: CLS
1060 PRINT "BEWARE- your bomb su
pply is      limited"
1070 PRINT ' FLASH 1;"PRESS ANY
KEY"
1080 PAUSE 0: CLS
1090 PRINT "CONTROLS"
1100 PRINT '"To drop a bomb you
must first   press '1' to start
the horiz    sight ,'space' to s
top it and tostart the vert and
'space' to   stop that and to dr
op a bomb"
1110 PRINT '' FLASH 1;"PRESS ANY
 KEY": PAUSE 0: CLS
1120 PRINT "SIGNS"
1130 PRINT '"†=nuclear footprin
t"
1140 PRINT '"(=Russian tank"
1150 PRINT '"C=your city"
1160 PRINT '"!=your defence line
"
1170 PRINT '"V=your horiz sight"
1180 PRINT '">your vert sight"
1190 PRINT FLASH 1''"PRESS ANY
KEY"
1200 PAUSE 0: CLS
1210 INPUT "LEVEL 1-9,9=easy ? "
;l
1211 LET l=INT l: IF l<1 OR l>9
THEN GO TO 1210
1220 LET b=l*10
1230 CLS : RETURN
```

Holocaust
by Nick Wilson

Charted by numbers

***Malcolm Davison** explains how to draw bar-charts to illustrate your programs.*

This is a general purpose graph (or more accurately bar-chart) program which will plot one to 12 values from one to multi-millions. The vertical scale is set by the highest value and can be either five or 10 'units' in value (see examples).

The graph can be given different colours and a title up to 30 letters long. If any values to be charted are negative, the appropriate bar is printed in red but above the *x* axis.

While the program was written to handle financial information, it would not be difficult to change the units to 'sheep', 'tons' or anything else. The '£' sign and scale of value is given in lines 2157 and 2160. As an alternative to the numbers 1-12 along the *x* axis, a routine to put the month's initials 'JFMA . . .' could be written.

One application for this program would be for a marketing or sales lecture where the graphs required as a visual aid could be stored on tape and loaded as needed. A program to handle the searching and loading could be employed, but by making careful use of the tape counter on the tape recorder and using *Load* 'graph name' *Screen*, such a program should not be necessary. The speed of access and display should be greatly enhanced by the new microdrive.

The other use of the program would be to print out graphs for use in reports, although much of the impact is lost through the lack of colour. The title of the graph should be printed in true video rather than inverse, to make it easier to read (delete *Inverse* 1; in line 2180).

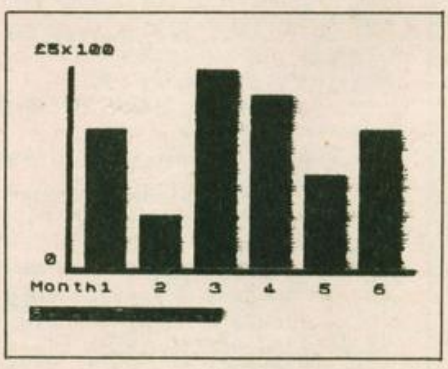
The colour check, lines 1040, 1070 and 1110, tests the input colour value. It does not allow the use of red as a *Paper* or *Ink* colour, or white as a *Paper* colour and prevents defining the *Paper* and *Ink* colours as the same colour. The input values are stored in a numeric array (lines 2071, 2075) after being checked as numeric inputs in the validation routine (3000-3050).

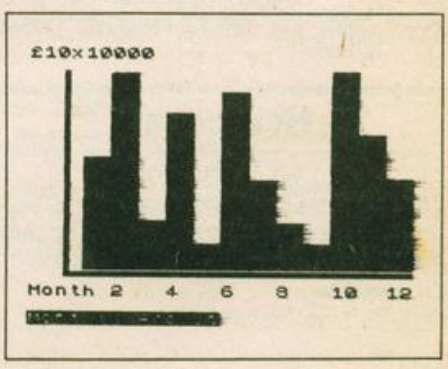
Lines 2080 to 2095 search for the largest input value and lines 2115 and 2120 decide whether a 10 unit or five unit vertical scale should be used. (The flag '*Five*=1' indicates the latter.)

Two bar widths are available, depending upon whether there are more than six input values (the variable *H* stores the number input values). Lines 2210 to 2280 handle the six or less values and lines 2207 to 2240 the seven to 12 values. Lines 2285 and 2215 change the colour of the bar to red if the value is negative.

To determine the height of the bar, lines 2210 and 2280 work out the proportion of 113 plot positions represented by the input value — the maximum value of the vertical scale being represented by *Range* previously determined in lines 2201 and 2205.

```
   1 REM "graph"
   2 REM © M.Davison
   3 REM
   5 INK 7: BORDER 0: PAPER 0: C
LS
1000 INPUT "How many graph value
s must I plot?",b$
1005 GO SUB 3000: IF error=1 THE
N GO TO 1000
1010 LET H=VAL b$
1020 IF VAL b$>12 OR VAL b$<1 TH
EN GO TO 1000
1030 INPUT "What colour paper?",
a$
1040 IF CODE a$<48 OR CODE a$>54
 OR CODE a$=50 THEN GO TO 1030
1050 PAPER VAL a$
1060 INPUT "What colour ink?";b$
1070 IF CODE b$<48 OR CODE b$>55
 OR CODE b$=50 THEN GO TO 1060
1080 IF a$=b$ THEN GO TO 1060
1090 INK VAL b$
1100 INPUT "What colour border?
";b$
1110 IF CODE b$<48 OR CODE b$>55
 OR CODE b$=50 THEN GO TO 1100
1120 BORDER VAL b$
1130 CLS
2050 LET FIVE=0: LET HIGHEST=0:
LET RANGE=0: LET Q$=" "
2055 INPUT "What is the title of
 the graph? (max. 30 letters)";A
$
2056 IF LEN A$<31 THEN GO TO 206
2
2057 BEEP .1,22: BEEP .1,18: CLS
 : PRINT AT 2,4; FLASH 1;" Sorry
 too many letters ": PRINT AT 3,
10; FLASH 1;" Try again ": PAUSE
 200: FLASH 0: CLS : GO TO 2055
2062 DIM V(12)
2065 REM
2066 REM ************************
2067 REM INPUT GRAPH VALUES
2068 REM ************************
2069 REM
2071 FOR Q=1 TO H
2072 INPUT "Enter value",b$: GO
SUB 3000
2073 IF error=1 THEN GO TO 2072
2074 LET V(Q)=VAL b$: NEXT Q
2075 GO TO 2080
2076 REM ************************
2077 REM SCALE OF INPUT?
2078 REM ************************
2079 REM
2080 LET HIGHEST=V(1)
2081 FOR R=2 TO H
2083 IF V(R)=0 THEN GO TO 2086
2085 IF V(R)>HIGHEST THEN GO TO
2095
2086 NEXT R
2090 GO TO 2100
2095 LET HIGHEST=V(R): GO TO 208
5
2100 FOR S=1 TO 9
2115 IF HIGHEST/(10↑S)<=10 THEN
GO TO 2120
2117 NEXT S: PRINT "Input value
too high": STOP
2120 IF HIGHEST/(10↑S)<=5 THEN L
ET FIVE=1
2120>IF HIGHEST/(10↑S)<=5 THEN L
ET FIVE=1
2132 REM
2133 REM ************************
2134 REM DRAW AXES
2135 REM ************************
2136 REM
2140 FOR Q=29 TO 31: PLOT INK 7;
Q,36: DRAW INK 7;0,117: NEXT Q
2142 FOR Q=36 TO 38: PLOT INK 7;
29,Q: DRAW INK 7;202,0: NEXT Q
2144 REM
2145 REM ************************
2146 REM ADD GRAPH DETAILS
2147 REM ************************
2148 REM
2155 IF FIVE=0 THEN GO TO 2160
2157 PRINT INK 7;AT 1,1;"£5x";10
↑S: GO TO 2162
2160 PRINT INK 7;AT 1,1;"£10x";1
0↑S
2162 PRINT INK 7;AT 16,2;"0"
2163 IF H>6 THEN GO TO 2400
2170 FOR Q=0 TO (H-1): PRINT INK
 7;AT 18,6+(Q*4);Q+1: NEXT Q
2180 PRINT INK 7;AT 20,1; INVERS
E 1;A$: INVERSE 0
2185 PRINT INK 7;AT 18,1;"Month"
2190 REM
2191 REM ************************
2192 REM DRAW HISTOGRAM BLOCKS
2193 REM ************************
2194 REM
2200 IF FIVE=0 THEN GO TO 2205
2201 LET RANGE=5*(10↑S): GO TO 2
206
2205 LET RANGE=(10↑S)*10
2206 IF H>6 THEN GO TO 2250
2207 FOR L=1 TO H
2208 IF V(L)=0 THEN NEXT L
2210 LET Y=INT ((113*ABS V(L)/RA
NGE)+.5)
2214 LET i=8
2215 IF V(L)<0 THEN LET i=2
2220 FOR S=1 TO 24: PLOT INK i;S
+7+(L*32),40: DRAW INK i;0,Y: NE
XT S
2230 LET i=8: NEXT L
2240 STOP : REM END OF PROGRAM
2250 IF H<13 THEN GO TO 2270
2260 PRINT "Too many values": ST
OP
2270 FOR L=1 TO H
2280 LET Y=INT ((113*ABS V(L)/RA
NGE)+.5)
2284 LET i=8
2285 IF V(L)<0 THEN LET i=2
2290 FOR S=1 TO 16: PLOT INK i;S
+23+(L*16),40: DRAW INK i;0,Y: N
EXT S: LET i=8: NEXT L
2300 STOP
2400 INK 7: FOR Q=1 TO H/2: PRIN
T AT 18,3+(Q*4);2*Q
2410 NEXT Q
2415 GO TO 2160
2995 REM
2996 REM ************************
2997 REM   Numeric validation
2998 REM ************************
2999 REM
3000 LET error=0
3010 FOR x=1 TO LEN b$
3015 IF CODE b$(x)=43 OR CODE b$
(x)=45 THEN GO TO 3030
3020 IF CODE b$(x)<48 OR CODE b$
(x)>57 THEN LET error=1
3030 NEXT x
3050 RETURN
```





Tony Bastable, presenter of Thames TV's Database programme.

Chimp champ chit-chat show

***Paul Kriwaczek** looks at Database – Thames TV's micro programme.*

Database is a half hour programme about microcomputers produced by Thames TV. The first episode was shown on Tuesday, October 12, at 11.30 pm.

At that time of night, it has to be a try on. ITV wants to see if its info-tech version of Wheelbase can pull an audience. On the showing of the first episode in the series, my feeling is that they have a winner.

Of course it is not anything like the BBC's Computer Programme, but then it was not intended to be. Database is simply to the micro what Wheelbase is to the motor, Tony Bastable and all.

The programme started with a visit to the appalling Milton Keynes house, that palace of misplaced technology, where it seems you cannot even turn on the lights without having to twiddle some infernal remote control. The central heating programmer, in normal houses a small and unobtrusive box, has here grown like a triffid, out of control all over a wall, until it looks like something that fell off the Tardis. But then, it allows you to program the heating a year ahead. It doesn't, however, provide a weather forecast.

On the interactive video-link, one is invited to participate in a council meeting, apparently under the control of a group of raving madmen.

The programme, thank goodness, refused to take all this too seriously and allowed itself to poke gentle fun at some of the excesses. Under what circumstances, Bastable wanted to know, would one need the facility for opening and closing the front room curtains by telephone link from abroad?

The Milton Keynes house is incorporated in a cable television network, a fact which led elegantly on to the next item — cable television. With excellent topicality, this concerned the publication of the Hunt report on cabling-up Britain. There was an intelligent interview with Lord Hunt, differing from the news reports of the day by concentrating on the technical implications of the document — coaxial cable versus glass fibre, and the provision of interactive services.

Then we had the sketch. This was Lion House getting its own back on the Computer Programme by demonstrating that Roy Kinnear is not their only salesman. A personable young man behind the counter performed admirably with the hearty embarrassment of the well-rehearsed ad-lib, dispensing jolly and perhaps a little optimistic advice on educational software for the TI micro. "But is it always like this," came the cry, and so, quick as a flash, over we went to our resident expert.

Dr Michael Thorne is a truly wonderful boffin, heavily bearded and with some kind of nervous twitch of the eyes, inhabiting a lunatic set full of giant resistors and pcb tracks. As he addressed us on the subject of the low standard of some commercial software, he was accompanied by a sort of squeaking noise that made me at first think he had mice about his person.

The joke turned out to be on me, because when the camera pulled back, it was to reveal the presence in the studio of a chimpanzee — the resident software quality control expert. The idea was an ironic reversal of Turing's test — any programme that cannot tell there is a chimpanzee and not a human at the other end of the joystick, cannot be all that bright. Next week, said Dr Thorne, he would be looking at the hardware. Whether the chimp had a long-running contract too, he did not reveal.

There followed, from the *Personal Computer World* show earlier in the year, a dutiful interview with two computer clubmen, to show that computer enthusiasts are just ordinary people. People simply do not come more ordinary than this pair.

And finally, for the reading of the latest micro news, we were back in the studio. Studio? The set appeared to be a cross between Carl Sagan's Cosmos space ship, and something out of the stills under the Star Trek credits, all screens, points and cubic curves. The presenter sat down at what was supposed to be a desk. Being Tony Bastable, I expected him to drive it away.

Paul Kriwaczek

All in all, a most enjoyable show. I wish ITV well with it. And if I am awake that late on Tuesday nights, I shall continue to watch. So should you.

Whats happening

SUFFOLK ZX81 USERS interested in setting up a software library should telephone P. Cockerton or R. Rees on Bury St Edmunds 4312 or 4867 (after 5 pm).

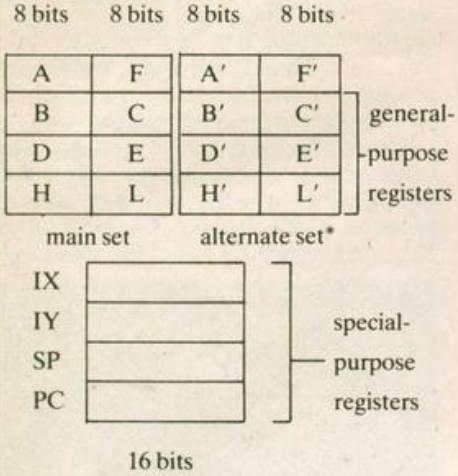
THE AUSTRALASIAN ZX USERS NEWSLETTER is published nine times per year. Membership is open to all ZX users. Contact Paul Jansen, PO Box 397, Dapto. NSW 2530, Australia.

MICRO-MART '82 will be held at St Francis School Hall, Bourneville Lane, Birmingham, on November 13. The show, including club stands, retail exhibitors, and a bring-and-buy stall, will be open from 10 am to 6 pm, tickets 50p.

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

Registering the bits and bytes



Here is the register organisation:

Ignore the alternate set for the moment.

The registers appear in pairs, indicating that they may be used either as 8-bit or 16-bit registers. For instance, we can refer to the *B*-register (8 bits), or the *C* register (8 bits) or the *BC* register (16 bits). The *B, C, D, E, H* and *L* registers can all be used in this way (but only in pairs *Bc, De* and *Hl*) but the *A* and *F* registers are strictly 8-bit registers and cannot be combined. For the 16-bit pairs, the senior byte is the left-hand one (*B, D* and *H*) as you would expect.

There are two index registers, *Ix* and *Iy*, a stack pointer (*Sp*) and program counter (*Pc*). Any of the 16-bit general-purpose register pairs (*Bc, De* or *Hl*) can be used for indirection but, for simplicity, we shall always use *Hl* for this purpose.

Load

Let's look at the *Load (Ld)* operation as an example of the 8-bit group. It's very like the *Ld* instruction in our imaginary machine, except that two extra addressing modes are allowed: *register-to-register,* and *immediate*. That gives a total of five addressing modes, with *direct, indirect* and *indexed* available as before.

Direct addressing is much the same as our imaginary equivalent, except that, since there is more than one register, we have to specify which register we want loaded:

LD A, (0F1C)

This loads the contents of 0F1C into the *A*-register. Note that, by convention, the movement is from right to left, so that we can write:

LD (0F1C), A

and mean "copy the contents of the *A*-register into 0F1C". Actually, the *A*-register is the only *8-bit* register which can be directly addressed.

Indirect addressing is also straightforward. Since we are going to standardise on the *Hl* for indirection, the instruction format is:

LD A, (HL)

which means "load the *A*-register *through* (ie from the address contained in) the *Hl* register". To pass data in the opposite direction we could have:

LD (HL), A

which puts the contents of A into the address *contained in Hl*. Registers other than A are allowed for this instruction.

Indexed addressing. Here, we need to indicate which index register is in use, and the amount of the offset:

LD A, (IX + 2E)

Note that in direct addressing. we showed an address of 4 hex digits, because 16 bits (2 bytes) are allowed for the address. The offset value in an indexed address instruction must be held in 1 byte, however, so we have only shown two hex digits.

Register-to-register. We can transfer data between registers like this:

LD D,B

which means: "load the contents of *B* into *D*".

Immediate. Here, data itself, rather than the address of data, is placed in the address field. So we can write:

LD B, 07

to mean "put the number 7 in *B*". Note again that the number is two hex digits, since it has to be stored in the single byte of the *B*-register. Note also that a *Ld* is really a *copy* — the numbers are retained in their original addresses or registers, but a copy is placed at the destination.

Now let's see what each of these instructions looks like in hex:

1. LDA, (0F1C)

First we look up the opcode for the *Ld A,* (nn) instruction (the nn indicates a general 2 byte address). This is 3*A*. So you would expect the instruction to code as:

3A 0F 1C

Unfortunately, there is a slight complication caused by the way the Z80 thinks about numbers. It likes the least significant (junior) byte of an address first. So we have to *swap the address bytes round:*

3A 1C 0F

This is mildly annoying, but you soon get used to it. It is an invariable rule for 2-byte numbers in Z80 instructions: *junior byte first, then senior.* Hence all those *Peek X + 256 *Peek (X + 1)'s* in the Sinclair *Manual.*

The *Ld* (nn), A instruction has the code 32, so:

LD (0F1C) becomes 32 1C 0F

2. LD A, (HL)

This is easy. There is no address part so it's just a 1-byte opcode. Look it up and you'll find it's 7E. Similarly *Ld (Hl), A* codes as 77.

3. LD A. (IX + 2E)

The general instruction is *Ld A, (IX + d), d* indicating a 1-byte displacement (in 2's complement notation). Its code is *DD 7E.* So the instruction is:

DD 7E 2E

where the byte *2E* is the displacement chosen in this case.

4. LD D. B

No problem here, again. The code is 50.

5. LD B, 07

The opcode is 06 so the instruction is 06 07.

What about arithmetic? There's an *Add* and a *Sub* instruction, both of which refer to the *A*-register, and which may use any of the addressing modes except direct.

Let's try writing a program to add the numbers 4 and 7 together. This would work:

```
LD A, 04     [put 4 in the A-reg.]
LD B, 07     [put 7 in the B-reg.]
ADD A, B     [add them, and put the result in the A-reg.]
```

Now store the result away somewhere:

LD (4300), A

Here's the program, the hex code, and the decimal equivalent:

Program	Hex	Decimal
LD A, 04	3E 04	62 04
LD B, 07	06 07	06 07
ADD A, B	80	128
LD (4300), A	32 00 43	50 00 67

We are left with the problem of loading this code into the ZX81, and then executing it. Since we are going to do a number of machine code routines, it is worthwhile writing a Basic program which loads and then executes machine code.

This is fairly easy. In principle, all we need to do is ask the user where he wants to put the code in memory, then ask for each byte of code in turn, and *Poke* it into the appropriate location. Then run the program calling the *Usr* function. Finally, *Peek* all the program locations and data area to ensure that the program is still intact and that the results are correct.

Obviously, it makes sense to have the data and program areas adjoining. So we will adopt this convention — the data area always precedes the program area, and is loaded with zeros to start with. We will begin by asking the user the size of his data area (as a number of bytes).

There is one other problem. According to the Sinclair *Manual,* all routines called by *Usr* have to end the same way:

LD A, 1E	3E 1E	62 30
LD I, A	ED 47	237 71
LD IY, 4000	FD 21 00 40	253 33 00 64
RET	C9	201

Actually, it is that final *Ret* that is crucial.

If you have any machine code subroutines/tips/games, please send them to: Machine Code, *Popular Computing Weekly,* Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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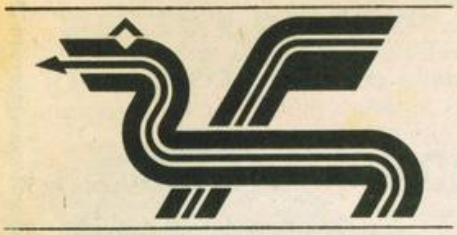

In the land of the Red Dragon

It is a rare accolade for a home computer to be allocated its own page in *Popular Computing Weekly*. We have decided to follow up the success of the Spectrum page with this Dragon page because:

a) The Dragon is a very interesting microcomputer with a good number of new features.

b) Many Dragon owners will either have no previous experience of computing or will have graduated from smaller machines such as the ZX81. To all these people many of the features of the Microsoft colour Basic used on the Dragon will seem quite peculiar at first.

c) The complexity of the Dragon and its use of the 6809 microprocessor means it will be a long time before we have all mastered all the intricacies of the machine. If we each let each other know what we discover we can all learn more quickly.

This page, therefore, depends on you being willing to share your discoveries with us and sending them to this page.

To start the page off we have a Flying Saucers program submitted by John Wrennel, a new Dragon owner. It shows a few of the simple peculiarities of Dragon Basic and is quite well documented.

In the coming weeks we hope to run a feature on the main differences between Dragon Basic and Sinclair ZX81 and Spectrum Basic and then, one by one, explore, with sample programs, some of the more unusual commands available to you.

Flying Saucer

No separate instructions are required for this program as they will be displayed when the program is run. Any key will fire a shell.

Here is a description of the structure of the program.

Program notes

Lines	
10 to 18	Set screen and define ship
20 to 60	Draw ground and gun
70 to 110	Position stars
120	Delay
130 to 165	Initialise
175	Random factor for speed
170 to 210	Find a height (c) for ship
220 to 380	Movement across screen
240	Check for only one shell at a time
250	Get any key to fire
275 to 290	Check for hit
300 to 310	Destroy ship accompanied by random noise
340	Blank saucer and shell's last positions
350	Check for shell off screen
400 to 460	10 ships hit — win
500 to 550	More than 15 shots taken — lose
600 to 700	Random time warp

Variables

SH$ Defines ship; gives impression of rotation
OF$ Blanks ship; gives impression of rotation
S$ Shots label
H$ Hits label
CHR$ (X) Plotting Characters i.e.
60 <
79 O
62 >
32 △ (space)
246 Graphic Ground
43 + (star)
X — Horizontal position of ship
SH — Number of shots
H1 — Number of hits
N — Height of shell
SA — Number of aliens
Q — Position of alien
Z — Position of shell
C — Height of alien
F — Hit flag

```
Optional Time Warp

308 IF RND(20)=10 THEN 600
600 CLS0:GOSUB700:CLS1:GOSUB700:CLS2:GOSUB700
610 CLS3:GOSUB700:CLS4:GOSUB700:CLS5:GOSUB700
620 GOTO 5
700 FOR D=1 TO RND(5):SOUND RND(250),RND(5):NEXT D
710 RETURN


PROGRAM PROPER

FLYING SAUCERS

  5 'FLYING SAUCERS
 10 CLS 1
 15 SH$=CHR$(60)+CHR$(79)+CHR$(62):'DEFINE SHIP
 18 OF$=CHR$(32)+CHR$(32)+CHR$(32):'BLANK SHIP
 20 FOR I=480 TO 510
 30 PRINT@I,CHR$(246);:NEXT I:'DRAW GROUND
 40 FOR I=1 TO 3:PRINT@I+472,CHR$(160)
 50 NEXT I
 60 PRINT@442,CHR$(160);:PRINT@410,CHR$(79)
 65 RESTORE
 70 DATA 45,234,252,320,88,101,366
 80 FOR X=0 TO 6
 90 READ A
100 PRINT@A,CHR$(43);:'POSITION STARS
110 NEXT X
120 FOR D=1 TO 1000:NEXT D:'DELAY
130 SH=0:H1=0
140 N=0:SA=0
150 S$="SHOTS= "
160 H$="HITS= "
165 PRINT@14,S$;:PRINT@56,H$;
170 R=RND(10):N=0:Q=0:Z=0
175 Y2=RND(150)
180 SA=SA+1
190 IF R>=7 THEN C=4:GOTO 220
200 IF R<=3 THEN C=6:GOTO 220
210 C=9
220 FOR X=0 TO 29
225 Q=32+C+X
228 SOUND 250,1
230 PRINT@Q,SH$;
240 IF N<>0 THEN 270
245 PRINT@410,CHR$(79)
250 A$=INKEY$:IF A$="" THEN 330
260 SH=SH+1:PRINT@21,SH;:PRINT@410," ";
270 N=N+1
275 FOR L=0 TO 2
278 Z=377-(33*N)
280 IF Q+L=Z THEN F=1:GOTO 300
290 NEXT L:GOTO 320
300 PRINT@Q-1,"  *  ";:H1=H1+1
305 FOR V=1 TO RND(5)+5:SOUND RND(250),1:NEXT V
310 PRINT@62,H1;:IF H1=10 THEN 400
315 GOTO 340
320 PRINT@Z,CHR$(79);
330 FOR B1=1 TO Y2:NEXT B1:'ALIEN SPEED DELAY
340 PRINT@Q,OF$;:PRINT@Z,CHR$(32);
350 IF N=10 THEN N=0:GOTO 380
360 IF SH>20 THEN 500
370 IF F=1 THEN F=0:GOTO 170
380 NEXT X
390 GOTO 170
400 CLS(3)
410 PRINT@170,"YOU WIN.....";
420 PRINT@230,"NO. OF INVADERS= ";:PRINT@251,SA;
430 PRINT@264,"SHOTS TAKEN= ";:PRINT@277,SH;
440 PRINT@294,"HITS MADE= ";:PRINT@316,H1;
460 PRINT@500," ";:STOP
500 CLS(6):PRINT@140,"OUT OF AMMO";
520 PRINT@200,SA;:PRINT@205," ALIENS ATTACKED";
530 PRINT@230,"YOU HIT    WITH     SHOTS!";
540 PRINT@238,H1;:PRINT@246,SH-1;
550 GOTO 460
```

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ZX81

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TELL ME, INFORMATION

M J Birkinshaw of the New England College, Arundel, Sussex, writes:

Q I am a librarian and I have been asked to supply a book mentioned in your May 6 edition. Unfortunately, I cannot trace this publication, and would be very grateful for details of publisher, price, etc. The book concerned is *'The Basic Handbook (An Encyclopedia of Basic computer languages)'* By David Lien.

A This is a problem that is starting to occur more often. A book is published in America, is imported and announced before it has had time to find its way into any of the more conventional catalogues. The book is in fact published by Compusoft Publishing, which is a sub-division of Compusoft Incorporated of San Diego, California 9211.

If you order it direct from the publishers it costs $19.95 plus $2.50 for postage and packaging. If you want it sent airmail then it is $10 postage and packing. Otherwise, expect to wait 6-8 weeks. The money is payable in advance in funds drawn on a United States bank. You should send an order to 'Compusoft publishers', 1050 Pioneer Way, El Cajon, California 92020.
The ISBN is 0-932760-05-8 and the Library of Congress catalogue number is 81-67479. By now I would guess that there is a British distributor. I would suggest that you first tried to contact either Foyles Bookshop in Charing Cross Road, London, or else Computer Bookshop in Birmingham. Computer Bookshop is at the following address: 30 Lincoln Road, Olton, Birmingham B27 6PA. Tel: 021-707 7544.

BAUDOT SPEED WITH SINCLAIR

Michael Meynall of Blackheath, London, writes:

Q I own a ZX81 and I am saving up to buy a Spectrum. Before I order one, I would like to clear up a few points.

Can the ZX81 programs I have be *Run* straight on to the Spectrum? Does Uncle Clive describe the machine code thoroughly in the Spectrum handbook, or hasn't he learnt his lesson yet from the ZX81? When will the microdrives be available and how much will they cost? And does the RS232 board allow you to interface the ZX81 with the Spectrum?

A This letter covers a lot of individual questions from other readers. A ZX81 program can be *Run* on a Spectrum, with exception of *Pokes* and *Peeks*, which often have different addresses. However, programs on cassette will not transfer because the baud rate of the Spectrum is very much faster than that of the 81. Also, the Spectrum scrolls automatically, so the *Scroll* function can be left out.

Unless you already have a good knowledge of machine code, the Spectrum handbook will not teach you to program in machine code. In all fairness, I feel that this is asking too much from a user manual. Machine code programming is a large subject in its own right. Nevertheless, Sinclair has learned from the ZX81 — the Spectrum manual is much better.

Latest date for the microdrives is now 1983 and not autumn 1982 as originally announced. The RS232 interface board will not allow you to connect up your ZX81 and Spectrum.

TURN THE FAT IN THE FIRE ONCE MORE

W Howard of Warbeck Drive, Blackpool, writes:

Q Due to the inability of Sinclair Research to supply a ZX Spectrum within 12 weeks (not the 28 days advertised), I would be obliged if you could forward me details of the new Acorn machine, and tell me when it is due on the market. My cancellation letter is on the way to Sinclair.

A Several people have written to me, who are upset by Sinclairs delivery times, and who consequently want to know more about the new Acorn Electron. In your particular case I fear that you have jumped out of the frying-pan and into the fire. Information on the new Acorn has been hard to get hold of.

What is known is that it is a mini-BBC machine, with the same graphics and 16K Ram. It is thought that it will cost about £150, and should be available early next year. Unfortunately, you still have another five months or so to wait. It must be said that Acorn never quoted a release date, and the announcement must be seen in the light of the launch of the Spectrum. However, it seems to me to be a little unwise to announce a new machine nine months before it can be delivered.

AT THE SIGN OF THE TETHERED GOAT

Derek Baskett of Battery Road, Cowes, Isle of Wight, writes:

Q After studying various magazines, I had finally decided to buy an Atari 400 as my first home computer. I had intended to buy a 48K or 32K machine from a mail-order company. Then I saw your *Peek and Poke* dated September 23, where you said that the Atari 400 is only capable of 16K Ram.

I have seen a number of advertisements for 32K and 48K Atari 400s and find it hard to believe that these companies are ripping everyone off. Does this mean that all the expanded Rams are going to be troublesome? Or is it a ploy by Atari to entice people to buy the more expensive Atari 800? There is a lot of software for a 32K or 48K Atari 800. Would I be able to run this on an expanded 400?

Could you also tell me if the Atari 410 is the only cassette player that can be used with the Atari 400?

A Companies like Maplin which offer a memory modification have too good a reputation to lose by so blatantly ripping anyone off. If you bought a 32K or a 48K Atari from an independent manufacturer, then any Atari program up to your memory limit will run. If they do not, then check with whoever you buy the machine from that they offer their own guarantee.

The problem stems from the fact that the CPU in the Atari is capable of working with up to 64K of memory. An independent manufacturer will simply wire up the control lines for the other 16K or 32K. It is a situation more commonly found in the ZX end of the computer market, where an independent manufacturer steps in to fill a gap in the market, which has been created by the original manufacturer not supplying what the customer wants.

As to whether this is a deliberate ploy by Atari or not, well, I do not think that they would want you to buy a 48K 400 as opposed to their own 48K 800. With Atari you are tied far more to their own products than you are with some other home computers, but they can usually supply what you want when you want it, something that cannot always be said for other computer manufacturers.

As far as I know, you have no choice other than the 410 cassette deck, and I cannot foresee an independent bringing out an alternative model at the moment.

A PENNY FOR THE GUY, SIR. A PENNY

G. Archer of Tatsfield, near Westerham, Kent, writes:

Q I am the proud owner of a Vic20. I have just read your review of the new Commodore 64. I am very impressed with what I read; I would like to know if a Vic20 can be uprated to the new Commodore 64 specifications? Would it be exactly the same and how much would it cost? Could it be done by sending it to the Commodore factory, or could it be done by a Commodore dealer?

A In short I'm afraid that it cannot be done. The new Commodore 64 is a very different animal to the Vic20. A close reading of the review, with a pen and paper on hand, will reveal quite a long list of extras and improvements over the Vic20. I have not seen inside the machine but the PCB must be different, and the memory mapping certainly is.

The 64 is clearly aimed somewhere up-market of the Atari, and even the BBC model B. Remember it can accept a second microprocessor which makes CP/M possible, and *Run Pet* software. This puts it very clearly into the small business as well as the home category. Such features are too different to be overcome by conversion. So if you want one, I suggest that you start saving now.

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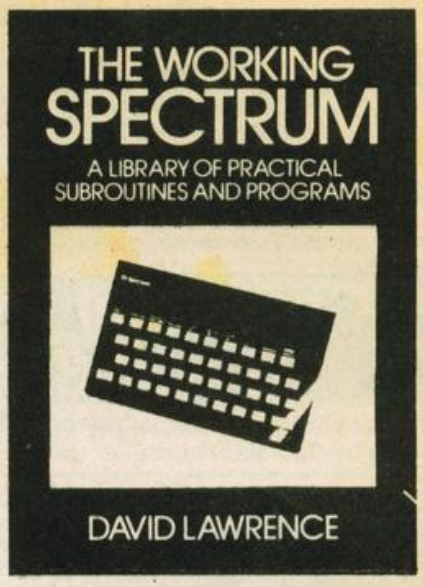

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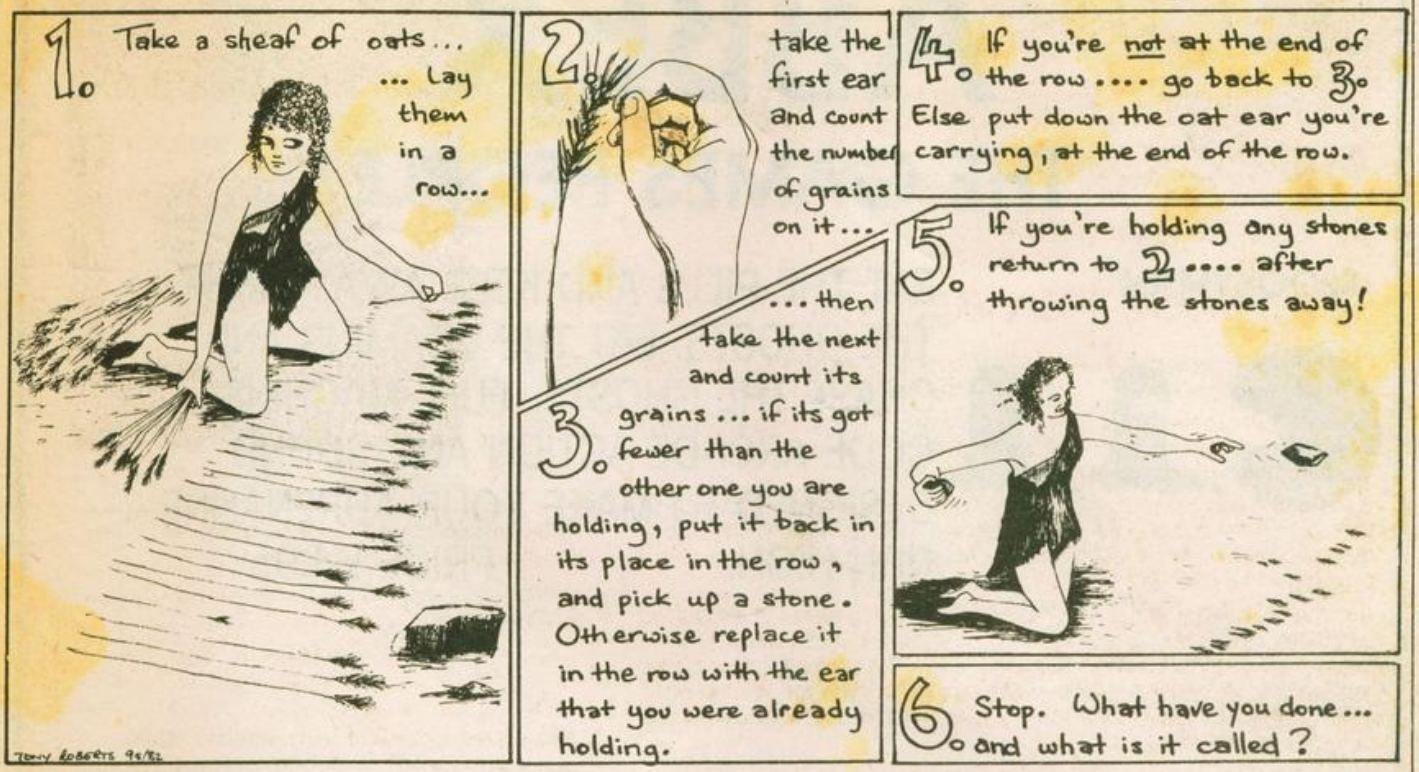
ANCIENT ALGORITHMS PUZZLE NO 29 by Tony Roberts



Solution to Puzzle No 24

This algorithm presents a method for converting binary numbers (represented by Tooth = 1, Hole = 0) into their decimal equivalents. In the jawbone illustrated in Issue No 24, the value was 10110111001 or 1465. The largest binary number — 11111111111111 — that can be converted using the alligator jawbone is $2^{14} + 2^{13} + 2^{12} \ldots 2^{1}$ — which is 32,766.

A computer program to do the same thing might be:

```
10 S=L=Y=0
20 PRINT "Input jawbone number (Tooth = 1, Hole = 0;"
30 INPUT J$
40 L=LEN J$
50 Y=Y+1
60 IF MID$(j$,Y,1) = "1" THEN S=S+1
70 IF Y=L THEN 130
80 S=2*S
90 Y=Y+1
100 IF MID$(J$,Y,1)="0" THEN 70
110 S=S+1
120 GOTO 70
130 PRINT "Decimal equivalent of jawbone binary number"; S
140 END
```

In the helpful advice category were the remarks by entrants that (a) binary number conversion was much more stimulating to the cave person than fabricating alligator-tooth necklaces and (b) crocodiles were not as useful as alligators since they have fewer teeth and therefore smaller bytes.

Winner of Puzzle No 24

The winner is: L Morris, Longacres Drive, Whitworth, Rochdale, Lancs, who receives £10.

A.R.T.H.U.R.

ARTHUR TAKES A TEST FOR DIVERGENT THINKING.

Laurence Lerner & James Macdonald
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IT CAN CLIP PAPER,
IT CAN CLIP PAPERY SUBSTANCES.
IT CAN CLIP SHEETS.
IT CAN CLIP LEAVES. CAN IT CLIP LEAVES?

YES, ARTHUR, IT CAN.

IT CAN CLIP BRANCHES.

NO, ARTHUR, NOT BRANCHES.

IT CAN NOT CLIP BRANCHES
IT CAN BE PUT DOWN.
IT CAN BE PICKED UP.
IT CAN BE PUT DOWN IN A HEAP OF PAPER CLIPS.
IT CAN BE PUT DOWN IN A HEAP OF JUNK.
IT CAN BE PUT DOWN IN A HEAP OF DUNG.
IT CAN BE PUT DOWN A MINE WHERE IT COULD CLIP PAPER
CLIP PAPERY SUBSTANCES
BE PICKED UP
IT CAN BE PICKED UP WITH ONE HAND
WITH ONE FINGER
THAT WOULD BE A TEST
WITH A MAGNET
WITH A FISHING ROD
WITH THE TEETH
THESE WOULD BE GAMES
IT CAN BE OPENED OUT
THAT WOULD BE WIRE
WIRE COULD BE
A WIRE HOOK
A WIRE MAN
A WIRELESS

NO, ARTHUR, A WIRELESS ISN'T MADE OF WIRE.

WIRE COULD NOT BE A WIRELESS
WIRE COULD BE A TELEGRAM

IT CAN CLIP TELEGRAMS.
IT CAN CLIP LETTERS.
IT CAN CLIP NAILS.

NO, ARTHUR, NOT NAILS.

IT CAN NOT CLIP NAILS.
CAN IT CLIP HEDGES?

NO, ARTHUR, NOT HEDGES.

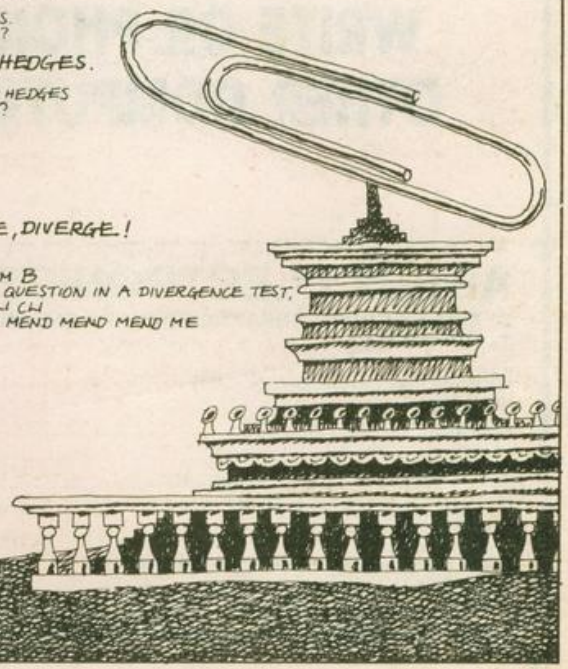
IT CAN NOT NOT CLIP HEDGES
CAN IT CLIP LETTERS?

YES, LETTERS.

IT CAN CLIP A TO B
IT CAN CLIP B TO C
IT CAN CLIP C TO

ARTHUR, DIVERGE, DIVERGE!

IT CAN CLIP A TO C
IT CAN UNCLIP A FROM B
IT CAN BE USED AS A QUESTION IN A DIVERGENCE TEST.
IT CAN CLIP CLI CLI CLI CLI
IT COULD BE USED TO MEND MEND MEND ME



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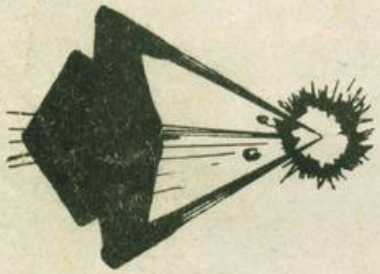

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