

POPULAR ^{40 lock} Computing WEEKLY

35p

26 May-1 June 1983 Vol 2 No 21

This Week

Spectrum utilities

Tony Bridge weaves his way through a maze of utility programs including *Masterkey*, *Disassembler* and *Machine Code Test Tool*. See page 13.

Dragon keyboard

Peter Chase presents a m/c routine to enhance keyboard responses and extend the use of colour on the Dragon. See page 22.

ZX81 label maker

R Luxton explains how to make your own labels on the 16K ZX81 on page 17.

New releases

All the latest software releases including news of *Valhalla*, an animated graphics adventure for the Spectrum. See page 53.

★ STAR
Depth Charge
on Vic20.
See page 10.
★ GAME

News Desk

Dragon goes across the pond!

DRAGON microcomputers will go on sale in America in August.

This is the result of negotiations, now in the final stages, between Dragon Data and the American manufacturer Tano, who will assemble, distribute and sell the computer in the US.

The American Dragons will be the first fruits of a new joint venture, set up by the two companies, called Dragon Tano Inc. Dragon Data holds a 49 percent share in the new company — Tano holds the remaining 51 percent.

Tano will begin by manufacturing 2,000 machines a week, supplemented initially by machines built by Dragon in this country.

The Dragon 32 will sell for \$300 (about £185) and the Dragon 64 will sell for \$400 (about £250). As well as being adapted to work with the US NTSC television system, the American Dragons differ from their UK relatives in that they

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Softek compiler payments dispute

SILVERSOFT and Softek have clashed head-on in a dispute over royalty payments for a program written using a compiler.

The argument concerns the Silversoft program *Slippery Sid* which was written using the *Super C* Spectrum compiler from Softek.

Softek is claiming that Silversoft has infringed copyright and broken a contract of sale of the *Super C* program, by using the compiler to develop a commercial arcade game without permission. The company is insisting — and Silversoft is steadfastly denying — that a royalty payment must be made by Silversoft to Softek on every *Slippery Sid* tape sold.

Softek is now considering legal action, possibly involving an

injunction this week, to halt sales of the *Slippery Sid* program pending resolution of the dispute.

Softek's Tim Langdell explained that the *Super C* program — written by Andrew Glaister — is sold subject to the condition that it is not used to write commercial programs:

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Continued on page 8

★★ ADVENTURE COMPETITION — WIN A 64 ★★

WINDOW ON ANOTHER WORLD

NEW RELEASES

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Published by Sunshine Publications Ltd.

Typesetting, origination and printing by

Chesham Press, Chesham, Bucks

Distributed by S M Distribution

London SW9. 01-274 8611. Telex: 261643

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Subscriptions

You can have *Popular Computing Weekly* sent
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Accuracy

Popular Computing Weekly cannot accept any
responsibility for any errors in programs we
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make sure programs work.

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Editorial

The decision to hold a General Elec-
tion on June 9 has resulted in the
death of the Data Protection Bill. With
insufficient time left to pass the Bill
before the dissolution of the present
Parliament, the government decided
to drop it.

The Data Protection Bill, you may
remember (*Popular Computing Week-
ly*, 31 March — 6 April), was bitterly
opposed by a variety of groups includ-
ing the British Medical Association
and the Law Society.

However, it looks likely that the Bill
will be resurrected after the election
if the Tories are re-elected.

Opponents of the Bill are not
against data protection legislation as
such, but they are concerned that
there should be adequate safeguards.
The old adage of garbage in/garbage
out is particularly applicable. If there
are no checks on what goes into a
computer, there will be few on what
comes out.

Perhaps there is a need for some
sort of data protection ombudsman —
an independent guardian conversant
with the intricacies of computer re-
cords.

Data protection is an extremely
thorny subject, but it is one that will
affect all of us. The time to lobby the
government for adequate safeguards
is now — it will be too late once a new
Bill has been passed.

Next Thursday

See if you can avoid the aliens in this
Invader's type action game, where you
are the city bomber trying to keep clear
of the flying anti-matter disc! New York
— next week's Star Game for the 16K
Spectrum by P. Watson.

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Compiler dispute

Continued from page 1

"If it is used in this way then the software house must reach agreement with us over a royalty payment. This is individually negotiated with each software house concerned, but is typically around five percent of the wholesale price.

"We think that this is a small price to pay for the saving that the *Super C* program makes in terms of the time needed to create a machine-code program.



Andrew Glaister

"If this is unacceptable, then the purchaser can send it back and we will refund the money.

"Silversoft bought our compiler in December and used it to produce the *Slippery Sid* program, without negotiating a royalty payment with us.

"What they appear to be saying is that they don't agree with the idea of royalties on compilers."

Softek claims copyright has been infringed in the so-called run-time routines in the *Super C* program that are used in the *Slippery Sid* program. Explained Tim: "Our compiler is different from other compilers found on main-frame and mini-computers. *Super C* produces a sort of mini-Rom. Instead of calling routines from the Spectrum's Rom it uses its own — which actually form part of any program written using the compiler. When a character is printed on the screen it is our run-time routine that does that."

Silversoft's David Patterson vigorously denies that any copyright has been infringed or contract breached in Sof-

tek's compiler: "Tim's main argument is that his compiler goes through a two-stage operation. The main compiler takes the Basic source code and converts it into machine-executable code. The second part of the program then executes it. He is claiming that because the executive code is an integral part of the program then we are in breach of his copyright. That is like trying to sell a paint-brush without a handle.

"We have absolutely no intention of paying a royalty to Softek on each *Slippery Sid* tape sold, and if he wants a fight then he's picked the right company.

"We bought his compiler by mail-order and there was no mention that Softek wanted to charge a royalty on programs developed using it in the mail-order advertisement — at the point of sale.



David Patterson

"When you write a programming tool like a compiler you either keep it to yourself or put it in the public domain. Trying to charge a royalty on programs written with it is laughable. We have no intention of doing anything about his request for a royalty and if he wants to sling mud — let him go ahead."

● Andrew Glaister, who wrote the *Super C* program for Softek, is a former Silversoft programmer. He wrote *Orbiter* for them last year. He receives 25 percent of any income gained by Softek on the *Super C* compiler, either through sales of the compiler itself or from royalties on programs written using it.

Design your own Forth micro!

POTENTIAL purchasers of a new Forth microcomputer are to be consulted over the final design of the machine.

The new machine, as yet unnamed, will be designed and manufactured by Remsoft and Advanced Test Systems.

It will run Forth, be priced between £300 and £500 and the first prototypes should be working by the end of June. The computer will be 6502-based with either 64K or 128 K Ram, 16K Forth 79 Standard Rom and an on-board disc operating system for Sony 3½ inch 70 track micro floppy disc drives.

Other features are yet to be determined and will be decided by potential purchasers of the machine. Advertisements will be placed in a variety of magazines inviting members of the public to fill out a questionnaire to help determine the final specification of the new machine. It will probably have an RS232, Centronics and RGB outputs, have a bit-mapped screen display in eight colours and a second Rom port.

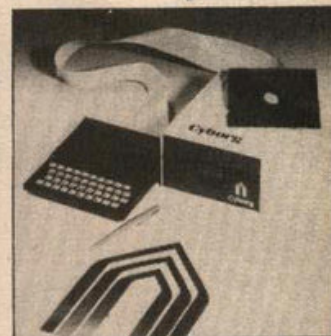
Remsoft already supplies a range of software for the Jupiter Ace Forth micro and plans to convert much of this material for the new machine in time for its launch later in the year. A word processing package and database program are also planned.

Explained Paul Wynter of Advanced Text Systems: "It is an experiment but, for the first time, the public will play a part in the design of a machine they might buy."

"The design is an up-rating of an existing 6502 board that we currently manufacture. The exact form of that up-rating is still very much undecided — and what form it will take depends very much on the results from our questionnaire."

If you would like to take part in the survey then write for your questionnaire to Remsoft, Freepost, Brighton BN1 1ZW.

Cyborg disc drive versions under way



CYBORG'S 5¼ inch disc drive is now working with the ZX81, Spectrum and Oric computers and work is under way on versions for the Vic20, Commodore 64 and Dragon.

The system's claim to fame is that the discs are transportable from machine to machine involving only a change of connector. This is possible because the disc operating system is designed with its own 6500/12 processor on board and the operating system software need therefore not be compatible with the host micro (see Popular Computing Weekly, May 5).

The system should go into production some time in late June.

Dragon drop their prices

DRAGON Data has cut the price of the Dragon 32 computer from £199.50 to £175.

First to react was Boots who introduced the new pricing last week and other retailers are expected to follow.

The price drop is recognised as a reaction to cost cutting two weeks ago of the Sinclair Spectrum machines. Boots' merchandising controller, John Flatman, commented: "It is a general trade price reduction which we think retains the correct price differential between the Dragon and the Spectrum."

Orleans and began by manufacturing control systems for the oil, gas and shipping industries.

Dragon has been looking for a suitable US manufacturer since the autumn of last year and the computer was first exhibited over there at the Comdex Fair in Atlanta this year.

Across the pond

Continued from page 1

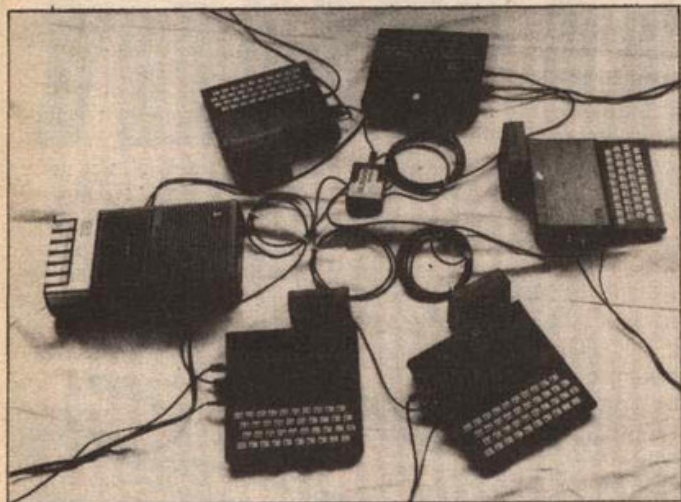
are equipped with an RS232 interface as standard.

Tony Clarke, Dragon's managing director, explained the strategy for the US: "Tano already sell an Apple com-

patible computer which they import from the Far East and they will use the dealer network set up for that product to sell the Dragons. At the same time we will hope to expand the network to pick up a considerable number of new dealers."

Tano is based in New

Low-cost networking



A LOW-COST simple 'networking' system for any machines that load from an ordinary cassette player is available from Network Computer Systems.

The Multiload system makes use of a computer's Save and Load commands to direct programs from one machine to another.

No facility is provided to protect against message collisions but a four-computer arrangement costs only £6.95. Additional connecting cable costs around 50p per metre.

The system will only transfer information satisfactorily between computers of the same type, but will work with ZX81s, Spectrums, BBCs, Orics and Aces.

Details from Sue Clarke, Network Computer Systems, 39 Bampton Road, Luton, Beds.

Timex dispute at an end

THE sit-in by 350 workers at the Timex plant, which had halted development work on the Sinclair Research flat-screen tv project, has ended.

Normal working is due to be resumed this week, bringing to an end a dispute which has lasted for more than six weeks. Union officials of the AUEW and TASS have accepted an agreement involving 425 more job losses, delayed for 90 days.

Clive Sinclair commented that he was "absolutely delighted" that the dispute has been resolved.

Now it's Ms Pac-Man!

IF you hoped you had seen the last of Atari's gobbling *Pac-Man* then you will be disappointed.

Now the company is offering a follow-up — *Ms Pac-Man*. Atari claims "this little lady is a screen sensation, more dynamic and more talented than even *Pac-Man* himself".

Ms Pac-Man is a cartiridge for the Atari VCS and costs £29.99.

Sinclair joystick option

THE Sinclair Research Rom cartridge adaptor (see *Popular Computing Weekly*, May 19) will also operate as a joystick interface.

The joystick port has been in the pipeline for some time. Indeed, some software packages from Psion — *Hungry Horace* for example — contain the necessary software hooks to run with the joystick.

● There is still no sign of the Sinclair £40 microdrives — originally mooted over a year ago. Although much of the development work is now complete, industry sources suggest that Norfolk-based DK Tronics has been brought in to assist with the project.

Argus cassette magazine

ARGUS Specialist Press, publisher of *Computer Today*, *ZX Computing* and *Micro Update*, is to launch the first magazine for computer users written entirely on cassette.

The cassette magazine —

Memory expansionboards for the BBCs

JOHN Richardson Computers plans a range of add-on memory expansion boards for the BBC microcomputer.

The company will sell 64K and 128K boards which, just like a Ram pack, simply plug into the computer via the 1MHz bus.

Although not addressable from the machine's Basic, the memory is seen by the computer as a 'book' of pages each containing 256 bytes. Access to the pages is via machine-code *Peeks* and *Pokes*. Just as with an array, it is possible to *Peek* in and *Poke* out of the pages keeping track of the page number.

The pages can be used to store data or sections of completed programs. Four pages can be linked together to hold a single screen of information. Such a technique could hold

displays used in simple animation or perhaps locations in a graphics adventure.

"The big limitation with the BBC machine," explained company founder, John Richardson, "is its memory. The advantage of our system compared with loading information off discs is speed. We can use a full 64K to store something like a mailing list or telephone directory in alphabetical order and get out data much quicker than is possible with a disc."

The 64K board should be available by the end of June and will cost around £140. The 128K board will follow at a price in the region of £175. More details from John Richardson Computers Ltd, Unit 337, Walton Summit, Bamber Bridge, Preston, Lancs.

Oric joins up with Cosmic in the Orient!

ORIC has formed a new company to manufacture and sell its computers in Japan and South East Asia.

The new venture — Oric Japan — is half-owned by Oric Products and half-owned by a consortium including one of Oric's far east manufacturers and Cosmic, a Japanese retail chain.

Oric's manufacturers are making the necessary changes

to the machine to operate with Japan's NTSC television system and Oric are also developing software which will run using the Japanese Kana character set.

Sales of the Oric computer in Japan are planned to commence in July.

● It is also hoped that a version of the NTSC Oric will be produced by the same manufacturer for sale in the US.

Microfairs to be held in June

THE beginning of June sees shows in London for both Sinclair and Commodore.

The 7th ZX Microfair will be held at Alexandra Palace on Saturday, June 4. Entry costs £1 and the fair will be open from 10 am to 6 pm.

Spectrum Computing — is for Spectrum owners and is compatible with both 16K and 48K models. The first issue — May/June — contains over 80K of programs and software reviews presenting on-screen extracts from the games.

Spectrum Computing will be published bi-monthly and will be available from W H Smith and John Menzies, price £2.99.

The 4th International Commodore Computer Show will be held at the Cunard International Hotel, Hammersmith from Thursday, June 9 to Saturday, June 11. Again, entry costs £1 and the show will be open from 10 am to 6 pm on Thursday and Friday and from 9 am to 5 pm on Saturday.

Texas price reduction

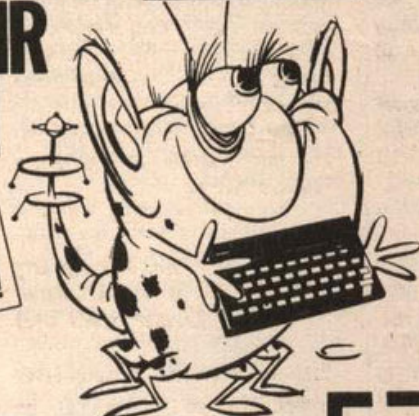
Correction: To take full advantage of Texas Instrument's special price deal for the 99/4A computer (see *PCW*, May 19) it is necessary to buy a selection of software cartridges.

To get a free Speech Synthesiser — worth £49.95 — or cassette recorder, you must also purchase six TI Rom software packs.

ZX MICROFAIR

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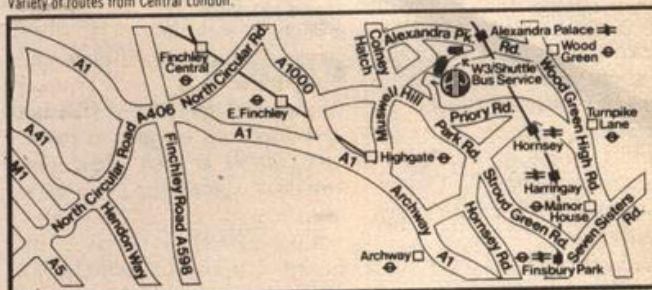
Big savings on most manufacturers' "show offers".

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Alternative: Piccadilly Line (from Heathrow etc) to Finsbury Park or Wood Green — Link with W3 bus service to the fair.

SATURDAY JUNE 4th at ALEXANDRA PAVILION, ALEXANDRA PALACE, WOOD GREEN, LONDON N22. FROM 10am to 6pm.

Advance tickets available from: Mike Johnston, 71 Park Lane, Tottenham, London N17 0HG. Adults £1.00. Kids (under 14) 50p.
Please make cheques payable to ZX MICROFAIR and enclose S.A.E.

LETTERS

Sensible solution?

I am writing to you on two subjects — the inevitable software library topic and the letter from Ashley Buss in your March 31 issue.

Dealing with the latter first, may I suggest to your reader that he refers to the Dragon manual (p. 17) for the easy method of listing programs, ie, pressing *Shift* and *@* together to stop the list at any point and then pressing any key to continue.

On the subject of software libraries, I find the attitude of certain manufacturers hard to accept. I know that this is a young industry, but surely some sense must prevail soon.

Instead of trying to fight the libraries, why do the manufacturers not enter into agreements with them? A similar situation to this happened in the video industry until the major companies realised that the market was primarily interested in renting tapes. Consequently, instead of selling their tapes to dealers, the video companies entered into rental agreements.

Now, I know that renting a film is not quite the same situation as renting software, but there are similarities. It does not matter how good the software is, there comes a time when its appeal wears off, and then what happens? It is swapped or sold to a friend — albeit illegally.

I am a member of a software library, and I find its services invaluable. I have, in the past, bought several tapes (up to £10 each) that were of disgraceful quality and on these occasions have felt somewhat cheated out of my hard-earned cash. Bad software had in fact discouraged me from making purchases for some time.

This is where the software library comes in. If I obtain a poor program, I don't mind having wasted £1.50, and if I obtain a good program, I will support that company again in the future.

One of the most interesting points is that I spend the same amount of money renting instead of buying. Now, assuming that is the situation with everyone else, there must be the same amount of money going into the system. There-

fore, it is just a question of getting the distribution of this money right.

There seem to be two alternatives. Firstly, the manufacturers could rent libraries their tapes on a monthly basis instead of selling them. Secondly, manufacturers could charge the libraries about 50p every time they lend a tape.

I am sure that given a sensible arrangement, the only people to suffer would be the manufacturers of poor quality software, and that would be no bad thing!

Iain Mackenzie
16 Dudley Drive
Glasgow G12 9SB

Who's to blame?

I feel I must reply to the letter from A J Prestwich (*Popular Computing Weekly*, April 28-May 4) concerning his trouble with obtaining his 32K expansion from ELR for his issue 1 Spectrum.

I also own an issue 1 and have received and fitted an expansion from ELR, and I don't really believe ELR should take all the blame. Sinclair has released more issue 1s than it has led people to believe and I will be very interested to see if Sinclair produces an expansion for it. By the way, my expansion operates perfectly even after one stretch of eight hours non-stop use.

PS. I thought Clive Curry's Imagical Software letter was hilarious.

G Bloomfield
Britannia
7 Edmund Close
Downend
Bristol BS16 5EJ

Free reign with railcards!

Hot on the heels of sensational revelations in certain magazines last week, concerning software houses and the cars their employees drive, Bug-Byte's co-director Tony Baden has let it be known that he is awaiting delivery of a Reliant Robin, complete with "GT stripe". Sales Manager John Phillips and Assistant Sales Manager Barbara Smathers share a 1973 Mos-

wich van and newly appointed creative and artwork head Les Harvey is believed to have ordered a Skoda Estelle. "Even though it's a bit flash," he says.

The rest of the staff have unlimited access to all buses and trains. "We allow them a free reign with their student railcards," says Baden. "And our UK Office Manager, Matthew Thomas, who I believe is 12, has his sister's bike." Baden hopes the news will not upset the company's customers, "I'd hate them to think we were wasting their money," he said.

Stop Press. Harvey distraught. Estelle not available. Yugo ordered.

Matthew Thomas
Bug-Byte
100 The Albany
Old Hall Street
Liverpool L3 3AB

This letter follows a news item about Imagine Software and its new range of company cars in *Home Computing Weekly*, May 17-23. We are eagerly awaiting new developments in this Liverpoolian saga. Watch this space.

Extended life!

Users of microcomputers may have seen a parallel between computer software and what has been known as the "soul" of a person, occupying the body's computer, the brain. The conclusion may have been drawn that were it possible to somehow record the program from the brain, then immortality could result, if it could be played into a replacement body.

Such science-fiction may well become fact, but not within the lifetimes of many of those now living. However, some Americans have been exploring the ideas of cryonic suspension, where the bodies of deceased people are stored in liquid nitrogen until such time as the freezing damage, cause of death and ageing damage can be reversed.

Work is in progress to enable British people to take part in the cryonics program, and the cost needn't be high within life, as long as sufficient assets are available upon death to pay for suspension and stor-

age. As you can't take them with you, the perceived financial loss if this unproven process doesn't work needn't be high. An associated group is also working on ways to retard ageing now, and collates available scientific information as well as funding its own research. It has achieved much publicity from appearances on US television and the publication of a best seller, *Life Extension - A Practical Scientific Approach* (Pearson & Shaw, Warner, \$20, 1982).

I have been researching the cryonics and life extension programs, and can send free details to anyone interested.

John de Rivaz
West Town House
Porthtowan
Truro
Cornwall TR4 8AX

One Point Two

They do say that in a certain part of Cambridgeshire there is a creature strange called *One Point Two* MOS. This affirmed twas borne of an Acorn by the Good Fairie Beebeecce.

If all tis said is true, *One Point Two* is a wondrous benevolent creature, serving as page to many Roms, making men especial Word Wise. It doth destroy the many tiny vermin in cassettes and renders sundry things possible.

Time and again the wise men have joyously foretold the coming of *One Point Two* throughout the realm. They look deeply into their crystal balls but often and sadly do turn away, their cash tills silent.

I have conversed with travellers and those in far places demanding of them "what doth the creature resemble". Though many have heard tell of it, I have met none who have yet seen it.

Despairing then I will hie me hence to a monastery or a Sinclair or a Dragon or anywhere that reacheth specification. Ere I go I must forewarn my family, friends and neighbours against th'illusions of life and the Model B.

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more program

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— 2 —

[illegible]

TO THE ACCOUNTS - BUYER

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 **Compatible with most micros. See table.** Dedicated software with all that's necessary to keep control of stock. This program will take the tedium out of stock control and save time and money. Routines include stock set up, user reference number, minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more.



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AB
CD

Compatible with most micros. See table. This program features routines found in much larger and more expensive packages with a typical word length of 5-6 letters it allows for around 1000 words in memory at one time. Ideal for the user who requires a simple program to write letters on his computer. Features include, block delete, block insert, search and replace, edit text, display text and more.

"Simple to use"

"Ideally suited to the way most offices run...."

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II	A	II	B	II	C
1	-J.B. SNOOKER T/A POT-BLACK				
2	PROJECTED CASH FLOW				
3			YEAR	ENDED	
4			Oct.	Nov.	
5			£	£	
6	INCOME				
7	Sales				
8			11786	10944	
9	REVENUE EXPENDITURE				
10	Purchases				
11	Advertising				
12	Director's salary				
13	Salaries				
14	Rent				
15	Telephone				
16	Insurance				
17	Printing, stationary				
18	Repairs & renewals				
19	Hire of equipment				
20	COMMAND BCDEFGPRSTW?				

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Some typical applications:-

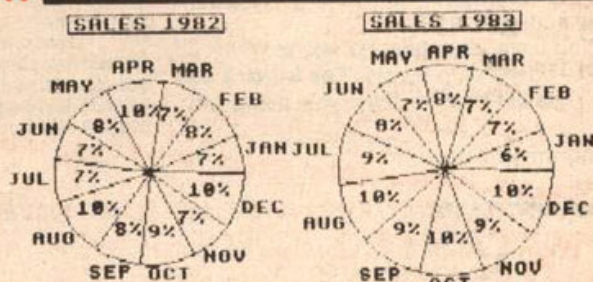
- * Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
- * Investment project appraisal - anything from double glazing to oil rigs!
- * Comparing rent/lease/buy options.
- * Processing the results of scientific experiments or field studies.
- * Engineering calculation models.
- * In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:-

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts	Plot	Final Accounts
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●		
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●										
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●										
Commodore 64	●										

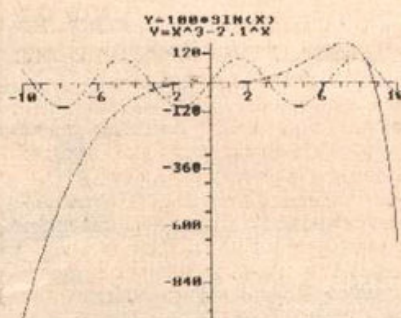
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plotting is also provided. The BBC version has a high resolution screen dump for the Epson or CP-80 printers, and the Spectrum version dumps to the Sinclair printer via the 'copy' key. A very useful program that will give superb results either from direct input of data from the keyboard or via simple access to other software data files. A must for business and education.

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Depth Charge

A new game for the Vic20 by Robert Irvine

In this game you are a warship patrolling the ocean, trying to clear it of enemy submarines. You move with the joystick, left, right, and use the fire button to drop a depth charge.

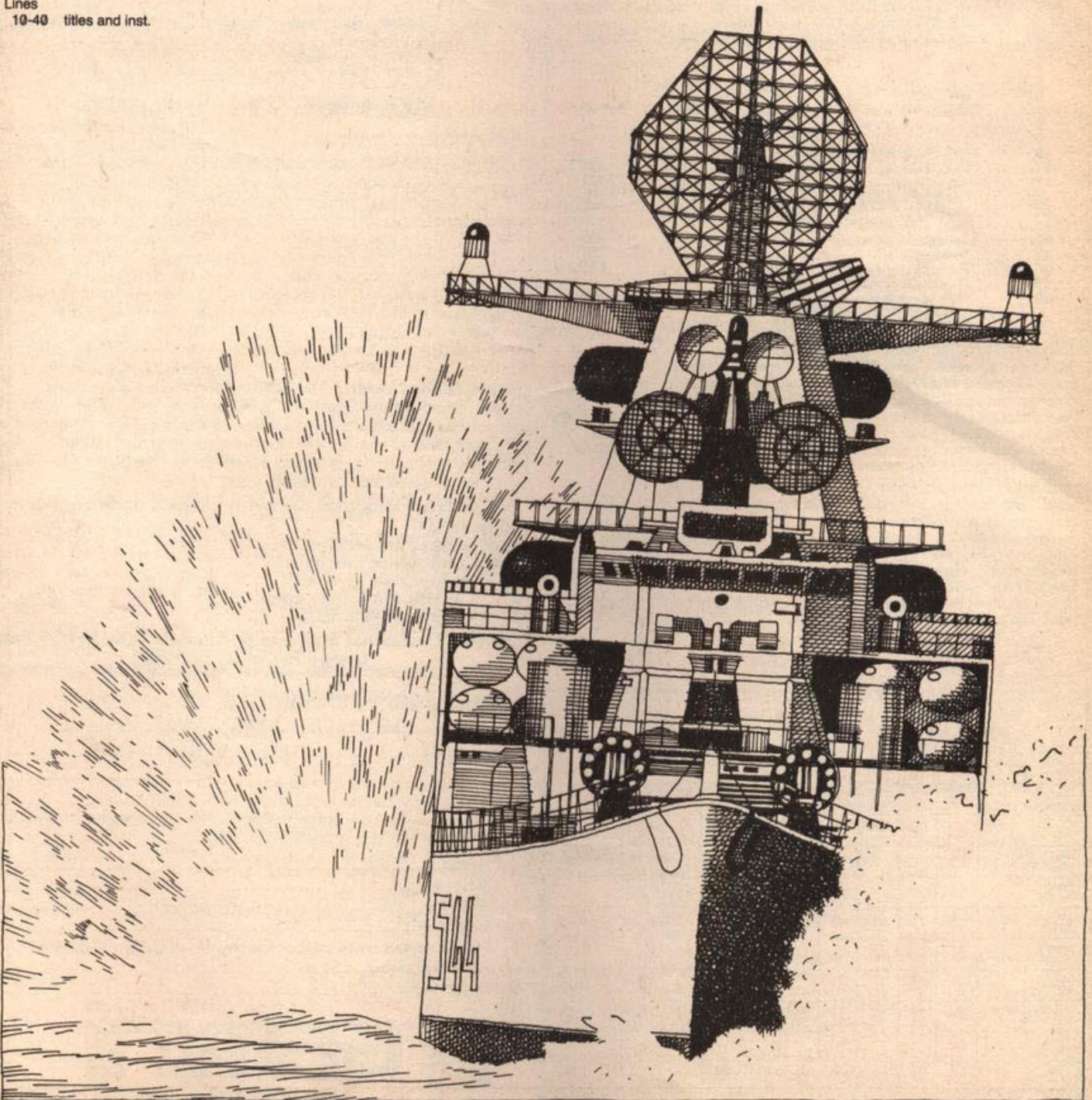
You have 20 depth charges to score as many points as possible. The lower a sub is in the water, the more points it is worth.

Program notes

Lines
10-40 titles and inst.

51-71 user def. graphics and joystick pokes
100-130 set up screen and define variables
130-140 decide where sub comes from and print it on screen
151-170 joystick peeks
175 checks if you have charges left
186 checks if you have hit a sub
190-230 firing sequence
300-325 sub hit routine
400-500 end graphics routine
500-530 end or restart routine

Variables used
dp — depth charge position
sp — ship position
sr — level of sub (depth)
sl — start location of 'sub' routine
se — end location of 'sub' routine
sv — score value (of sub)
sc — total score
fd — depth charge has fallen
vl — volume level (sound)
vv — volume level (sound)



READY.

```

10 PRINT"███";"  DEPTH CHARGE"
15 PRINT"███BY ROBERT IRVINE (C)"
20 PRINT"███YOU CONTROL THE SHIP."
25 PRINT"███TRY TO 'DEPTH CHARGE'";PRINT"███THE SUBMARINES THAT"
26 PRINT"███MOVE BENEATH YOU."
27 PRINT"███YOU HAVE 20 CHARGES.";PRINT"███THE LOWER SUBS SCORE";PRINT"███MORE POINTS"
30 PRINT"███GOOD LUCK!!"
35 PRINT"███PRESS ANY KEY TO START███"
40 GETPP$:IFPP$=""THEN40
51 POKE36876,220
55 FORV=7168TO7168+71:READJT:POKEY,JT:NEXTY
61 DATA0,0,0,0,0,0,0,0
62 DATA4,4,63,15,255,106,63,31
63 DATA128,128,248,224,225,255,254,252
64 DATA0,0,0,0,14,255,111,63
65 DATA64,224,236,232,232,255,246,252
66 DATA0,0,40,124,40,0,0,0
67 DATA255,255,255,255,255,255,255,169,148,74,170,53,210,74,89
68 DATA16,56,56,16,16,56,16,40
69 POKE36869,255:F=0:FD=22:DP=0:M=0:SC=0:DL=20
71 POKE37151,0:PA=37151:PB=37152:RB=37154
100 REM SET UP SCREEN
105 POKE36879,238:PRINT"███"
110 FORJK=7680TO8185:POKEJK,0:NEXTJK
115 FORHN=38510TO38510+22:POKEHN,0:NEXTHN
116 FORLM=38532TO38985:POKELM,6:NEXTLM
120 PRINT"███"
125 SP=7800
126 POKESP,1:POKESP+1,2
130 REM MOVE SUB
131 SR=INT(RND(1)*8):IFSR<10RSR>=8THEN130:SE=0:SL=0:K=0:U=0:Q=0:SG=0
132 VV=15
133 IFSR=2THENSL=8142:K=1:U=1:Q=1:SG=20:SV=15:GOTO146
134 IFSR=3THENSL=8052:K=-1:U=1:Q=-2:SG=-20:SV=10:GOTO146
135 IFSR=4THENSL=7922:Q=1:U=1:K=1:SG=20:SV=5:GOTO146
136 IFSR=5THENSL=8162:K=-1:U=1:Q=-2:SG=-20:SV=15:GOTO146
137 IFSR=6THENSL=8032:Q=1:U=1:K=1:SG=20:SV=10:GOTO146
138 IFSR=7THENSL=7942:K=-1:U=1:Q=-2:SG=-20:SV=5:GOTO146
140 REM PINT SR
146 SE=SL+SG
147 IFSL<>SETHENSL=SL+K:POKESL,3:POKESL+U,4:POKESL-Q,0
148 IFVV>0THENVV=VV-1
149 POKE36878,VV:IFSL=SETHENPOKESL,0:POKESL+U,0:POKE36878,0:GOTO131
150 PRINT"███SCORE"SC:PRINT"███CHARGES LEFT"DL"███"
151 A=PEEK(PA):POKERB,127:B=PEEK(PB):POKERB,255
155 IF(BAND128)=0ANDF<>1ANDSP<7810THENSP=SP+1:POKESP,1:POKESP+1,2:POKESP-1,0
160 IF(AAND16)=0ANDF<>1ANDSP<7790THENSP=SP-1:POKESP,1:POKESP+1,2:POKESP+2,0
170 IF(AAND32)=0ANDDL>0THENF=1
175 IFDL=0THENGOTO400
180 IFF<>1THENGOTO147
185 DP=SP+FD+1
186 IFPEEK(DP)<>0ANDPEEK(DP)<>5THENGOTO300
190 POKEDP,5:IFM>0THENPOKEDP-22,0
210 M=M+1:FD=FD+22
220 IFM=17THENDL=DL-1:POKEDP,0:F=0:FD=22:M=0:DP=0:GOTO230
230 GOTO147
300 POKEDP-22,0:POKEDP+1,7:POKEDP-1,7:POKEDP,7
310 POKE36876,0:POKE36877,220:FORL=15TO0STEP-1:POKE36878,L
315 FORLL=1TO100:NEXTLL:NEXTL:POKE36877,0:POKE36876,220
320 POKEDP,0:POKEDP+1,0:POKEDP-1,0
325 M=17:SC=SC+SV:SL=SE:GOTO220
400 POKE36878,0:POKE36876,0:POKE36877,128:VL=0
405 POKESL,0:POKESL+1,0:POKESL-1,0
410 POKESP,0:POKESP+1,0:POKESP-1,0
420 POKE7800,1:POKE7801,2
430 POKE8152,3:POKE8153,4
440 FORPM=8131TO7823STEP-22:VL=VL+1
445 POKEPM,8:IFPM+22<>8153THENPOKEPM+22,0:POKE36878,VL
446 FORTJ=1TO100:NEXTTJ
450 NEXTPM
455 POKE7800,7:POKE7801,7:POKEPM+22,0
460 POKE36877,220
465 FORGU=15TO0STEP-1:POKE36878,GU
470 FORHJ=1TO150:NEXTHJ
480 NEXTGU
485 POKE7800,0:POKE7801,0:PY=0
490 POKE36878,0:POKE36877,0:POKE36876,220
495 VL=15:FORDB=8152TO8184:POKEDB,3:POKEDB+1,4:POKEDB-1,0:POKE36878,VL:VL=VL-0.
75
496 IFVL=0THENVL=15
497 FORT=1TO50:NEXTT
498 NEXTDB
499 POKEDB,0:POKEDB-1,0
500 POKE36876,0:POKE36878,0:POKE36869,240:POKE36879,27:PRINT"███"
505 PRINT"███YOU WERE ELIMINATED";PRINT"███WITH A SCORE OF"SC"."
510 PRINT"███ANOTHER GAME (Y/N)"
515 GETXX$:IFXX$=""THEN515
520 IFXX$="Y"THEN530
525 PRINT"███":END
530 RESTORE:CLR:GOTO51

```


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Programs for programs

Tony Bridge looks at the growing range of utilities for the ZX Spectrum

The vast majority of those people now buying home computers do so, apparently, to play games. Walk into the average software store, and the assistant will almost certainly ask you, "Which game would you like, Sir/Madam?"

But surely, sooner or later, the squeaks and explosions of the *Invaders* and *Scramblers* and hungry little *Pacmen* must pall for many people. It is then that the more serious programs come into their own.

The Sinclair Spectrum is particularly well-served in this area, as a well-trodden path for the Hobbyist has been forged from the ZX80, to the ZX81, and on to the Spectrum. The beauty of the Sinclair range is the excellent selection of software readily available for light relief, and the sheer — sorry about the jargon — "friendliness" of the machines.

So, in this review we shall take a look at some of the Utility programs — programs that make it easier for you to make your own programs work. In addition we'll look at Business Utilities — programs that make it easier for you to make your (small) business work.

Programming is a rather esoteric art, shrouded in mystery to the uninitiated. But it is rapidly becoming clearer to many people, as they take the plunge into the murky waters.

To the serious programmer, a Toolkit is a necessity. *Workforce*, run by Derek Tidman, has a number of programs which will be of interest. *Programmers Dream* (or *PD*, author Dr Robert Rayment), is loaded before work starts, and includes several useful features. *Renumber* is a powerful facility which rennumbers your fledgling program from any start point, in any step size, to any finish point. All *Gotos*, *Gosubs*, *Restores*, etc, which will be affected, are taken care of along with the renumbering.

Block Move is a similar facility, allowing the programmer to move a whole chunk of lines to another place within the listing, renumbering being handled along the way. *Erase* will do just that to any number of lines — but beware, *Gotos* and *Gosubs* are not handled by this command (but this shouldn't be a problem — the program would, on Run, go on to the next line after a *Goto* to a non-existent line).

Change String will change either every occurrence of a string, or selected occurrences. *Dump* (strange name) prints on the screen the variable names and values. Finally, but not least, the size of your program, together with the variables can be inspected. All this is pretty standard

fare for Toolkits, and contains nothing new, but Dr Rayment has written a very compact program (just 1450 bytes) which, along with the comprehensive documentation, is an absolute gem. The program is very easy to use — just *Clear* space above *Ramtop*, and then begin working on your own program. *PD* will be ready when needed.

Another compact little beauty from Dr Rayment and *Workforce* is the *Spectrum Disassembler*, which allows you to peek at the secrets of your machine code programs. The screen display contains, on the left, the address, and in the centre, the code of the bytes at that address. On the right is the mnemonic associated with the code. As you enter your machine code program, the *Disassembler* will translate the bytes into mnemonics for your inspection. The program is well-documented, and assumes the user to be completely familiar with machine-coding techniques.

As an introduction it is very useful

The final Utility from *Workforce* is *Display* a character generator, written by Gloster Software. Now, there are many CGs on the market, all pretty much the same, though each has its own attractive points — all Spectrum owners will already have a good one on the *Horizon* tape from Psion, and of course this one is free with the computer. Good value for money!

However, the tape from Gloster/*Workforce* is a different proposition entirely. As you will know, the Spectrum supports 21 User-Defined Graphics (UDGs) in addition to the 96 standard characters — *Display* will provide you with a massive 273 extra shapes (on the 16K machine) or 336 shapes on the 48K machine. To put it another way, the normal 21 UDGs allowed by the Spectrum may be held in sets of "pages" in memory and called up as needed — 16K will hold 13 pages and 48K will hold 16 pages. *Display* enables you to show all these pages on-screen at the same time.

A demo program is *Loaded* first. This consists of a title page, the text of which is set out in characters of 64 (to the line) width. Around the introductory text is arrayed a large number of UDGs, any of which may be set into animated motion at the touch of a key. You will see, for example, a rocket taking off, rifles shooting at a poor little bird, jugglers, munching *Pacmen*, dancers, spinning wheels and many more.

The main program follows on the tape. Once this is *Loaded*, a work space is

displayed along with a display "sheet".

Now is the time to *Load* into this space any characters you may have previously created, should you wish to work on them. Following the main program are several "pages" containing the characters from which the demo title page was built — you are advised to *Load* these and use them to gain insight into the workings of *Display*.

The Basic method to amend characters is: *Pick* from the display "sheet" or (if you are creating your own) *Fetch* a standard character from the Spectrum's keyboard, and move the character to the work space. Now the character may be *Turned* clockwise or anti-clockwise by 1/4 or 1/2 turns.

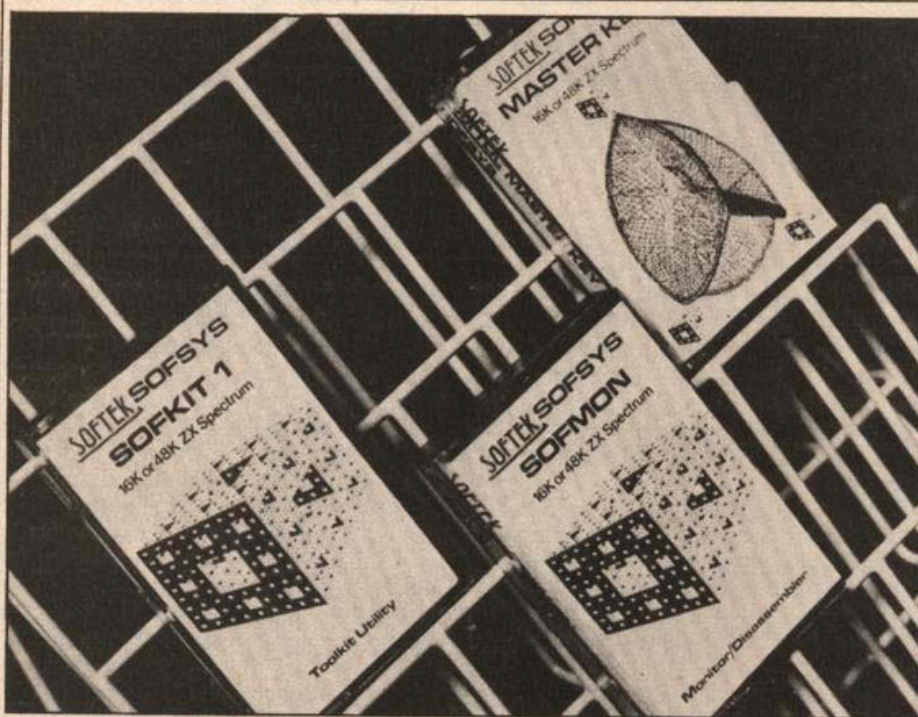
You may also *Invert* (or flip over) the character, *Reverse* back-to-front, *Expand* the character (so that any quarter will fill the whole square), and finally *Shift* the whole thing by one pixel at a time to the left, right, up or down. During this procedure, any of the pixels within the character square may be turned on or off. Finally, your amended or newly-created shape may be returned to the display sheet, ready for eventual *Saving* to tape.

By typing *Help*, a page of options is presented, and this along with the usual good *Workforce* documentation, ensures that the user is never left helpless. Advice on creating animated graphics is included, and all in all, it is hard to imagine a more useful UDG-generating aid than this.

Another machine code programming aid has been published by Oxford Computer Publishing Ltd. Written by F O Ainley, the *Machine Code Test Tool* comes nicely packaged in a shiny, sturdy box, slightly smaller in size than a paperback. The accompanying manual is described as a Tutorial in machine code, and fulfills this function quite well. A 32-page booklet cannot enter into quite as much detail as a full-blown book on the subject, but as an introduction it is very useful.

Your best course is to work through a book such as William Tang's *Spectrum* continued over the page





Machine Language for the Absolute Beginner, and return to the program with a better knowledge of the jargon and techniques of machine code programming. Write an exploratory program and use the *Test Tool* to run and debug your attempt. The contents of all the registers will be displayed for you to inspect and change as necessary.

As a bonus, a Character Generator (yes, another one!) is included on the reverse side of the cassette — it's fairly standard, with no surprises, but it's nice to get a little gift, isn't it?

Spectrum Machine Language for the Absolute Beginner is just one of many books now on the market (there'll be more!), all attempting to instruct the Spectrum user in the delights of machine coding. This book is one of the best I have seen on the subject — for once the title is on the nose! I can recommend this to anyone just getting interested.

The only quibble I have with the book is the amount of spelling mistakes — there is at least one per page, and the Great Spelling Mistake Hunt eventually become a major entertainment. Fortunately, this does not detract from the work as a whole, and only becomes a nuisance when a missing page throws the reader into momentary confusion.

A cassette is also available, containing some of the programs from the book.

Whilst on the subject of cassettes that come with books, let me mention once again Trevor Toms' *Spectrum Pocket Book*, which I spoke of briefly some weeks ago. Half of the book consists of the usual games listings, though for a change, these are original and actually quite good. They also, of course, contain a lot of useful routines for the reader's own games. And, incidentally, the line by line documentation of the program is exemplary.

The balance of the book is taken up with a very well-written introduction to machine code techniques.

A cassette is available for the games, and another for the machine code part of the book. Amongst other goodies on the second tape is a Screen Toolkit, which is a routine for scrolling up, down, left and right, as well as printing to any pixel.

Another system, recently released, is *Sofsys*, from Softek, Tim Langdell's company. The full system consists of five programs — to take full advantage of them, they should be *Loaded* into memory together. However, they maybe used individually.

Before work is begun, the heart of the system, *Masterkey*, should be *Loaded*. With the aid of this program, up to seven keys may be defined by the programmer. *Masterkey* comes with five keys pre-defined, which may be edited to suit the user's requirements. As they stand, they control, with one key-touch, entry of the Assembler which is another part of the system, entry of the Disassembler, and the operation of the Compiler.

Softek, confusingly, has another name for this program, *Softime*, which hints at its other facility, a clock.

With *Masterkey* in memory, *Softkit 1*, a programming toolkit maybe *Loaded*. This is a fairly straightforward toolkit — like many others, it enables the use to *Renumber* (with all *Gotos*, *Gosubs* and so on), *Erase* all *Rem* statements (thus saving memory), and examine the length of program and variables at any time. The program will also change upper case characters into lower, and vice-versa.

Probably the most important and unusual feature for a program at this price and this computer, is the *Trace* facility. Run the program through, and you'll see the line number and statement currently being processed. Thus, if the program

hangs up, the bug can be *Traced* very easily.

Softkit 1, like some of the other parts of *Sofsys*, has been written by Andrew Glaister, the author of several best-selling games for the Spectrum.

The next element of *Sofsys* is *Sofmon* (look, I didn't dream up these names!), the Disassembler/Monitor of the system. There are two versions, one for each of the memory sizes, but the facilities are the same in either case. Each command maybe accessed by one keystroke, thus, at one stroke relieving you of the need to buy *Masterkey*.

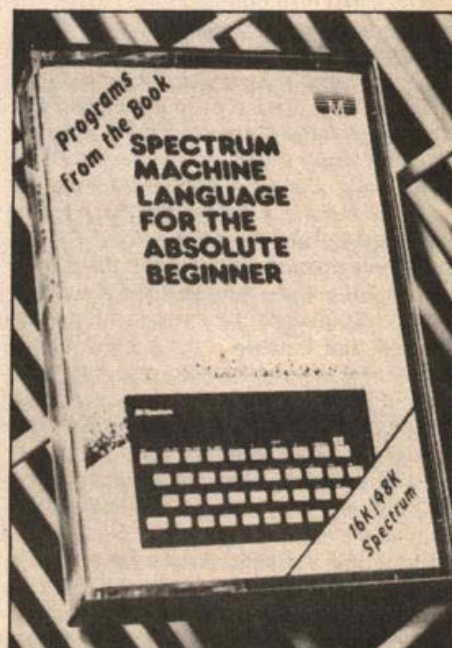
As will all the other parts of *Sofsys*, the documentation is precise and clear, guiding the user effortlessly through the highways and byways of the Utility. Twenty-five functions in all are available, including, in the Monitor section, *Erasing* or *Inserting* bytes in memory, decimal to Hex conversion, and vice-versa, *Moving* areas of memory, finding a series of bytes, and so on.

Probably the most intriguing part of the whole *Sofsys* package, however, and one that Softek obviously regard as the flagship of the system, is the Compiler, or *Super C*, as Softek couldn't refrain from calling it!

A number of things the Super C can't handle

Super C comes well-packaged in a large box that opens like a book to reveal the cassette nestling inside along with a 22-page instruction manual. The cover artwork shows, for some strange reason, a futuristic starship pilot fixing the viewer with an icy stare. Reflected in his visor is a — well, probably a Betelgeusian Battlecruiser! And just when you thought it was safe to go back to the Spectrum! Eye-catching, however, which is the object of the exercise.

The Compiler converts, more or less



instantly, your Basic program into machine code, thus endowing the program with all the benefits of machine code. Three small programs are included in the package, which demonstrate the point admirably. A screen printing routine is followed by a count from 0 to 1,000, and in both cases, the compiled program is orders of magnitude faster.

The most impressive demonstration is the third, a very simple *Invaders* program. In Basic it is very slow, and you wouldn't want to play it for more than a few seconds. When compiled, the program becomes very much faster, and the game is at least bearable for a couple of minutes.

Down to the operation now — and it's all clearly explained in the manual. If *Masterkey* has been *Loaded*, a key can be defined to handle the compiling command, but that's very quick to type anyway. Just *Load* your Basic program, and then simply key *Randomise* *Usr* 49152 — a fraction of a second later, the program is in machine code!

Sounds simple, doesn't it? Well, it is, but don't get the idea that you can write anything in Basic and have it compiled for you. There are a number of things that *Super C* will not handle, and which necessitate extra thought when writing your original program.

First, variables can only be upper case (capital) characters, and you are only allowed to define 25 of them — A to Z. A second example is *Gotos*, *Gosubs* and *Returns*. These must all refer to an existing line, no more jumping to a vague line number and letting the computer find the next relevant line. *Super C* will not, moreover, recognise a calculated line number (so you cannot say *Goto* 20*score).

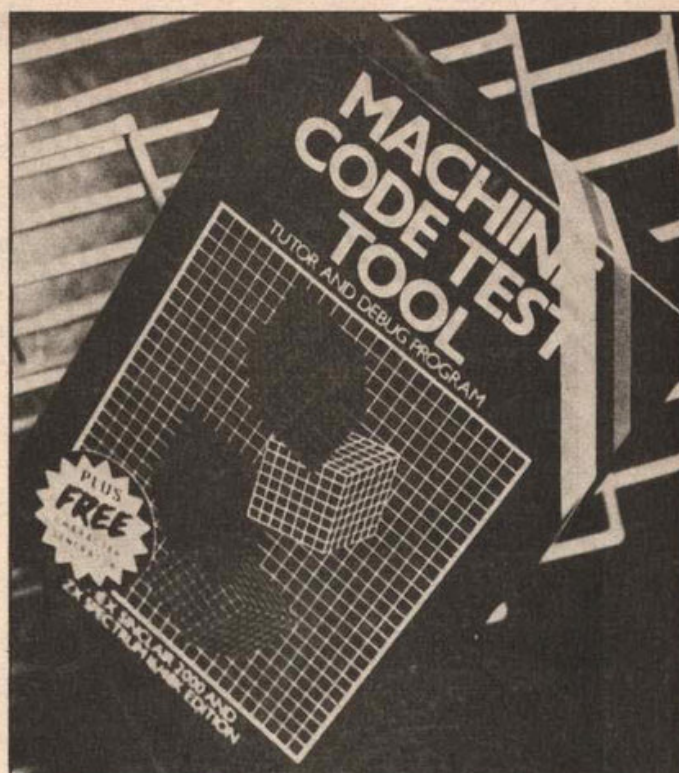
A stand that is morally indefensible

A final example here, although there are several more in the manual, is the restriction on local colour commands. You'll be used, in Sinclair Basic, to putting *Over*, *Inverse*, *Ink*, *Paper*, and so on within *Print* statements — these will not affect the rest of the screen or program. These will not be compiled by *Super C*. You will have to set the parameters globally, and then reset after the *Print* statement.

However, the most serious drawback in *Super C*'s facilities is that it will not compile statements involving fixed-point arithmetic, and will not allow string-handling statements. An enhancement package will, says Softek, be available soon to enable the programmer to use these facilities in his Basic program.

I don't know if Softek intends to give the package to existing customers or will charge extra for them, but I think a program calling itself a Compiler should certainly include these facilities.

The total *Sofsys* package can be recommended, and the Compiler, in particu-



lar, though expensive at £15, is — with the caveat of the lack of some important facilities — worth every penny.

One final doubt nags me, however, and that is about the copyright notice at the beginning of *Super C*'s manual. I've deliberately left this point out of my appraisal until now — it will only affect you if you intend to market your compiled program. Softek is very concerned that, as such programs must contain some of *Super C*'s routines, the company must ask

you for a royalty. I think this stand is, morally at least, indefensible. There are many compilers in use much higher up the computing scale, at the minicomputer and mainframe level. Royalties are not sought by the original manufacturers of these programs, unless the actual compiler itself is passed on to a third party as part of a total package.

Legally, of course, Softek are entitled to ask whatever they desire — and *Sofsys* remains as a most important suite of programs for the programmer. ■

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Clearly labelled!

R Luxton explains how to make your own labels on the 16K ZX81

Label Maker is a routine for the 16K ZX81 to print your own personal label at the head of any program. It can take the form of a "copyright" mark, a special

instructions panel, a fancy nameplate, or whatever you want. It is designed to be Poked above Ramtop, so that it can be quickly added to any existing program.

Fig 1 Label Maker

```

1 REM .....
.....
20 FAST
30 REM =====
40 REM INPUT TITLES
50 REM =====
60 PRINT "ENTER PROGRAM TITLE"
70 INPUT A$
80 IF LEN A$ > 25 THEN GOTO 70
90 PRINT
100 PRINT "ENTER COPYRIGHT LINE"
110 INPUT B$
120 IF LEN B$ > 25 THEN GOTO 110
130 REM =====
140 REM SET-UP GRAPHICS
150 REM =====
160 LET A=137
170 FOR I=16513 TO 16635
180 IF I=16540 THEN LET A=136
190 IF I=16604 THEN LET A=138
200 POKE I,A
210 NEXT I
220 LET A=133
230 FOR I=16513 TO 16609 STEP 3
240 POKE I,A
250 NEXT I
260 LET A=5
270 FOR I=16539 TO 16635 STEP 3
280 POKE I,A
290 NEXT I
300 LET A=0
310 FOR I=16540 TO 16608
320 IF I=16545 THEN LET I=16572
330 IF I=16577 THEN LET I=16604
340 POKE I,A
350 NEXT I
360 REM =====
370 REM POKE IN TITLES
380 REM =====
390 LET C=1
400 LET Z=INT ((26-LEN A$)/2)
410 FOR I=16546+Z TO 16546+Z+LE
N A$
420 POKE I,CODE A$(C)
430 LET C=C+1
440 IF C>LEN A$ THEN GOTO 460
450 NEXT I
460 LET C=1
470 LET Z=INT ((26-LEN B$)/2)
480 FOR I=16578+Z TO 16578+Z+LE
N B$
490 POKE I,CODE B$(C)
500 LET C=C+1
510 IF C>LEN B$ THEN GOTO 530
520 NEXT I
530 CLS
540 GOTO 560
550 STOP
560 PRINT "IF LINE 1 IS OK,," "E
NTER GOTO 600 AND NEWLINE.," "IF
NOT,," "ENTER GOTO 20 AND TRY AG
AIN.,"
570 PRINT
580 PRINT
585 PRINT
590 LIST
600 LET A=16513
610 FOR I=32645 TO 32767
620 POKE I,PEEK A
630 LET A=A+1
640 NEXT I
1000 REM =====
1010 REM REMOVE WHOLE PROGRAM
1020 REM =====
1030 NEW
2000 SAVE "LABEL MAKE"
2010 RUN
    
```

ram's title, and then the copyright line, after which the screen will go blank for a few seconds, and will then List showing your label in 1 Rem. If the label is correct, just enter Goto 600 and Newline. If not, then enter Goto 20 and Newline, and enter it again. When the label is right, enter Goto 600 and Newline, and the computer will Poke your label above Ramtop.

Now Load the program on which the label is to appear and add a 1 Rem with exactly 122 full stops, and the lines in Fig 2, preferably at the end of the program. Then enter Goto 9000 and the label will be down-loaded from above Ramtop to the head of your program. Also, enter as a direct command "Poke 16510,0" to change the line from 1 to 0, where it is safe from accidental erasure.

The program will not Run in the usual way, although Run will still clear the variables. You should start your program by "Goto (the second line)" or "Run (second line)", if the variables need resetting.

As an extra, add lines 8999 and 9025 (Fig 3) and then enter as a direct command "Print A\$" after you have down-loaded your label. It will then be in A\$ as well as at the head of your program. This is very useful for calling from anywhere throughout the program as a natural break or just as a piece of advertising. Or, just enter "Lprint A\$" for the printer to produce a convenient sized label for sticking to cassettes or cassette cases.

Fig 2

```

1 REM .....
.....
9000 LET A=32645
9010 FOR I=16513 TO 16635
9020 POKE I,PEEK A
9030 LET A=A+1
9040 NEXT I
    
```

Fig 3

```

8999 DIM A$(123)
9025 LET A$(I-16512)=CHR$
PEEK A
    
```

Examples of labels

ZX81 LABEL MAKER
(C) 1983 R.G.LUXTON

DO NOT ENTER *RUN*
TO START ENTER *GOTO 10*

The Pit — part two

Paul Sellin presents part 2 of The Pit — a text adventure for the 16K Spectrum

This week, having initialised the arrays and variables to start the game, we shall look at one of the most important elements in an adventure game — the monster.

Lines 3015 to 3075 contain the monster routine, with the data being stored in line 3100. The routine is really very simple: once the monster has been 'chosen' from the data, either it attacks you (line 3025), you attack it (lines 3030 to 3035) or you retreat.

If you are still 'alive' after the monster has attacked you, then the program moves on to the 'attacking the monster' sequence. If the monster survives, which is checked at the end of line 3035, then the

program jumps back to line 3025 and puts you under attack again!

On entering the monster routine, the computer must randomly select which monster to present. This occurs in line 3015 — by looping a random number of times, each time reading a set of data, the current data after the last loop becomes the chosen monster.

Line 3100 contains five pieces of data for each monster: first its name, which is a string and is assigned to *ps*, then four variables representing in turn its strength, *psi* power, dexterity and intelligence, each in the range 0 to 20. These are assigned to the four variables *st*, *ps*, *de* and *in*. Notice how the monster's variables differ from the

player's variables of *s*, *p*, *d* and *i*.

If you survive the monster's attack, then you have the chance to fight back. Depending on your dexterity, the computer allows you a certain amount of time in which to attack — if the time runs out, then the monster attacks again.

The computer allows you to attack in one of three ways: either by casting a spell (key *s*), by giving it a thought problem (key *t*), or by just attacking normally (any other key except *t*). Pressing the *r* key allows you to retreat.

The spell routine is in lines 3050 and 3055. It prints up a suitably fiendish spell and then calculates its effects by comparing the variables *p* and *ps*. If the monster dies, then the whole monster routine is exited via line 3040; if not, then the monster attacks again with the program jumping to line 3025.

The 'thought' routine works in a similar way in lines 3060 to 3070. The computer

```

2530 DATA "a potion of sight", "c
hoking gas!!!", "Flash!!", "an expl
osion!", "an old skeleton", "a set
of bonuses!", "nothing", "a set o
f bonuses!", "nothing"
2540 IF x$(1 TO 2) = "Fl" THEN LET
si=0: GO TO 8500
2545 IF x$(1 TO 2) = "ch" THEN PRIN
T "It weakens you...": LET d=INT
(d-RND*8): LET i=INT (i-RND*8):
LET s=INT (s-RND*5): GO TO 8000
2550 IF x$(1 TO 3) = "a p" THEN PRI
NT "You boost your powers of si
ght...": LET si=1: GO TO 1000
2560 GO TO 1000
2705 IF NOT si OR NOT il THEN GO
TO 8500
2710 IF y<2 OR x<2 OR y>9 OR x>1
9 THEN PRINT "No Flares here,
dear creature...": BEEP .2, -12
: GO TO 1000
2715: CLS: PRINT "Here goes wi
th one precious flare...":
FOR f=y-1 TO y+1: PRINT TAB 12,
PAPER 2, " ": FOR e=x-1 TO x+1:
PRINT INK 7, PAPER 2, a$(z, f, e):
NEXT e: PRINT " ": NEXT f: P
RINT AT 5, 15, "+": INK 0: LET fl=
fl-1: PRINT " ": GO TO 1000
2720 GO TO 1000
2800 PRINT "Oh dear!"" You've f
ound a Time Warp...": LET z=1+IN
T (RND*3): LET x=1+INT (RND*19):
LET y=1+INT (RND*9): FOR h=36 T
O -12 STEP -1: BEEP .05, h: NEXT
h: PRINT "You are now at Level
": z: "At position "x": "y": GO
TO 8000
2900 LET e=1+INT (RND*9): LET fl
=fl+e: PRINT "You found "e": " fl
ares": LET a$(z, y, x) = " ": GO TO
8000
3015 RESTORE 3100: FOR f=1 TO IN
T (1.5+RND*7): READ p$, st, ps, de,
in: NEXT f: PRINT "You have foun
d "p$: "Status Report: "Stre
ngth", st "Psi Power", ps "Dexteri
ty", de "Intelligence", in: FOR f=
1 TO 300: NEXT f: IF d-de>0 THEN
IF 5*RND*2>de*2 THEN GO TO 3030

```


generates a random multiplication sum in line 3065 — the accuracy of the monster's 'answer' is dependent on *in*, its intelligence, plus a random factor.

There are a few little extras, such as you not being allowed to 'think' if *i* is less than 10, whereupon you will immediately be attacked again. Also, a stupid monster, where *in* equals zero, will ignore your sums and proceed to attack regardless.

'Retreating' is contained in line 3033 which just prints up a suitable message and exits the monster routine to line 8000. But, your strength is reduced significantly if you retreat from a weak monster.

Normal attacking revolves around line 3035 which calculates the monster's damage and subtracts it from its strength. If *st* is still greater than zero, then the monster attacks you again with the program jumping back to line 3025.

On killing the monster and reaching line 3040, your psi power is increased according to that of the monster. The *m* character

in the main array is replaced by a space, ensuring that the monster really is dead. If you kill the *Warlord*, which is the strongest monster of them all, then you could pick up treasure if the program jumps to the 'treasure' routine in line 2000.

On leaving the monster routine in line 3045, the program jumps to line 8000. This is just one big multi-statement line, which prints out all the variables and strings of the player. *Poking* 23692 just lets the screen scroll automatically. This routine then jumps back to the main loop at line 1000.

A couple of other useful blocks of program are those which give the player his 'eyes'. These are the 'flare' routine (lines 2700 to 2715) and the 'map' routine (lines 9201 and 9220). Both are accessed directly during the game by pressing keys *f* or *m* respectively (lines 1003 and 1004). If you are blind and *si* equals zero, then both routines will jump to line 8500 and then back to the main loop.

The 'flare' routine prints out the eight positions all round your current position and draws a box around them, at the same time taking one off the *fl* variable, and then returns to the main loop at line 1000. But, note that the flares will not work on the edges of the array (line 2710 — why do you think that is necessary?).

Finally, the map routine in line 9220 prints out horizontally the 10 rows of that 'page' of the array and marks your current position. Note the double *Pause* statements before jumping to the Status Report; this is to get round the Spectrum Rom bug which sometimes ignores a single *Pause* statement.

Next week we shall look at the final part of *The Pit*.

● *The Pit* has been split into three parts. Enter part 2 of the program now and *Save* it on tape. Part 3 will be published next week. You will need to enter all three parts of the program before *Running* it.

```

3025 BEEP .1,0: PRINT "The mons
ter attacks...": PAUSE 100: LET
h=ABS (INT ((1st*RND)-ar*RND/2)/
2)): PRINT "You take ";h;" damag
e.": LET s=s-h: PRINT "Your stre
ngth: ";s: PAUSE 30: IF s<=0 THEN
GO TO 9800
3030 BEEP .1,24: PRINT FLASH 1:
"***5strike Now***": PAUSE 1: PAU
SE d*S: IF INKEY$="" THEN PRINT
"Too late...": GO TO 3025
3031 IF INKEY$="s" THEN GO TO 30
50
3032 IF INKEY$="t" THEN GO TO 30
50
3033 IF INKEY$="r" THEN PRINT "
Cowardly Creature!!": LET s=s-IN
T ((21-st)/4): GO TO 8000
3035 PRINT "You attack...": PAU
SE 50: LET h=ABS (INT ((1st*RND*2
)-de*RND/2)): PRINT "Monster ta
kes ";h;" damage.": LET st=st-h:
PRINT "Its strength: ";st: IF st
>0 THEN GO TO 3025
3040 PRINT "You have killed the
monster.": LET p=p+INT (ps/4): L
ET a$(z,y,x)="": IF p$="the War
lord" THEN IF RND*10>6 THEN PRIN
T "You're lucky, the monster was
carrying treasure...": GO TO
2010
3045 GO TO 8000
3050 PRINT " INVERSE 1: "Rest th
y time, thou ferocious and accurse
d creature": FOR e=1 TO 50: NEXT
e: PRINT "The monster staggers.
...": PAUSE 1: PAUSE 100: IF RND*
p*8>ps*2 THEN PRINT "...and dies
...": GO TO 3040
3055 PRINT "...and recovers.": L
ET p=p-ps/4: GO TO 3025

```


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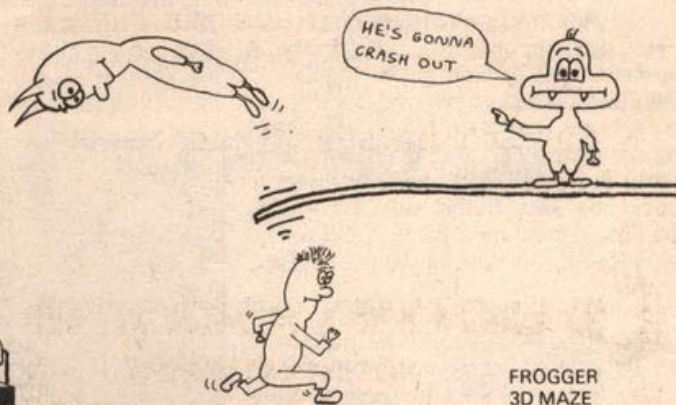
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All keyed up!

Peter Chase explains how to use machine code to enhance the Dragon's keyboard

This article is aimed both at readers who have assembler packages and may be wondering what to do next, and for those who would like to extend the capabilities of the Dragon by using machine code routines in their Basic programs. The following routines are designed to improve keyboard responses and to extend colour and text usage.

The *Inkey\$* function will only tell that one key is being pressed. If more than one key is pressed then neither key will register. Similarly, if one key is already being held down, a second one will not register.

Using machine code, it is possible to check if any key is being held down, regardless of how many other keys are being pressed. This has very many applications. For instance, it allows diagonal movements by pressing two arrow keys or, in action games, one key can be used as an 'accelerator' and another for 'steering', etc.

To find out if a key is being pressed, it is necessary to place its column number into location *&HFF02* and then to check the appropriate bits in location *&HFF00*. Listing 1 *@KEY* shows how this can be programmed in assembly language.

The program works by storing the *A* register in the column select register at *&HFF02* and then comparing the *B* register with the contents of the row input register at *&HFF00*. Table 1 shows what values to put in the *A* and *B* registers to check any key. If the selected key is depressed, then the *Z* flag in *CCR* will be set, allowing the use of *BNE* and *BEQ* jumps.

For those without assemblers, lines 15-60 of Listing 2 show how the routine can be entered into Basic programs by *Poking* the hex codes into locations starting with *&H7001* (the additional codes allow the row and column numbers to be *Poked* into locations *&H7002* and *&H7003*). The routine is then accessed with *Exec &H7001*.

Listing 2 itself is a program showing one use of the *@KEY* routine. It allows hi-res drawing in eight directions with the four arrow keys. Pressing the arrow keys alone gives movement, while depression of shift and arrow keys together allows drawing on the screen. You can produce very intricate 3-dimensional drawing with this program which can then be *Saved* as screens on cassette.

One of the major drawbacks of the Dragon 32 is that it is not possible to have text and hi-res graphics together using Basic alone. Also, the number of colours in hi-res modes is very limited. However, the video chip used in the Dragon is capable of producing many more modes. One of the

most useful of these is alpha semigraphics mode 24, which allows usual text, 64 x 192 hi-res graphics and nine colours all to be used at once. In a previous issue of *Popular Computing Weekly* it was explained how to get into mode 24 from Basic using *Poke &HFFC5,0:Poke &HFFC3,0:Poke &HFFC0,0*.

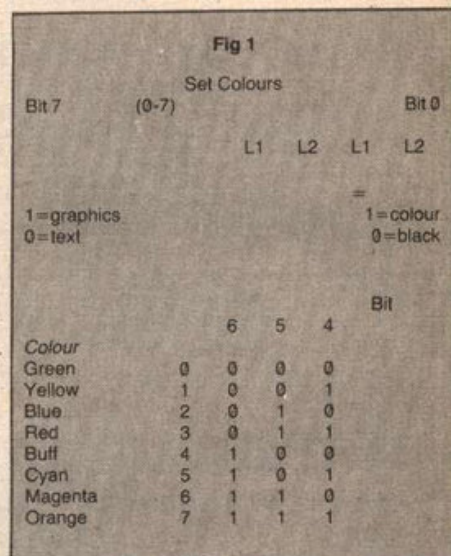
For those with assemblers, Listing 3 contains five routines for printing text in mode 24. *@SEL24* selects mode 24, while *@CLS24* fills the mode 24 screen with the character stored in location *&HFF0*. *@PT2* prints the character stored in the location *&HFF2* at co-ordinates stored in *&HFF0* and *&HFF1*.

@SCRL24 scrolls the screen up one line. *@MSG24* prints a message to the screen from the address pointed to by the *Y* register. To use the latter routine, both *@PT2* and *@SCRL24* must be in memory as well.

If you want to use these routines from Basic, then the first four can be entered as shown in lines 15-60 of Listing 2 by *Poking* the hex codes (column two of Listing 3) into addresses starting *&H7FF0* and then *Exec* the address of the routine. To use *@MSG24* from Basic, it is first necessary to define *Def Usr0 = &H7080* at the start of your program and then use *N = Usr0(Varptr(A\$))* where *A\$* is the

string you wish to print.

The real advantage of mode 24 is the mixing of text with 9-colour hi-res graphics. The display memory in mode 24 goes from 1024 to 7168 (decimal). Each of the 192 rows contains 32 bytes and each byte is organised as in Figure 1.



For example, to set the top left pixel yellow, then the binary for the appropriate byte is 10011010 which equals 154 in decimal. So in Basic, the command would be *Poke 1024,154*. The equivalent assembly instruction is *LDA #154 Sta 1024*.

Listing 4 is an assembly program to show the mode 24 9-colour hi-res graphics. Listing 5 is a version of this for use without an assembler and shows the mixing of text with hi-res graphics.

Table 1

	FE	FD	FB	F7	EF	DF	BF
FE	0	8	@	H	P	X	ENT
FD	1	9	A	I	Q	Y	CLR
FB	2	:	B	J	R	Z	BRK
F7	3	;	C	K	S	UP	
EF	4	,	D	L	T	DN	
DF	5	-	E	M	U	RT	
BF	6	.	F	N	V	LT	
7F	7	/	G	O	W	SPC	SFT

Put the number across the top into *A* or if using BASIC *poke* it into *&H7002*. Put the number down the side into *B* or *POKE* into *&H7003*.

continued on page 25

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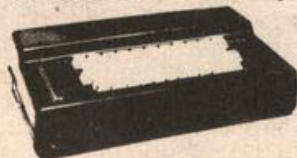
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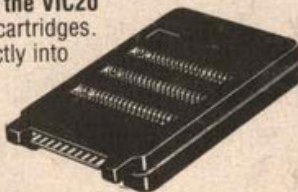


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Listing ONE-KeyBoard Controller

```

7001          30  PRT
7001 047F    40 @KEY ANDA #127
7003 F7FF02  40 STB #FF02
7005 F0FF00  40 LDB #FF00
7007 C47F    40 ANDA #127
7009 3404    40 PSHS B
700B A1E0    40 CMPA ,S+
700D 39      40 RTS
7010          50  END @KEY
    
```

Listing Three-Routines for MODE 24

```

7001          30  PRT
7001 3402    50 @SEL24 PSHS A
7003 B0FF22  50 LDA #FF22
7005 04F0    50 ANDA #255-15
7007 B7FF22  50 STA #FF22
7009 7FFFC3  50 CLR #FFC3
700B 7FFFC3  50 CLR #FFC3
700D 7FFFC0  50 CLR #FFC0
700F 3502    50 PULS A
7011 39      50 RTS
7013 3412    70 @CLS24 PSHS A,X
7015 0E0400  70 LDX #1024
7017 B07FF0  70 LDA #7FF0
7019 A700    70 @CLOOP STA ,X+
7021 0C1030  70 CMPX #1424+6144
7023 25F3    70 BLD @CLOOP
7025 3512    70 PULS A,X
7027 39      70 RTS
7029 3450    30 @PT2 PSHS D,X,Y
7031 0E0400  30 LDX #1024
7033 B07FF1  30 LDA #7FF1
7035 2707    30 BEQ @NADD
7037 30B30100 30 @ADDL LEAX #84,X
7039 4A      30 DECA
7041 20F3    30 BNE @ADDL
7043 B07FF0  30 @NADD LDA #7FF0
7045 30B0    30 LEAX A,X
7047 060C    30 LDA #12
7049 F07FF2  30 LDB #7FF2
7051 E704    30 @PRT STB ,X
7053 30B020  30 LEAX #32,X
7055 4A      30 DECA
7057 20F0    30 BNE @PRT
7059 47FF0  30 INC #7FF0
7061 LDA #7FF0 30 LDA #7FF0
7063 CMPA #32 30 CMPA #32
7065 BLD @END 30 BLD @END
7067 CLR #7FF0 30 CLR #7FF0
7069 INC #7FF1 30 INC #7FF1
7071 LDA #7FF1 100 LDA #7FF1
7073 CMPA #16 100 CMPA #16
7075 BLD @END 100 BLD @END
7077 DEC #7FF1 100 DEC #7FF1
7079 BSR @SCL24 100 BSR @SCL24
7081 @END PULS D,X,Y 110 @END PULS D,X,Y
7083 39      110 RTS
7085 30B020 120 @SCL24 LDD #3072
7087 0E0400 120 LDY #1024
7089 CE0500 120 LDU #1024+304
7091 AEC1    120 @SCL LDX ,U++
7093 AFA1    120 STX ,Y++
7095 5A      120 DECB
7097 20F3    120 BNE @SCL
7099 4A      120 DECA
7101 20F0    120 BNE @SCL
7103 39      120 RTS
7105 0E0400 130 @MSG24 LDA ,Y+
7107 0100    130 CMPA #13
7109 2709    130 BEQ @MEND
7111 0A04    130 ORA #04
7113 047F    130 STA #7FF2
7115 BSR @PT2 130 BSR @PT2
7117 BRA @MSG24 130 BRA @MSG24
7119 @MEND RTS 130 @MEND RTS
7121 39      140 END @SCL24
    
```

LISTING TWO-DRAWING WITH @KEY

```

15 CLEAR1000,M42000
10 RESTORE
20 I=M42000
30 I=I+1
40 READ A4
50 IF A4="X" THEN 100 ELSE POKE I,WAL("M"+A4):GOTO30
60 DATA CC,00,00,7F,70,FF,F2,FF,02,F6,FF,00,34,04,A1,E0,
  26,03,73,70,FF,30,2
100 PNODE4,1:IFCLS:SCREEN1,1
110 X=120:Y=30:C=3
120 DIMC(7,7)
150 PUT(X-3,Y-3)-(X+3,Y+3),C,NOT:PUT(X-3,Y-3)-(X+3,Y+3),C,NOT
160 POKEM42002,MHF:POKEM42003,M47
170 EXECM42001:IFPEEK(M42002)THEN C=SELSE C=0
180 POKEM42002,M40F
190 POKEM42003,M47:EXECM42001:IFPEEK(M42002)AND Y/2 THEN Y=Y-1
200 POKEM42003,M47:EXECM42001:IFPEEK(M42002)AND Y/2 THEN Y=Y+1
210 POKE M42003,M40F:EXECM42001:IFPEEK(M42002)AND X/2 THEN X=X-1
220 POKEM42003,M47:EXECM42001:IFPEEK(M42002)AND X/2 THEN X=X+1
230 PSET(X,Y,C):GOTO150
    
```

Listing Four-Weird n' Wonderful Display

```

7001          35  PRT
7001 0E0000  40 @START LDX #0000
7003 7FFFC3  50 CLR #FFC3
7005 7FFFC3  50 CLR #FFC3
7007 7FFFC0  50 CLR #FFC0
7009 7FFFD7  50 CLR #FFD7
7011 10E0400 60 LDT #1024
7013 0600    60 LDA #120
7015 A700    60 @CLS STA ,Y+
7017 10BC1BE2 60 CMPY #7138
7019 25F0    60 BLD @CLS
7021 10E0400 70 LDY #1024
7023 AC00    80 @DEND LDA ,X+
7025 0A00    80 ORA #120
7027 A700    80 STA ,Y+
7029 0C0000  80 CMPX #0000
7031 BLD @XOK 80 BLD @XOK
7033 0E0000  80 LDX #0000
7035 @XOK CMPY #7138 80 @XOK CMPY #7138
7037 BLD @YOK 80 BLD @YOK
7039 LEAY -32,Y 80 LEAY -32,Y
7041 BSR @SCROLL 80 BSR @SCROLL
7043 @YOK BRA @DEND 80 @YOK BRA @DEND
7045 @SCROLL PSHS X,D,Y,U 90 @SCROLL PSHS X,D,Y,U
7047 LDD #3072 90 LDD #3072
7049 LDY #1024 90 LDY #1024
7051 LDU #1050 90 LDU #1050
7053 @SCR LDX ,U++ 90 @SCR LDX ,U++
7055 STX ,Y++ 90 STX ,Y++
7057 DECB 90 DECB
7059 BNE @SCR 90 BNE @SCR
7061 DECA 90 DECA
7063 BNE @SCR 90 BNE @SCR
7065 PULS X,D,Y,U 90 PULS X,D,Y,U
7067 39      90 RTS
7069 39      100 END @START
    
```

Listing Five-Text n' Hires

```

10 CLEAR1000,M42000
20 I=M42000
30 I=I+1:READA4:IF A4="X" THEN POKE I,WAL("M"+A4):GOTO30
40 DATA 0E,00,00,7F,FF,C3,7F,FF,C3,7F,FF,C0,7F,FF,D7,10,0E,04,00,
  06,00,A7,A0,10, 0C,1B,E2,25,F0,10,0E,04,00,A0,00,0A,00,A7,
  A0,AC,00,00,25,03,0E,00,00,10,0C,1B,E2 ,25,03,31,A0,00,0D,
  02,20,E3,34,70,CC,00,00,10,0E,04,00,CE,04,20,A0,C1,A0,A1,5A
45 DATA 20,F0,40,20,F0,35,70,35
50 DATA2
60 EXECM42001
    
```


Cause and effect . . .

Calvin Woodings explains how to use the analysis of variance technique

In any set of experimental results, the variations which appear will have arisen from a number of different sources. At the very least, there will be the variation caused by the effects of the factor being investigated, along with the variation caused by the errors in measuring these effects.

More complex experiments can involve several factors being tried at several levels — unwanted variations can arise from the method of measurement, the operator carrying out the tests, the day on which the test was done, and even such apparently unlikely effects as the weather. Analysis of Variance (*Anovar*) is an extremely powerful statistical tool which enables you to quantify such variations, so that you can decide which of the deliberately created effects are important compared with the unwanted error or interaction effects.

Unfortunately, many different types of *Anovar* are required to cope with the many different types of experiment, and a general purpose program to suit all options is way beyond the scope of this article. So, in order to give the reader a taste of the possibilities, this program deals with experiments involving between two and six factors, each at two levels, and with all possible interactions of the factors being studied. Such experiments are known as 2^n Factorials, where n is the number of factors and 2 is the number of levels of each factor (this notation also tells you how many trials are involved overall; eg, three factors at two levels means 2^3 or 8 separate trials). Such an experiment is frequently used at the outset of an investigation, when you are interested in looking at several different effects to decide which ones merit a more detailed study.

Suppose you are interested in improving the fuel consumption of your car. Suppose also you feel that the grade of fuel, the tyre pressures, and the maximum speed used are going to be important. You decide to measure the consumption over a standard route with two star versus four star fuel, 20 psi versus 30 psi in the tyres, and 50 versus 70 mph as speed limits. The complete factorial experiment will involve 8 runs as shown in Figure 1.

Each run involves a different combination of factors and the table illustrates these runs arranged in the 'standard order' to suit our method of analysis (devised originally by F Yates in 1937). Notice how the levels of the factors alternate going down the columns. The order is Lo/Hi for factor 1, LoLo/HiHi for factor 2, and LoLo-LoLo/HiHiHiHi for factor 3.

While it is important to arrange the results in this way prior to analysis, in this sort of trial it is also important not to carry out the runs in the same order. In fact, the run order should be randomised so that any unwanted effects (eg, the weather) are not easily confused with the factors being investigated.

Lets assume you carry out the trial and obtain the results shown in the last column of Figure 1. You run the program typing in 3 for the number of factors, *fuel*, *tyres*, and *speed* for the factor names, and *MPG* for the results name — then you type in the results in the order requested. You then have an opportunity to edit the data.

The next prompt, asking for an estimate of the error variance from other similar trials needs some explanation. In *Anovar*, the significance of effects and their interactions is estimated by dividing the variance (or mean square) due to the effect under

review by the variance due to experimental error. This error variance may be available from the analysis of other trials. Such 'external' estimates of error are to be preferred if available, but if not the full factorial experiment enables you to get an error estimate by treating the more unlikely interactions as errors.

The ratio of effect to error variance is known as the variance ratio or F-ratio. Statistics text books generally contain tables of F-ratio which enable the calculation of the significance of the effects being studied.

In this case, we have no external error estimate so answer *No* to the prompt. The first *Main Effects* table appears (Fig 2) and informs you that increasing *Fuel* (ie, changing from 2 star to 4 star) adds 1.13 miles to your gallon, while increasing *Tyres* (ie tyre pressure) adds 3.63 mpg. Increasing speed reduces mpg by 2.92. The error mean square shows 0 because you did not have one from other trials — you are advised to be prepared to note the numbers of those interactions which you are willing to sacrifice in the interests of significance testing.

Continuing to the next screenful, the 1st order interactions (ie, the interactions of all possible pairs of main effects) appear (Fig 2). In this example they are all relatively unimportant as indicated by the small *Mean sq* figure. Similarly, the second order interaction (only one possible interaction of groups of three effects in this case) is unlikely to be of any great experimental interest. Note that the numbers of the interactions are the numbers of the 'standard order' used for data entry, and not the order in which they appear on the screen.

Now that you have decided that none of the interactions are of any value, you can pool their variances to estimate the error variance. Enter 3,5,6 and 7 followed by 0 to end and say *Y* to look at the tables again. This time the F-ratios for each effect are given, along with the value of F-ratio corresponding to the 90 percent confidence level (Fig 3). You can now see that

STANDARD ORDER	FUEL level	GRADE value	TYRE level	PRESS value	SPEED level	value	RESULTS
1	lo	2	lo	20	lo	50	28.9
2	hi	4	lo	20	lo	50	30.0
3	lo	2	hi	30	lo	50	32.6
4	hi	4	hi	30	lo	50	33.3
5	lo	2	lo	20	hi	70	26.1
6	hi	4	lo	20	hi	70	26.7
7	lo	2	hi	30	hi	70	29.1
8	hi	4	hi	30	hi	70	31.2

Figure 1. Standard order for results in 2^3 Factorial

the tyre pressure effect is not only the biggest factor in improving fuel consumption, but also the effect of highest significance. Speed is the next most important effect, and is highly significant in reducing the miles per gallon figure. Fuel is less important.

Program notes

Procdataload and *Procentry* control data

input, the standard order being computed by lines 610 to 650. *Procanalysis* calculates the effects of the changes and the corresponding mean squares using Yates' method. Note that for 2 level factorials the effect and mean square are exactly equivalent and that the mean square is also the sum of squares (mean squares = sum of squares/dof, and dof or degrees of freedom are 1 in a 2 level experiment). The

arrays required for the standard order labels and Yates' analysis of a six factor experiment use up nearly all the available memory on the Model B.

Procprintout, along with *Procheading*, prints out the results of the analysis for the main effects, and *Procints* handles the interaction pages.

Procerror calls for interactions which can be used to estimate error variance. Given the standard order numbers of the unwanted interactions, it simply averages their mean squares. The degrees of freedom are used in three different ways for calculating error variance (dof), as a flag to check if another interaction has been added to the estimate (dof), and as an approximation with which to enter the F-ratio table (d).

Procext deals with an external estimate of error variance. The data at the end of the program consists of the probability points of the F distribution, for cases when the experiment has only 1 degree of freedom per effect, and a 90 percent confidence level is required. The F-ratios correspond to increasing degrees of freedom in the error variance estimate (up to 27 dofs) followed by one F-ratio for 28 to 59 dofs (ie, 2.85), and another for more than 59 dofs (ie, 2.75).

MAIN EFFECTS

No.	Change	Effect on M.P.G.	Mean Sq
1	Increasing FUEL	1.13	2.53
2	Increasing TYRES	3.63	26.3
4	Increasing SPEED	-2.92	17.1

Error Mean Square = 0
From 0 Degrees of Freedom

Note No's of interactions you wish to use as estimate of error variance from the following tables.

Press any key to continue

1st ORDER INTERACTIONS

No.	Change	Effect on M.P.G.	Mean Sq
3	FUEL TYRES	0.275	0.151
5	FUEL SPEED	0.225	0.101
6	TYRES SPEED	0.125	3.12E-2

Press any key to continue

2nd ORDER INTERACTIONS

No.	Change	Effect on M.P.G.	Mean Sq
7	FUEL TYRES SPEED	0.475	0.451

Enter No's of interactions you want to use as estimate of the error variance.
('0' to finish)

Figure 2. Print out on first Pass

MAIN EFFECTS

No.	Change	Effect on M.P.G.	F-ratio
1	Increasing FUEL	1.13	13.8
2	Increasing TYRES	3.63	143
4	Increasing SPEED	-2.92	93.1

Error Mean Square = 0.184
From 4 Degrees of Freedom

If F-ratio > 4.54 then effect of change is significant at >90% level.

If F-ratio = 0 then effect has been chosen to estimate error.

Figure 3. Print out on second Pass

Continued over the page


```

10 REM STATISTICS/ANALYSIS OF VARIANCE
20 REM FOR 2^N FACTORIAL EXPTS.
30 REM (C) C.R.WOODINGS/MAY 1983
40 REM FOR BBC MICRO MODEL B
50
60 MODE7:PROCTitle
70 CLS:PRINTTAB(0,12)"Enter number of
  factors (min=2:max=6) "
80 f=VALFNinPut(1,49,55):r=2^f
90 DIM F$(f),data(f,r),name$(f),efec(r),
  mnsqr(r),lbl$(r),int$(r)
100 fctr=f:rslt=r:ext=0
110 PROCdataload
120 REPEAT:dof=0:erv=0
130 CLS:IF FNyes_no(10,12,"Edit the data")
  :PROCreview
140 CLS:PRINTTAB(15,12)"COMPUTING":
  PROCanalysis
150 CLS:IF FNyes_no(1,11,"Do you have a good
  estimate of error variance from other
  trials") THEN PROCext:GOTO180
160 p=0:REPEAT:PROCprintout(p):PROCerror
  (p):p=p+1
170 UNTIL NOT FNyes_no(5,VPOS+1,
  "See the tables again")
180 UNTIL NOT FNyes_no(10,VPOS+1,
  "Another run")
190 MODE7:PROCdouble_height(11,"BYE",132)
  :END
200
210 DEFPROCtitle
220 PROCdouble_height(8,"STATISTICS",132)
230 PROCdouble_height(12,"Analysis of 2^n
  Factorial Experiment",131)
240 PROCcontinue:ENDPROC
250
260 DEFPROCdouble_height(row,words$,colour)
270 column=INT((40-LEN(words$))/2)-2
280 FOR I=row TO row+1:PRINTTAB(column,I):
  CHR$(141):CHR$(colour):words$
290 NEXT:ENDPROC
300
310 DEFFNyes_no(x,y,A$)
320 LOCAL ans:PRINTTAB(x,y):A$:"(Y/N) ? "
330 REPEAT:ans=(GET AND &DF):UNTIL ans=&59
  OR ans=&4E:PRINTCHR$(ans)
  =(CHR$(ans)="Y")
340
350
360 DEFPROCcontinue
370 PRINTTAB(7,23)"Press any key to
  continue ":REPEATUNTILGET:ENDPROC
380
390 DEFFNinPut(len,loASC,hiASC)
400 LOCAL K%,Z%:K%=0:In$="":PRINT STRING$(
  len,"."):STRING$(len+1,CHR$(8)):" "
  :%FX15,1
410 REPEAT:Z%=GET
420 IF Z%=127 AND K%>0 THEN K%=K%-1:In$=
  LEFT$(In$,K%):VDUZ%,46,8:GOTO450
430 IF Z%>loASC AND K%<len AND Z%<hiASC
  THEN K%=K%+1:In$=In$+CHR$(Z%):VDUZ%:GO
  TO450
440 IF NOT(Z%=13 AND K%>0) VDU7
450 UNTIL Z%=13 AND K%>0
460 =In$
470
480 DEFPROCreview
490 FOR N%=0 TO rslt-1
500 PROCentry("EDITING")
510 PRINT:data(0,N%):IF FNyes_no(8,15,
  "Change entry") THEN PRINTTAB(8,17)"NE
  W RESULT = ":data(0,N%)=EVALFNinPut
  (10,40,58)
520 NEXT:ENDPROC
530
540 DEFPROCdataload
550 FOR N=1 TO fctr:CLS
560 PRINTTAB(3,12)"Enter a name for factor
  ":N:" "
570 name$(N)=FNinPut(5,32,127):NEXT
580 CLS:PRINTTAB(5,12)"Enter a name for
  results.":
590 rslt=FNinPut(6,32,127):CLS:PRINTTAB
  (15,12)"COMPUTING"
600 REM rest of Procedure gets results in
  standard order for Yates Method
  X=1:R=0:REPEAT
610 FOR N%=1 TO rslt/X
620 FOR M%=1 TO X
630 IF N%DIV2<>N%/2 THEN F$(R)=F$(R)+
  " Lo" ELSE F$(R)=F$(R)+" Hi"
640 NEXT:NEXT:X=2*X:R=R+1:UNTIL R=fctr
650 FOR N%=0 TO rslt-1
660 PROCentry("LOADING")
670 data(0,N%)=EVALFNinPut(10,40,58)
680 NEXT:ENDPROC
690
700
710 DEFPROCentry(B$)
720 CLS:PRINTTAB(12,1)"DATA ":B$:PRINTTAB
  (0,11-fctr):
730 FOR X%=0 TO fctr-1:level$=MID$(F$(X%),
  N%*3+1,3)
740 PRINTTAB(10):name$(X%+1):TAB(17)"at":
  level$:
750 IF B$="EDITING" THEN 780
760 IF level$=" Hi" THEN level$="H" ELSE
  level$="L"
770 lbl$(N%)=lbl$(N%)+level$
780 NEXT:PRINT:TAB(10)"Result = ":ENDPROC
790
800 DEFPROCanalysis total=0
810 FOR M%=0 TO fctr-1
820 FOR N%=0 TO rslt-1 STEP 2
830 data(M%+1,N%/2)=data(M%,N%)+data
  (M%,N%+1)
840 data(M%+1,N%/2+rslt/2)=data(M%,N%+1)
  -data(M%,N%)
850 NEXT:NEXT
860 FOR N%=0 TO rslt-1
870 efec(N%)=data(M%,N%)/2^(M%-1)
880 mnsqr(N%)=data(M%,N%)/2/rslt
890 NEXT:mnsqr(0)=0:ENDPROC
900
910 DEFPROCprintout(Pass) @%=&308
920 CLS:PRINT:PROCheading("MAIN EFFECTS")
930 N=1:FOR M=1 TO fctr
940 PRINT:N:TAB(3)"Increasing ":name$(M):
  TAB(23):efec(N):TAB(32):
950 IF Pass=0 THEN PRINT:mnsqr(N) ELSE
  PRINT:mnsqr(N)/erv
960 N=N*2:NEXT:PRINT"Error Mean Square =
  ":erv"From ":dof:"Degrees of Freedom"
970 IF Pass THEN PRINT"If F-ratio>:f_ratio
  : then effect of change is sig
  nificant at >90% level."'"If F-ratio=0
  then effect has been chosen to estimate
  error."
980 IF ext OR Pass THEN 1000
990 PRINT"Note No's of interactions you
  wish to""use as estimate of error v
  ariance""from the following tables.""
1000 FOR N=2 TO fctr:PROCcontinue
1010 PROCints(N-1,Pass)
1020 NEXT:@%=10:ENDPROC
1030
1040 DEFPROCints(order,Pass) VDU26:CLS
1050 IF order=1 THEN S$="st" ELSE IF order=2
  THEN S$="nd" ELSE IF order=3 THE
  N S$="rd" ELSE S$="th"

```



```

1060 PRINT "order";S$;PROCHeading(" ORDER
INTERACTIONS")
1070 FOR N%=3 TO rslt: int$(N%)="":flag=-1
1080 FOR X%=1 TO fctr
1090 IF MID$(lbl$(N%),X%,1)="H" THEN int$(
N%)=int$(N%)+ " "+name$(X%):flag=flag
+1
1100 NEXT
1110 IF flag=order THEN PRINT N%;TAB(2);
int$(N%);TAB(23);efec(N%);TAB(32);GOT
O1120:ELSE GOTO1130
1120 IF Pass=0 THEN PRINT:mnsqr(N%) ELSE
PRINT:mnsqr(N%)/erv
1130 IF VPOS>21 THEN PROCcontinue:VDU28,0,
24,39,5:CLS
1140 NEXT:ENDPROC
1150
1160 DEFPROCHeading(C#)
1170 PRINTC$;TAB(21)"Effect on"
1180 PRINT"No. ";TAB(4)"Change";TAB(23);
rslt$;TAB(32);
1190 IF Pass=0 THEN PRINT"Mean Sq" ELSE
PRINT"F-ratio"
1200 PRINTSTRING$(39,"_"):ENDPROC
1210
1220 DEFPROCError(Pass) Dof=0
1230 IF ext THEN 1310
1240 IF Pass THEN PRINTTAB(2,9)"Add
interactions to error estimate?" ELSE
PRINTTAB(0,9)"Enter No's of interac
tions you want to""use as estimate of
the error variance."
1250 PRINTTAB(12)"('0' to finish)"
1260 REPEAT:err=VALFNinput(2,40,58):VDU9,9
1270 IF err=0 OR mnsqr(err)=0 THEN 1300
1280 erv=erv+mnsqr(err)
1290 mnsqr(err)=0:dof=dof+1:Dof=dof
1300 UNTIL err=0
1310 d=dof:IF Dof=dof erv=erv/dof
1320 IF dof>27 AND dof<60 THEN d=28
1330 IF dof=60 THEN d=29
1340 FOR N%=1 TO d:READ f_ratio:NEXT
1350 RESTORE:ENDPROC
1360
1370 DEFPROCext
1380 ext=-1:CLS:PRINTTAB(1,12)"Enter the
error variance estimate ";
1390 erv=VALFNinput(5,40,58)
1400 CLS:PRINTTAB(1,12)"Enter the degrees
of freedom on which this error va
riance is based.";
1410 dof=VALFNinput(5,40,58)
1420 PROCerror(1):PROCprintout(1):ENDPROC
1430
1440 DATA 39.9,8.53,5.54,4.54,4.06,3.78,3.59,
3.46,3.36,3.28,3.23,3.18,3.14
1450 DATA 3.1,3.07,3.05,3.03,3.01,2.99,2.97,
2.96,2.95,2.94,2.93,2.92,2.91
1460 DATA 2.90,2.85,2.75:REM 90% Probability
points of f_ratio for 1 to 27,>27,
and >59 degrees of freedom

```

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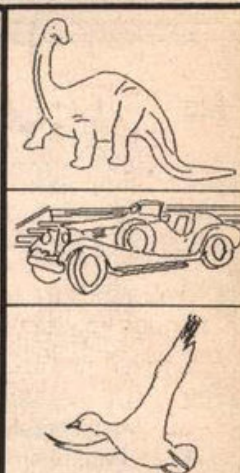
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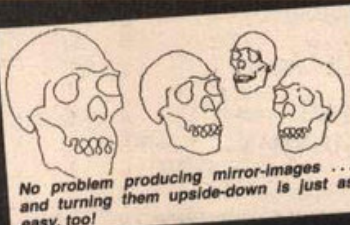
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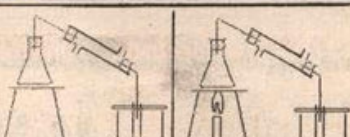


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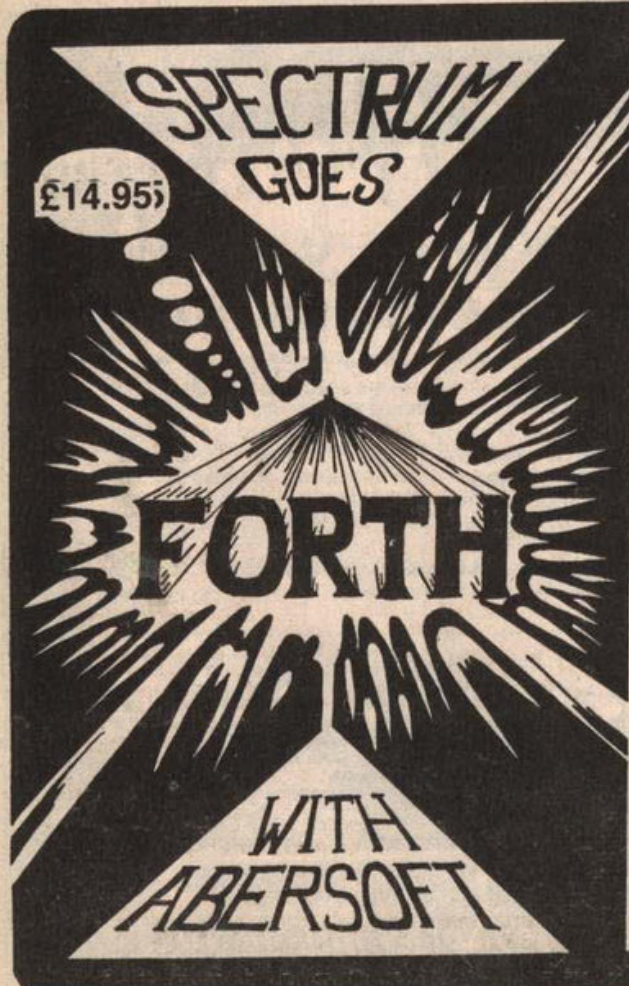
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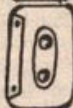
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Jackpot

on ZX81

The screen displays a fruit machine and all

the winning combinations possible. These can very easily be changed by changing lines 20 to line 35.

Line 47 to line 79 choose three different reels at random to be displayed for the

winnings. These can also very easily be changed by altering line 47. Add as many characters to the variable B\$ as you like, then alter line 50 (let $J = \text{INT}(\text{RND} \times 10) + 1$). The question mark should always be one more than the amount of characters in B\$.

When all this is done and it is exactly as you desire it to be, save it on tape by typing Goto 120. You are now ready to run it. Hit key "R" to spin the reels.

Graphics note

Line 47 = OX* (SHIFT T) (SHIFT H) (INV SPACE) (SHIFT Y) (INV £) (INV ?).

LISTING FROM JACKPOT I

```

1 REM "JACKPOT"
2 PRINT "10P"
3 PRINT "
4 PRINT "
5 PRINT "
6 PRINT "
7 PRINT "
8 PRINT "
9 PRINT "
10 PRINT "
11 PRINT "
12 PRINT "
13 PRINT "
14 PRINT "
15 PRINT "
16 PRINT "
17 PRINT "
18 PRINT "
19 PRINT "
20 PRINT AT 0,12;"
21 PRINT ""
22 PRINT AT 2,12;"
23 PRINT ""
24 PRINT AT 4,12;"
25 PRINT ""
26 PRINT AT 6,12;"
27 PRINT AT 8,12;"
28 PRINT AT 10,12;"
29 PRINT AT 12,12;"
30 PRINT AT 14,12;"
31 PRINT AT 16,12;"
32 PRINT AT 18,12;"
33 PRINT AT 20,12;"
34 PRINT AT 22,12;"
35 PRINT AT 24,12;"

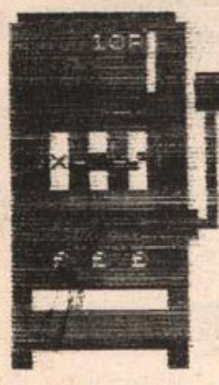
```

```

46 IF INKEY$<>"R" THEN GOTO 45
47 LET B$="OX#
48 DIM A$(3)
49 FOR F=1 TO 3
50 LET J=INT (RND*10)+1
78 LET A$(F)=B$(J)
79 NEXT F
80 FOR F=1 TO 3
82 FOR J=1 TO 7
83 PRINT AT 7,0+2*F;D$(J)
84 NEXT J
85 IF RND<.6 THEN GOTO 82
86 PRINT AT 7,0+2*F;A$(F)
90 NEXT F
100 IF INKEY$<>"R" THEN GOTO 46
105 CLS
106 RUN
110 STOP
120 SAVE "JACKPOT"
130 RUN

```

EXAMPLE FROM JACKPOT I

	£1:00
	0:90
	0:70
	0:50
	0:50
	0:50
	0:50
	0:30
	0:20
	0:10

Jackpot
by Peter Morton

Prism

on BBC

This program will produce a prism, which will rotate first in one direction, then the

other. The speed is controlled by the number added to A in the subroutines.

By adding a few points, a cube or more complex shape could be made.

Program notes

5 Cursor off

18-31 Draws the prism
32 This colour is easier on the eyes than normal white
39 Draws the foreground square
40-49 Decides which subroutine to use
51 Calls appropriate subroutine
1000,2000 Subroutines. Try altering the numbers.

```

5 VDU23;8202;0;0;0;
10 A=100:GOS=1000
11 XXX=100
15 MODE4
17 C=A+600
18 MOVE A+XXX,500:DRAW C+XXX,500
20 MOVE A+XXX,500:DRAWA,900
21 MOVE C+XXX,500:DRAWC,900
30 MOVE C+XXX,500:DRAWC,300
31 MOVE A+XXX,500:DRAW A,300
32 GCOL0,1

```

```

39 DRAWA,900:DRAWC,900:DRAWC,300:
DRAWA,300:GCOL0,2
40 IF A+800>1280 THEN GOS=2000
48 IF A<0 THEN GOS=1000
49 IF XXX=1200 THEN GOS=1000
51 GOSUB GOS
55 GOTO15
1000 A=A+10:XXX=XXX-10:RETURN
2000 A=A-10:XXX=XXX+10:RETURN

```

Prism
by M Weatherill

Lunar Lander

on Spectrum

In the game you are a ground-based flight controller responsible for the guidance and safe landing of several modules returning to the moon's surface at bases A and B.

More points are awarded for landing at

B, as it is more difficult than landing at A. The real problem is bringing the landing speed of the modules down to required limits before fuel is used up.

Once a module has crashed the game is over.

Program notes

User defined graphics: 1-2, 2026.

Draws scenery: 10, 100, 2001, 2025, 9813 & 9825.

Sets up variables: 110, 306, 2027.

Movement of module: 140-155, 300 & 310, 2020-2023, 2030, 9821-9835.

Draws border: 2013.

Checks module striking scenery: 305 & 2029.

Prints red border — fuel low: 311 & 2031.

Module landing: 2040.

Instructions: 8999.

Module crash routine: 9998-9999.

```

1 LET Q1=0: GO SUB 8999: PAUS
= 0: CLS: GO SUB 9002: FOR X=0
TO 7: READ A: POKE USR "A"+X,A:
NEXT X: DATA 126,195,255,126,24,
36,66,231: LET a=1: LET b=1: POK
E 23658,8: LET SCORE=0: FOR X=0
TO 7: READ A: POKE USR "B"+X,A:
NEXT X: DATA 3,31,56,63,63,63,31
7: FOR X=0 TO 7: READ A: POKE US
SR "C"+X,A: NEXT X: DATA 192,248
,60,252,252,252,248,224
2 FOR X=0 TO 7: READ A: POKE
USR "E"+X,A: NEXT X: DATA 192,22
$,112,56,28,62,0,0: FOR X=0 TO 7
: READ A: POKE USR "D"+X,A: NEXT
X: DATA 3,7,14,28,56,124,0,0
10 CLS: PLOT 0,56: DRAW 24,8:
DRAW 8,-8: DRAW 16,0: DRAW 0,-2
: DRAW 16,0: DRAW 56,64: DRAW 24
,4: DRAW -24,-64: DRAW 16,-56: D
RAW 8,0: DRAW 12,56: DRAW 20,4:
DRAW 8,52: DRAW 48,8: DRAW 16,-8
100 PRINT AT 15,6: "E": AT 14,20:
"8"
110 LET FUEL=35: LET SPEED=0: L
ET a=1: LET b=2
140 IF INKEY$="" THEN LET b=b+1
: LET SPEED=SPEED+1: PRINT AT a-
1,b-1: " ": AT a,b: " ": PRINT AT a
,b+1: " ": LET a=a+1
141 IF FUEL<9 THEN BORDER 2
143 IF INKEY$="6" THEN PRINT AT
a,b+1: "6": LET FUEL=FUEL-2
145 IF INKEY$="0" AND b<30 THEN
LET FUEL=FUEL-.5: LET SPEED=SPE
ED+.5: PRINT AT a,b+1: " ": LET b
=b+1: BEEP .1,20
150 IF INKEY$="5" AND b>0 THEN
LET FUEL=FUEL-.5: PRINT AT a,b+1
: " ": LET SPEED=SPEED+.5: LET b=
b-1: BEEP .1,20
151 PRINT AT 3,17: BRIGHT 1: IN
K 6: " ": BRIGHT 0
155 IF INKEY$="7" AND a>0 THEN
PRINT AT a,b+1: "7": LET SPEED=SP
EED-3: LET FUEL=FUEL-1: LET a=a-
1: BEEP .1,20
300 IF a=14 AND b=5 OR a=14 AND
b=4 THEN CLS: GO TO 9800
301 PLOT 248,0: DRAW 0,175: PLO
T 0,175: DRAW 0,-175
302 IF FUEL<0 THEN LET FUEL=0
303 IF SPEED<1 THEN LET SPEED=S
PEED+4
304 PRINT AT 3,17: BRIGHT 1: IN
K 2: " ": BRIGHT 0
305 IF SCREEN$(a,b)<>" " THEN
FOR f=0 TO 7: POKE USR "q"+f,RND
255: NEXT f: PRINT AT a,b+1: IN
K 6: " ": FOR f=1 TO 100: NEXT f:
CLS: GO TO 9000
306 PRINT AT 0,0: "VELOCITY ";SP
EED: " ": AT 21,10: "SCORE ";SCORE
: AT 0,15: "FUEL ";FUEL: FOR f=0 T
O 15: PRINT AT a,b+1: " ": NEXT f
310 IF a=10 AND b=20 OR a=10 AN
D b=19 THEN GO TO 2000
311 IF FUEL<1 THEN LET a=a+1: P
RINT AT a-1,b+1: " ": AT a,b+1: "X"
: GO TO 300
900 GO TO 111
2001 CLS: IF Q1=0 THEN PLOT 152
,0: DRAW 56,16: DRAW 0,16: DRAW
-8,0: DRAW 16,48: DRAW -8,32: DR
AW 8,40: DRAW 38,0: PLOT 48,0: D
RAW 8,24: DRAW 8,0: DRAW 0,16: D
RAW 16,64: DRAW -24,40: DRAW -56
,0: LET Q=3: LET U=15: PRINT AT
0,U: "A": AT 0-1,U: " "
2013 PLOT 0,0: DRAW 255,0: DRAW
0,168: DRAW -255,0: DRAW 0,-168
2020 IF INKEY$="8" THEN PRINT AT
0,U-1: " ": AT 0-1,U-1: " ": AT 0-1
,U+2: " ": AT 0,U+2: " ": LET U=U+1
2021 IF INKEY$="5" THEN PRINT AT
0,U+2: " ": AT 0-1,U+2: " ": AT 0,U
-1: " ": AT 0-1,U-1: " ": LET U=U-1
2022 IF INKEY$="7" AND 0-1>1 THE
N LET Q=0-1: PRINT AT 0+1,U: "

```

```

: LET SPEED=SPEED-3: LET FUEL=FU
EL-1
2023 IF INKEY$="" THEN LET Q=Q+1
: PRINT AT 0-2,U: " ": LET SPEED
=SPEED+1
2024 PRINT AT 0,U: "A": AT 0-1,U:
" "
2025 IF Q=19 AND Q1=0 THEN CLS:
LET Q1=1: LET Q=3: IF Q1=1 THEN
PLOT 120,32: DRAW INK 3,16,0: P
LOT 120,16: DRAW 16,0: DRAW 0,8:
DRAW 48,0: DRAW -16,32: DRAW 8,
32: DRAW -16,24: DRAW -8,16: DRA
W 8,40: PLOT 120,16: DRAW 0,8: D
RAW -24,0: DRAW -32,40: DRAW 24,
40: DRAW -24,32: DRAW -16,32
2026 PRINT AT 0,U: "A": AT 0-1,U:
" "
2027 IF SPEED<1 THEN LET SPEED=0
2028 IF FUEL<1 THEN LET FUEL=0
2029 IF SCREEN$(0+1,U)<>" " AND
ATTR (0+1,U)<>3 THEN GO TO 9998
: IF SCREEN$(0+1,U+1)<>" " AND
ATTR (0+1,U+1)<>3 THEN GO TO 999
8: IF SCREEN$(0,U-1)<>" " AND A
TTR (0,U)<>3 THEN GO TO 9998: IF
SCREEN$(0,U+2)<>" " AND ATTR (
0,U)<>3 THEN GO TO 9998
2030 IF INKEY$="6" THEN PRINT AT
0,U: "A": AT 0-1,U: " ": LET FUE
L=FUEL-2
2031 PRINT AT 1,0: "VELOCITY ";SP
EED: " ": FUEL("FUEL: ") SCORE("S
CORE: ")
: IF FUEL<2 THEN PRI
NT AT 0-2,U: " ": AT 0-1,U: " ":
LET Q=Q+1: GO TO 2024
2032 PRINT AT 1,0: "VELOCITY ";SP
EED: " ": FUEL("FUEL: ") SCORE("SC
ORE: ")
: IF SPEED<0 THEN LET
SPEED=3
2033 PRINT AT 0,U-2: " ": PRINT A
T 0,U-1: " ": AT 0-1,U-1: " ": AT 0,
U+2: " ": AT 0-1,U+2: " "
2040 IF Q=15 AND U=15 AND Q1=1 A
ND SPEED<5 AND SPEED>0 THEN PRI
NT AT 0-1,U: " ": AT 0,U: " ": PRI
NT AT 0+1,U: " ": AT 0+2,U: "A":
PLOT 120,31: DRAW INK 2,16,0: LE
T SCORE=SCORE+4: FOR F=0 TO 150:
NEXT F: GO TO 9911
2041 IF FUEL<10 THEN BORDER 2
8997 GO TO 2010
8998 STOP
8999 CLS: BORDER 0: PAPER 0: IN
K 7: CLS: PRINT AT 21,0: "Press
any key": PRINT AT 0,11: "MESSAGE
TO": AT 2,6: FLASH 1: "DANGER CON
TAINED": FLASH 0: AT 4,4: "BY DAVI
D DYER (AGE 11)": AT 10,6: "THE KE
YS ARE AS FOLLOWS": AT 12,10: "8-
RIGHT": AT 14,10: "5-LEFT": AT 16,1
0: "6-HOLD": AT 18,10: "7-THRUST":
RETURN
9000 CLS: PRINT AT 8,2: "END OF
MISSION": AT 10,2: "MODULE DESTROY
ED": AT 12,2: "COLLISION VELOCITY
WAS ";SPEED:
KNOTS": AT 16,2: "YOUR
SCORE IS ";SCORE
9001 STOP
9002 CLS: PLOT 16,149: DRAW 176
,0: PRINT AT 2,2: "TOUCH DOWN VEL
OCITIES": AT 5,2: "BASE 'A' 0-2 K
NOTS. SCORE+2": PRINT AT 7,2: "A
BASE 'B' 0-5 KNOTS. SCORE+4": A
T 21,0: "Press any key to contact
module": PAUSE 0: CLS: RETURN
9813 LET g=3: LET h=12: PRINT AT
g-1,h+1: " ": AT g,h+1: "A"
9814 PRINT AT 1,1: "VELOCITY ";SP
EED: " ": AT 2,1: "FUEL ";FUEL: " ":
AT 3,1: "SCORE ";SCORE: " "
9815 PLOT 0,32: DRAW 70,16: DRAW
24,40: DRAW 0,-32: DRAW 40,0: D
RAW 0,40: DRAW 24,-24: DRAW 48,0
: DRAW -8,-64
9820 PRINT AT g-1,h+2: " ": AT g,h
+2: " ": PLOT 0,0: DRAW 255,0: DR
AW 0,175: DRAW -255,0: DRAW 0,-1
75

```



```

9821 IF INKEY$="" THEN LET g=g+1:
: LET SPEED=SPEED+1: PRINT AT g-
2,h;"
9822 IF INKEY$="7" AND g-1>3 AND
SPEED>0 THEN LET SPEED=SPEED-2:
LET FUEL=FUEL-1: LET g=g-1: PRI
NT AT g+1,h;"
9823 IF INKEY$="5" AND h>5 THEN
LET h=h-1: PRINT AT g,h+2;" ";AT
g-1,h+2;" "
9824 IF INKEY$="6" AND h<26 THEN
LET h=h+1: PRINT AT g,h-1;" ";A
T g-1,h-1;" "
9825 PLOT 0,32: DRAW 70,16: DRAW
24,40: DRAW 0,-32: DRAW 40,0: D
RAW 0,40: DRAW 24,-24: DRAW 48,0
: DRAW -8,-64
9827 IF SPEED<0 THEN LET SPEED=S
PEED+4
9829 IF INKEY$="6" THEN PRINT AT
g-1,h;"⊙";AT g,h;"▲": LET FUE
L=FUEL-2
9830 IF FUEL<0 THEN LET FUEL=0:
IF FUEL<1 THEN LET g=g+1: PRINT
AT g-2,h;" "; PRINT AT g,h;"▲"
:AT g-1,h;"⊙": IF SCREEN$(g+1,
h)<>" " THEN GO TO 9999: IF SCRE
EN$(g+1,h+1)<>" " THEN GO TO 99
99: GO TO 9825
9832 IF SCREEN$(g,h-1)<>" " AND
ATTR(g,h)<3 THEN GO TO 9999
9833 IF SCREEN$(g,h+2)<>" " AND
ATTR(g,h)<3 THEN GO TO 9999
9834 PRINT AT g,h-1;" ";AT g-1,h
-1;" "; PRINT AT g-1,h;"⊙";AT g
,h;"▲"
9835 PLOT INK 3,104,64: DRAW INK
3,16,0: IF g=13 AND h=13 AND SP
EED>0 AND SPEED<3 THEN PAUSE 0:
LET SCORE=SCORE+2: FOR F=0 TO 20
0: NEXT F: CLS : GO TO 9900

```

```

9836 PRINT AT 1,1;"VELOCITY(";"SP
EED;")";AT 2,1;"FUEL(";"FUEL;")"
;AT 3,1;"SCORE(";"SCORE;")"
9837 IF FUEL<10 THEN BORDER 2
9880 GO TO 9820
9911 BORDER 0: CLS : PAUSE 50: P
RINT AT 10,0;"ALPHA-CORRECT SURF
ACE CONTACT.";AT 11,0;"STANDBY C
ONTROLLER FOR NEXT MODULE AR
RIVING ON SCHEDULE:"""Press any
key to contact next module":
PAUSE 0: GO TO 10
9998 BORDER 0: FOR F=0 TO 9: FOR
X=1 TO 8: POKE USR "0"+X,RND*25
5: NEXT X: PRINT AT 0,W-1; INK 6
; FLASH 1;"SSS";AT 0-1,W-1; INK
6; FLASH 1;"SSS"; FLASH 0: NEXT
F: PRINT AT 0,W;"";AT 0-1,W;""
; CLS : FOR F=0 TO 21: PAUSE
5: PRINT AT F,8;"END OF MISSION
";AT F-1,8;""; NEXT
F: PRINT AT 10,0;"Press any ke
y for another game": PAUSE 0: RU
N
9999 BORDER 0: FOR F=0 TO 10: FO
R X=0 TO 7: POKE USR "0"+X,RND*2
55: NEXT X: PRINT AT g,h; INK 6;
FLASH 1;"SSS";AT g-1,h; INK 6;
FLASH 1;"SSS"; NEXT F: PRINT AT
g,h;"";AT g-1,h;""; CLS :
FOR F=0 TO 21: PAUSE 5: PRINT AT
F,8;"END OF MISSION";AT F-1,8;""
; NEXT F: PRINT A
T 10,0;"Press any key for anothe
r game": PAUSE 0: RUN

```

Lunar Lander

by G Dyer

Colour Mix

on BBC Micro

I have enclosed a utility program for either

model of the BBC computer which will allow the user to intermix any two colours from a range of eight available colours.

This will produce fairly reasonable colours you would expect if you mixed the colours as if they were paint.

But as many readers will know they can't be mixed as well, as they are not 'pure' colours. The produced colours will not be true, but I hope this short program will help readers to make their choice for colour mixes good ones.

```

10
20 REM"                Colour Mix
30 A$="      Author:   Mark Colson
40
50 MODE7
60 VDU23;8202;0;0;0;
70 VDU23,224,170,85,170,85,170,
  85,170,85
80 PROCIntro
90 MODE4
100 VDU23;8202;0;0;0;
110 VDU19,0,A-1;0;
120 VDU19,1,B-1;0;
130 FORA=1TO1240
140 VDU224
150 NEXT
160 A$=GET$
170 RUN
180
190 DEF PROCIntro
200 PRINTCHR$157
210 FORF=1TO2:PRINTCHR$157CHR$141
  CHR$129CHR$136TAB(14)"COLOUR
  MIX":NEXTF

```

```

220 PRINTCHR$157
230 PRINT "CHR$131CHR$157CHR$130
    TAB(6)A$" "CHR$156
240 PRINTCHR$157CHR$132"PICK TWO
    OF THESE COLOURS (BY NUMBER)"
250 PRINTCHR$157
260 DATABLACK,RED,GREEN,YELLOW,
    BLUE,MAGENTA,CYAN,WHITE
270 FORF=1TO8
280 READA$
290 PRINTCHR$157CHR$133TAB(5)F;"
    "A$
300 NEXTF
310 PRINTCHR$157
320 PRINTCHR$133CHR$157CHR$135TAB
    (4)"Press any key after to
    continue "CHR$156
330 A=VAL(GET$)
340 B=VAL(GET$)
350 ENDPROC
>RUN

```

Colour Mix
by Mark Colson

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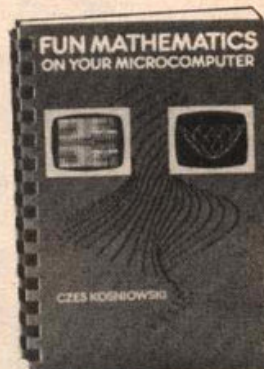
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Parachute Attack

on Lynx

This is a game for the Lynx involving falling parachutes.

You are on a hillside and parachutes are

falling from the sky and into a boat.

You must shoot them before they get there. You are given six skill levels which determine how and how fast the parachutes falls.

Shoot with the space bar — you have 20 shots. The computer will bleep when you

have hit a parachute.

Variables

T=Total points
E=Skill level and speed of parachute
A+B=Co-ordinates
O\$=Points or Point
R = Parachutes that got away

```

100 REM *** PARACHUTE ATTACK ***
110 REM *** JOANNA GREENWOOD ***
120 LET R=0
130 LET T=0
140 LET M=0
150 LET X=100
160 LET U=190
170 LET P=0
180 LET N=0
190 CLS
200 INPUT "SKILL LEVEL (1 TO 6)";E
210 IF E>6 THEN GOTO 200
220 LET E=E+1
230 RANDOM
240 PAPER 1
250 CLS
260 INK 4
270 FOR D=135 TO 230
280 LET U=U-1
290 PLOT 0,U,D
300 PLOT 2,255,D
310 NEXT D
320 INK 0
330 FOR G=120 TO 134
340 PLOT 0,212,G
350 PLOT 2,215,G
360 NEXT G
370 INK 0
380 FOR L=115 TO 119
390 PLOT 0,190,L
400 PLOT 2,220,L
410 NEXT L
420 INK 5
430 FOR J=231 TO 247
440 PLOT 0,0,J
450 PLOT 2,255,J
460 NEXT J
470 INK 0
480 FOR Y=215 TO 229
490 LET X=X-1
500 LET M=M+1
510 PLOT 0,M,Y
520 PLOT 2,X,Y
530 NEXT Y
540 LET B=5
550 LET A=AND(90)+10
560 INK 7
570 PLOT 4,A,B
580 PLOT 0,A-2,B+1
590 PLOT 2,A+2,B+1
600 PLOT 0,A-4,B+2
610 PLOT 2,A+4,B+2
620 PLOT 0,A-5,B+3
630 PLOT 2,A+5,B+3
640 PLOT 0,A-5,B+4
650 PLOT 2,A+5,B+4
660 PLOT 0,A-4,B+5
670 PLOT 2,A,B+13
680 PLOT 0,A+4,B+5
690 PLOT 2,A,B+13
700 PLOT 0,A,B+5
710 PLOT 2,A,B+13
720 IF N=9 THEN GOTO 1020
730 IF INK=1 THEN GOTO 770
740 INK 1
750 IF KEY$=" " THEN GOTO 820
760 GOTO 570
770 LET B=B+E
780 IF B>203 THEN LET R=R+1
790 IF B>203 THEN GOTO 540
800 IF KEY$=" " THEN GOTO 820
810 GOTO 560
820 INK 6
830 PLOT 0,189,117
840 PLOT 2,A,117
850 IF INK=1 THEN GOTO 900
860 LET P=P+1
870 IF P>20 THEN GOTO 1040
880 IF INK 1
890 GOTO 830
900 IF B+4=117 THEN GOTO 950
910 IF B+5=117 THEN GOTO 950
920 IF B+6=117 THEN GOTO 950
930 IF B+7=117 THEN GOTO 950
940 GOTO 570
950 LET T=T+1
960 BEEP 50,100,63
970 INK 7
980 PAUSE 2500
990 LET N=9
1000 INK 1
1010 GOTO 570
1020 LET N=0
1030 GOTO 540
1040 CLS
1050 VDU 24
1060 IF T<>1 THEN LET O$="S"
1070 ELSE LET O$=" "
1080 PRINT "YOU SCORED ";T;" POINT";O$
1090 PRINT "USING 20 SHOTS"
1100 IF R<>1 THEN LET O$="S"
1110 ELSE LET O$=" "
1120 PRINT R;" PARACHUTE";O$;" GOT AWAY"
1130 VDU 25
1140 PRINT @ 3,80;"WOULD YOU LIKE ANOTHER GO (Y/N)"
1150 IF GET$="Y" THEN GOTO 100
1160 END

```

Parachute Attack
by Joanna Greenwood

Early Bird

on Spectrum

You are a poor little bird who is stranded in Mr Green's garden with a broken wing. But be careful, a cat is on the prowl and out to devour you.

In the garden there is a puddle that slowly soaks away. You must avoid hopping into it or you will drown.

In order to recover you must catch 10 worms.

Full instructions are contained in the program.

Program notes

10-80 User defined graphics.
99-199 Initialise
200-299 Set up screen
300-320 Move bird and check position
325-350 Move cat and check position
360-380 Move worm and check position
800-987 Concluding comments
990-999 Instructions

```

1 GO SUB 990
10 FOR I=0 TO 60: READ B: PEEK
110 DATA 56,40,56,16,140,64,56,
120 DATA 165,90,189,60,60,24,24
130 DATA 24,24,36,219,219,36,24
140 DATA 0,3,4,100,166,144,0,0
150 DATA 199,135,130,254,254,25
160 DATA 6,135,66,56,56,16,16,2
170 DATA 0,0,0,0,0,0,0,0
180 DATA 96,225,34,28,28,8,6,24
190 LET SC=0: LET I=.5: GO SUB
200
100 GO SUB 296: LET A=6: LET B=
8: LET X=10: LET Y=30
120 LET WX=INT (RAND*21): LET WY
=INT (RAND*21): IF WITH (WX, WY)
05 THEN GO TO 120
130 LET BS="H"
140 PRINT AT X,Y:BS:AT 5,B: INK
0:"E":AT 0X,0Y: INK 2:"D"
150 GO TO 300
200 PAPER 4: INK 4: INVERSE 0:
OVER 0: BRIGHT 0: FLASH 0: BORDE
R 4: CLS
210 FOR I=0 TO 31: PRINT INK 0:
AT 0,I:"H":AT 21,I:"H":AT I/1.5
I,0:"H":AT I/1.5,21:"H":NEXT I
220 PRINT AT 1,1: INK 1:" "
FOR J=2 TO 6: PRINT AT I,1:
INK 1:" " :NEXT J
230 FOR I=7 TO 20: PRINT AT I,1
: INK 0:" " :NEXT I: PRINT
INK 0:" "
240 PRINT AT 2,2: BRIGHT 1: INK
6: PAPER 5: BRIGHT 1: AT
250 PRINT PAPER 7: AT 3,2:

```

Continued on page 39

PROGRAM OF THE WEEK

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OPEN FORUM

```

3,0;" "AT 5,2;" "AT 5,6;" "
280 FOR I=18 TO 20: PRINT AT I,
8; PAPER 0; BRIGHT 1;
NEXT I
290 FOR I=1 TO 20: PRINT PAPER
0; INK RND#3+2; AT RND#2+18, RND#2
+8; CHR$( (RND#2)+144); NEXT I
295 RETURN
296 LET X=10: LET Y=15
297 FOR I=1 TO 100: PRINT AT X,
Y; INK 5;
298 LET X=X+RND#1.5-RND#1.5: LET
Y=Y+RND#1.5-RND#1.5: LET X=X-(
X>17)+(X<1): LET Y=Y-(Y>30)+(Y<8)
299 NEXT I: RETURN
300 LET X1=X: LET Y1=Y: PRINT A
T X,Y;"
305 LET X=X+(INKEY$="6" AND X<1
7)-(INKEY$="7" AND X>1): LET Y=Y
+(INKEY$="8" AND Y<30)-(INKEY$="
9" AND Y>30): IF Y>Y1 THEN LET b
=CHR$(Y1-Y+150)
306 IF X=INT (WX+.5) AND Y=INT
(WY+.5) THEN GO TO 950
307 IF X=INT (a+.5) AND Y=INT (
b+.5) THEN GO TO 900
308 IF ATTR (X,Y)=37 THEN GO TO
850
310 IF ATTR (X,Y)<>36 THEN LET
X=X1: LET Y=Y1
315 IF AND(.5-1 THEN PRINT AT R
ND#16+1, RND#22+8;"
320 PRINT AT X,Y; INK 2; b$
325 LET a1=a: LET b1=b: PRINT A
T a,b;"
330 LET a=a+(X<1 AND ATTR (a+
1,b)<>37)-(X>17 AND ATTR (a-1,b
)<>37): LET b=b+(Y<30 AND ATTR
(a,b+1)<>37)-(Y>30 AND ATTR (a,
b-1)<>37)
331 LET a=a+(a<1)-(a>17): LET b
=b+(b<30)-(b>30)
333 LET b2=b: LET a2=a
339 IF a=X AND b=Y THEN GO TO 9
00
350 PRINT AT a,b; INK 0;"E"
355 LET WX=X: LET WY=Y
370 PRINT AT WX,WY;" ": LET WX=
WX+RND-RND: LET WY=WY+RND-RND: I
F ATTR (WX,WY)<>36 THEN LET WX=W
X1: LET WY=WY1
380 PRINT AT WX,WY; INK 1;"D"
390 GO TO 300
850 FOR I=10 TO -11 STEP -2: BE
EP .05,I: BEEP .05,I+2: BEEP .05

```

```

I+3: NEXT I
860 PAUSE 30: BORDER 0: PAPER 0
INK 7: CLS
870 PRINT "Birds can't swim wi
th a broken wing."
880 GO TO 980
900 FOR I=20 TO 0 STEP -1.5: BE
EP .05,I: BEEP .1,30: NEXT I
910 PAUSE 30: BORDER 0: PAPER 0
INK 7: CLS
920 PRINT "The cat needed a m
eat too..." "You needed to eat
10-sc; more worms" to amend y
our wing."
930 GO TO 980
950 LET sc=sc+1: LET l=l+.1: IF
sc=10 THEN GO TO 950
955 PRINT HI 4,4: INK 7: PAPER
0: BRIGHT 1; sc: FOR I=1 TO 17: P
RINT AT I,8;"
NEXT I: GO TO 100
965 PAUSE 30: BORDER 0: PAPER 0
INK 7: CLS
970 PRINT "Your wing is mended
and you can fly back to your nes
t."
980 PRINT "Another game (Y/N) ?
985 INPUT g$: IF g$="Y" OR g$="
Y" THEN RUN 90
987 STOP
990 CLS: PAPER 7: INK 0: BORDE
R 4: CLS: PRINT TAB 6;"THE EARL
Y BIRD"
Good morning, this m
orning you are a bird. A poor inj
ured bird helpless on the ground
d because your wing is broken.
Somewhere there are
ten little worms waiting to be a
te. But there is also a cat.
The cat is tired to begin with b
ut speeds through the game.
There is a puddle in
the lawn that must be avoided
but this puddle soaks into the ground
slowly."
991 PRINT "To move use keys
5 to 8."
992 PRINT "Press any key to s
tart."
995 IF INKEY$="" THEN GO TO 995
999 CLS: RETURN

```

Early Bird
by Richard Evans

DRAGON 32 ACE HIGH



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

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FEATURING— The ZX Spectrum—Your Personal Computer

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OPEN FORUM

Prime Number

on Vic20

This program works on any Vic20 and many other machines with the minimum of adjustment.

The user types in a number above 1 and the computer will then proceed to work out all the prime numbers between 1 and your number. The results will be printed out on the screen unless the following adjustment

is made to print it out on the printer:

add 85 OPEN 1,4:CMD1
change 120 PRINT#1:CLOSE:END

Other machine users (ie, the Sinclair ate command will have to be inserted to 1) Open the printer command channel in line 85, and 2) Close the printer command channel in the line 120.

Other machine users (i.e. the Sinclair ZX81 and Spectrum) will also have to delete the cursor commands in lines 60, 70 and 80.

Program notes

Line
60 (Cursor command — Clear Screen) asks for the user to type in a number.
70 (Cursor command — Cursor Down) demonstrates what the number shows.
80 (Cursor command — Cursor Down) INPUTs the number and checks to see whether it is valid.
90 PRINTs the first prime number (a 2) and starts the FOR-NEXT loop.
100 Checks to see if the number is prime, and if it is, PRINTs it.
110 Identifies that the number is not prime.
120 Terminates the program.

```
10 REM*****
20 REM*
25 REM* PRIME NUMBER FIND
30 REM*
40 REM* BY M.A. VALENTINE
45 REM*
50 REM*****
60 PRINT"[CLR]ENTER LAST NUMBER TO BE CHECKED."
70 PRINT"[CD]I.E. '1000' CHECKS FROM 2 TO 1000."
80 INPUT"[CD]";N$:N=VAL(N$):IFN<2ORN<>INT<N>THEN80
90 PRINT" 2";:FORC=2TON
100 FORA=2TOSQR(C):IF(C/A)<>INT(C/A)THENNEXT:PRINT" "C;:NEXT:GOTO120
110 A=SQR(C):NEXT:NEXT
120 END
```

Prime Number
by M Valentine

Adventure Competition

Write an adventure game and win a Commodore 64!

Popular Computing Weekly is offering a star prize of a Commodore 64 for the best adventure game written for any home micro — PLUS — a special prize of a Vic20 for the best essay on an adventure theme — PLUS — for the next 10 runners-up, two Commodore adventure games.

Each week during May, *Popular Computing Weekly* will publish a coupon — simply cut out any three and send them in with your entry.

The best adventure games are ideally a combination of action and logical riddles. For instance, to open a door, the player should not merely have to find the magic word, but have to solve a puzzle in order to progress to the next location. Good graphics obviously enhance a program — and we'll be looking for a game that makes imaginative use of graphics, although that does not mean that a text-only program will be eliminated.

Other things we will be looking for are the surprise twists that make a program worth coming back to again and again.

And remember, don't make your game too difficult in the early stages — adventuring novices should have a chance to get some way into the game before getting stuck!

For those of you submitting scenarios with your program, think of it as a guide line for a programmer. Draw a map showing location objects and other important details of your

adventure, and compile a dictionary of key words that your program will accept.

If you do not want to write a full-blown adventure game, you can still enter the competition by writing an essay (up to 2,000 words) on an original adventure theme. A Vic20 will be awarded to the essay which describes the most original and interesting adventure game.

The competition will be judged by Tony Bridge and *Popular Computing Weekly* editor Brendon Gore.

PRIZES

1. Commodore 64
2. Vic20
3. Two Commodore adventure games of your choice for 10 runners-up.

HOW TO ENTER

All you have to do to enter this competition is collect the coupons from three issues of the magazine and send them, together with your entry (stating which machine your game is for) to:

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Adventure Competition
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

RULES

1. Each entry must consist of your adventure, or essay, together with three coupons, and your name and address.
2. Closing date for the Adventure Competition is 30 June 1983.
3. The judges' decision is final.
4. No employees of Sunshine Publications Ltd, or their families, will be eligible to enter.

Adventure Competition

4

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If all this is familiar to you, then you have probably played *Dungeons and Dragons*. *The Valley*, from Kayde Software, is a program for the expanded Spectrum, Vic20, Dragon, Newbrain and Oric, based on the combat system and monsters of that most popular Role Playing game. *Computing Today*, over a year ago, featured a program of the same name. Documented in great detail, it was written in Petsoft, with conversions available for the TSR and Sharp machines.

Generally, the program works well, although a black mark must be given to Kayde as the program does not *Auto-run* after *Loading*. This is a silly mistake nowadays — it's so easy to include the routine, and gives a much better impression to the player.

However, the rest of the program is much better. After selecting the skill level you want to play at (for some reason called "Speed Level" — there's no speeding involved in this game!), you are asked to choose a character. In true *D&D* fashion you may be wizard, cleric, thinker, warrior or barbarian — they all have their own effect on the later stages of the game, and you'll probably have your own favourite.

Then, the first map is drawn. A winding road, the "safe path", crosses a barren landscape which contains a few swamps and forests. At either end of the road is a castle, a refuge at which you may rest and rejuvenate and to which you must return treasures found along the way.

The article accompanying the original program went into the background of the scenario in great detail, with one of those high-flown gothic stories of magic and chivalry. Unfortunately, there is none of that here.

The general atmosphere, however, is medieval — you can tell that because of the language (there are lots of "thees" and "thous"), and the shape that represents you, a shield with white cross.

While on the safe path, no harm will befall you, as no creature will attack — but that's rather boring, and you certainly won't progress that way. Step off the path and you're fair game for any passing creature. The object is to move across the map picking up experience points along the way, as well as treasure, of course, like any self-respecting knight. Each swamp and forest contains temples or lodges, with several rooms, in some of which may be secreted the various gems and hoards of gold. These buildings are surrounded by lakes, inhabited, naturally, or rather unnaturally, by watery monsters.

The database for monster generation contains such lovely things as ringwraiths, harpies, minotours and wyverns, amongst many others. The monsters are of two sorts — natural or supernatural. You must make the appropriate reaction to each kind, by using one of three kinds of spells, or using your sword to hack at a specified part of the creature.

The ultimate aim of the adventure is to go from lowly Monsterfood (rating #1) through Necromancer and Paladin to Master of Destiny (rating #28). To get your rating, you must return to one of the castles with the various rings and helms

that you've picked up in your travels.

On the H-scale (where Melbourne House's *The Hobbit* is assumed to have an arbitrary score of 20), *The Valley* must rate about 17. A vital point is lost because of the lack of the presentation at the start and for having no *Auto-run*. Another point off for not having a *Save* routine. This is fairly serious, as the game will obviously take many hours to play.

However, the reason for losing the third point (the program is written in slow Basic) may actually help you. The lack of speed is regrettable, though you can live with it, but being written in a high-level language the program is easily adaptable. It should be fairly easy to write in your own *Save* character and program routine.

So, although the program shows its age, the adventure is nevertheless going to give you hours of non-cerebral, bash-about, rip-roaring fun!

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

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

The highest score sent in so far this month is 9968 from Carl Doran of Skidby Mill, N. Humberside. If you have a higher score, you could still win this month's £10 — but hurry, entries close on May 31.

Notes

- 1) Each entry must consist of a ZX printout and your name and address.

Can you beat the new high score?

- 2) Closing date for this month's *Cruising* challenge entries is May 31.
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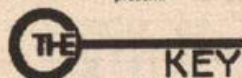
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ATARI 400 16K + basic cartridge, £125, as new. Tel: (0202) 517342.

ZX81 + 16K RAM. Fully boxed including software, only £40. Tel: (0226) 382851.

JUPITER ACE. Hardly used, £65 ono. Tel: Gravesend (0474) 61608.

TRS80 L2/16K with CTR80, green screen, lower-case mod., sound monitor, RS232 interface + £200 software (including scripsit), £350. Tel: Gravesend 332817 evenings.

VIC SOFTWARE SUPER EXPANDER, Vic graphics £25, three Bug-Byte rabbit tapes £10, Voodoo Castle £15, three-slot Motherboard + 8K £30, stack light pen £15, Rabbit Myriad plus Charset 20, £10. Contact P. Boyd, 6 Whitefield Road, Holbury, Hants.

CREED 75 TELEPRINTER (CASED), with modem/dial unit, paper, etc. Very good condition, £50. Buyer collects. Tel: Stratford-on-Avon (0789) 69571.

Computer Swap 01-930 3266

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

Spectrums for sale

48K SPECTRUM with DK'Tronics keyboard, with numeric pad and built-in light pen + brand new Kempston joystick and additional sound generator, which can produce sounds that would make a BBC user jealous, £260. Tel: Rainham (Essex) 23341.

48K SPECTRUM with ZX printer, £160. Tel: 0222 867086.

48K SPECTRUM, 10 weeks old, £300 software, all top games, £160. Tel: 061-336 5954.

SPECTRUM 16K, mint condition. Lots of software including cassettes and magazines, £110. Tel: 01-870 2235.

16K SPECTRUM. Issue two + Horizons tape, two Space Invaders, £75. Tel: 01-337 0989.

ZX81 16K + DK'Tronics keyboard and £30 software, £65 ono. Tel: 0622 676810 after 4 pm.

16K SPECTRUM + software including Scramble and Avenger, £90. Tel: 01-304 5974.

16K SPECTRUM with lots of software, books, print and plotter, £130. Tel: Bedford 212646 after June 4.

16K SPECTRUM. Leaving country, £65 ono. Tel: 061-366 8223 (anytime).

ZX81s for sale

16K ZX81 with Redditch keyboard, £60 of software, magazines and two manuals. Asking £90 ono. Tel: 0292 89280. Ayr, Scotland.

ZX81 1K + software, manual, leads, four months' old. Upgrading to Spectrum, £35. Tel: Llanboidy (099 46) 211 after 4 pm.

ZX81, 16K, with Fuller keyboard, books and software, £100. Tel: 051-327 6629 after 6 pm.

16K RAM PACK for ZX81, £20. Brand new, under guarantee from April. Unused. Tel: Stubbington 662787.

16K ZX81 with DK'Tronics keyboard, printer, extra paper, AGS joystick converter + one joystick, high resolution graphics pack, £50 of software + magazines, £100 ono. Tel: 01-883 3653.

ZX81 16K with Dean Electronics keyboard + Q5 sound board + motherboard + £50 of software + books, worth £180, sell for £90. Tel: 01-854 2987 after 6 pm.

ZX81 1K, excellent condition, all leads, power pack, manuals, some software, £30 for quick sale. Tel: Mr Leete, 0753 74111 (office hours).

ZX81 16K with full size keyboard and lots of software, £80. Tel: Croston 600263.

16K ZX81 with Press keyboard + manuals and leads + four tapes and a few magazines, £60. Tel: 499-4374 (after 5 pm).

ZX81 + 16K, Quicksilver soundboard/motherboard, DK'Tronics graphics board. Can be sold separately, £90. Tel: Tunbridge Wells 29101.

16K ZX81 with Redditch keyboard, Abacus controller, printer and books + games, £75. Tel: Reading 475826.

ZX81 + 16K, still boxed + over £100 of software, £100 ono. Tel: Evesham 2487.

16K ZX81 with File 60 keyboard and beginner's book, £65. Tel: Crawley 883922.

ZX81 SINCLAIR 16K with manuals and leads etc, also £40 of software, £65. Tel: 0454-612485 (after 5 pm).

ZX81 + unused 16K + manual etc. Pro. keyboard + £45 software, £60. Tel: Dave, Crewkerne (0460) 74667 after 6 pm.

ZX81 + 16K Ram, DK'Tronics keyboard, all leads, manual and books, also a lot of software, £100 ono. Tel: Harlow 31079 after 7 pm.

ZX81, 16K, machine code book, three books, software Scramble, 3D Defender, three adventures, magazines, £200. Yours for £130 ono. Tel: 01-995 6018 (after 5 pm).

16K ZX81 with soundbox, 15 tapes, all leads, etc. Good condition, £98. Tel: 397-6136.

ZX81, 16K, three games tapes for £45. Tel: Newton-le-Willows (Merseyside) 21444.

ZX81, 16K, with all leads, lot of software, including Frogger, 3D Monster Maze and Scramble. Tel: Leeds 652380 after 5 pm.

ZX81, 1K, with keyboard and software, £45 ono. Tel: 0241 52507.

ZX81, 16K and Zonx 81 soundpack + 10 tapes, 20 magazines + two books, £80 ono. Tel: (Crayford) (2)524-859.

ZX81, 16K, printer and paper, manual, books, worth £140, £100 ono. Tel: Dudley 236925 (after 6 pm).

ZX81, 1K + keyboard. £35. Tel: 01-603 5644.

Dragons for sale

DRAGON 32, 8 months old + cassette recorder, joysticks + software, £200. Tel: 0702 545575.

DRAGON 32 with cassette recorder, 2 joysticks, parallel printer interface, cable, manuals, books, magazine articles + reviews, software, blank tapes, worth £300+, sell for £225. Tel: Coventry 618579.

DRAGON 32, 6 months old, still in original box, £30 of games software. Tel: Stanford-le-Hope 642635.

DRAGON 32 + joysticks, 22 games worth £420, in excellent condition, will sell for £235 or will sell software separately. Tel: Hull 52572.

DRAGON 32, joystick, 22 tapes, 1 month old, value £420, yours for £235 ono, will separate. Mr Carr, Hull 507683.

DRAGON 32, joysticks, recorder, books, leads, 6 cassettes, Berserk cartridge, just over £300, sell for £200 ono. Tel: Chelmsford (0245) 62008.

DRAGON 32, mint condition + joysticks, £150 software + manuals/books, £210 ono. Tel: 0422 65009 after 6 pm.

DRAGON 32, 1 week old, pair of joysticks, 1 games cartridge, machine code book, £200 or exchange for BBC Model A. Tel: 0602 215810.

DRAGON 32, £100 of software, joysticks, books, worth £350, £250 ono. Tel: Stoke-on-Trent (0782) 413759 (6 pm).

DRAGON 32 + Tandy colour printer and extras, £280. Tel: 648 3924 (daytime).

DRAGON 32, 6 months old, complete with all leads, cassette recorder, instruction manual, books, joysticks, 7 games, £180. Tel: 0793 763960.

DRAGON 32, 6 months old + 2 joysticks, Berserk cartridge, 6 games (Donkey King, Phantom Slayer etc), 3 Tandy books, games book, magazines (Coconews) (3), Rainbow (3), Dragon User, all worth £300+. Could deliver, £220 ono. Tel: Leeds (0532) 622004.

Tandys for sale

TRS 80 COLOUR COMPUTER, 32K VCR recorder, joysticks, cassette + cartridge software, learning lab, books etc, cost nearly £700, accept £350 ono. Tel: 061-370 2162.

TANDY CCP 115, colour graphics printer plotter, with spare paper + pens, £120. Tel: Coventry 618579.

SWAP ADVENTURELAND for any other Vic adventure, except for Pirates Cove. Tel: 041-942 8146.

TANDY TRS 80, Model 1 Level 2, 16K, CPU + joystick + software, £125 ono. Tel: 0635 21419 after 6 pm.

Commodores for sale

COMMODORE Vic20 + C2N cassette unit + 4th language cartridge, £90 ono. Tel: Guildford 576252.

COMMODORE 64 with the latest model tape recorder (C2N) and reference guide manual and 11 games worth nearly £100. Total value about £520 guarantee — sell for £470 ono. Tel: 01-450 4858.

SPECIAL VIC20 8K internal memory + 8K expansion, high resolution Rom, machine code monitor, C2N tape, books, joysticks, software including Backgammon, Adventureland, £225 ono. Tel: 061-4313553.

VIC20 + cassette unit, + super expander cartridge, programs and cartridge + adventure cartridge and cassette, software, £190. Tel: Egham 34643 after 6 pm.

VIC20 + cassette recorder, joystick, + software, swap for 48K Spectrum or £130. Tel: 0536 741651.

COMMODORE 64 with tape and software + manual and leads, £275 ono. Tel: 0625 828549.

VIC20 + tape recorder + programmes + Programmers Reference Guide + 22 copies of Personal Computer World (in binders), in very good condition. Cost £280. Accept £180 or very near offer. Tel: 01-866 6321.

VIC20 CARTRIDGES to sell, Jelly Monsters, Omega Race, Starbattle, Road Race, Radar Rat Race, £15 each. Adventures include all five Scot Adams £17 each. Also Vic20 software to exchange. Tel: 01-387 8751.

COMMODORE 64 + C2N cassette recorder, complete with joysticks and software, £330 ono. Tel: Malvern 61602.

VIC20, C2N cassette unit, etc, £135. Tel: 01-407 2667.

VIC20 with cassette deck, super expander, five cartridges, cassettes, joystick and books — for £250, worth £370 — call Tenby 2139 after 4.20.

VIC20 plus C2N cassette unit, 8K Ram, super-expander cartridge, books, manuals — for £150 — call 01-558 5631 after 6 pm.

COMMODORE 16K RP, £30. Tel: Leigh 675514.

EX-DEMONSTRATION MODEL VIC20 (under guarantee), plus C2N cassette deck. Also software + joystick, mint condition hardly used, £150. Tel: 01-841 3342.

VIC20, 16K RP + cassette recorder, £160. Tel: Tamworth 288393.

VIC20 plus C2N cassette, joystick, as new, £130. Tel: 0536 741651.

VIC20, cassette, three cartridges, software, joystick, Basic PI, excellent condition, worth £300 accept £175. Tel: 02993 5548.

COMMODORE 64, £280 ono. Only 2 months old. Tel: Tunbridge (0732) 361920.

VIC20 + 3 and 16K, Programmers Reference Guide, VIC Revealed, Sargon Chess, £155. Tel: (0732) 361920.

VIC20 8K Rampack, little used, £32 ono. Tel: 061 881 4391 (Manchester).

SPEECH SYNTHESIZER for the Commodore VIC20, swap for extra memory. Tel: 0772 25385.

VIC20 still under guarantee with cassette recorder and dust cover, + mags + games cassette, £170. Tel: 021 327 4986.

COMMODORE PET 4032, 9 inch screen, tool kit, visicalc, lots of books, cover, 18 months, £370. Tel: 01-440 1553, 01-445 7771.

VIC20, 21K cassette deck, joystick, books, 9 cartridges, including Jelly Monsters, Omega Race, Chess, 30 cassettes, including Llamasoft, all original software no pirate copies, cost new, over £600. £260 for quick sale. Tel: 0702-201637.

VIC20 GAMES, Pirate Cove, Mission Impossible, Nutant, Herd and Avenger — cartridges, £15 each. Telephone for other games, including Quackers, Scramble, Blitz, Vicme, etc, all under £6 each. Tel: Sarndon 270081.

VIC20 SUPER EXPANDER, £25. Tel: 01-808 6450.

COMMODORE 64 + C2N cassette player, University Lecturer, must sell, £350. Tel: Bracknell 20539.

VIC20 + cassette, Adventures + Adventureland cartridge, Vicmen, Amek, Asteroids, Vic Panic, over £60 other games + utilities, program reference guide, three metre video cable extension, all in good condition, £195 ono. Tel: Bolton (0204) 706892 (evenings).

VIC20, four months' old, swap for ZX Spectrum. Tel: Tenby 3042.

VIC20, £50, Super Expander cartridge £20, C2N cassette deck £30, joystick £5, Omega Race £15. Tel: Crayford 56911 (after 6 pm).

VIC20 + tape recorder + 8K Ram + joystick + £90 software + Vic Innovative Computing + Vic Revealed, £150. Tel: Basildon 45186.

VIC20, five months old, 16K memory + cassette recorder, £150. Tel: (Cardiff) 595784.

VIC20 + 3K + 16K + tape deck, Introduction to Basic 1 & 2, joystick, maths and English revision cassettes, £75 of software, five months' old. Excellent condition, £190. Tel: 0554-820561.

VIC20, 8K Ram, £25, 3K Ram, £15, Super Expander, £18, Vic Stockcontrol, £10. Introduction to Basics, Part 1, £8, Sargon II Chess cartridge, £18, The Court cartridge, £15. Other software available. Tel: (Huntingdon) 0480-72170.

VIC20 COMPUTER + C2N cassette recorder + 16K Ram, £100. Tel: Taunton 88726.

VIC20 + C2N cassette recorder, 4-slot motherboard, 16K Ram expansion, Super Expander, machine code monitor, joystick, Jellymonsters, lots of software including The Invasion, Starquest, Chess and many more, £300. Tel: (0522) 702644 (after 5 pm).

VIC20 HI-RES, £18 ono. Tel: 01-579 2129 (after 6 pm).

COMMODORE VIC with tape unit, complete dust covers set, joystick, all manuals, Road Race Rom cartridge, much tape software, original Bugbyte Vicmen and Blitz. Excellent condition, £200 ono. Tel: Padgate 810490 (after 5 pm).

VIC20 C2N CASSETTE DECK, 16K memory, exp. joystick, two cartridges and software + magazines, £260 ono + five months' guarantee. Tel: 01-317 0999 (after 6 pm).

VIC20 plus C2N cassette deck (with one year eight months' guarantee), plus software and joystick. Sell for £150. Tel: 01-841 3342.

TAPE DECK + joystick for Vic20 + two games, Panic and Alien Blitz. All brand new, will accept £45. Tel: Hamilton 0698 428015.

VIC20 CASSETTE DECK, synthesiser tape + book and games, £150. Tel: 340-9611 (ask for Kevin).

VIC20 + C2N cassette drive and a Rom cartridge, £110. Tel: D. Helliier, Barry 744067.

VIC with cassette unit + 8K + 3-slot expander, Introduction to Basic Part 1, joystick, books, including Vic Revealed, software, £155. Tel: Billericay 56854.

Ataris for sale

ATARI VCS with six cartridges, £85. Tel: 555 8317.

ATARI 400 48K cassette unit, disk drive, over £800 of games, utilities on cassette + disc, £150 of reference books, £800 ono. Tel: Basingstoke (0256) 55464 (evenings/weekends).

ATARI VCS + eight cartridges including Amidar, Spiderman, Empire Strikes Back, Demon Attack, Frogger. Worth £340, sell for £190 ono. Tel: 061 2267502 (after 4 pm).

ATARI 800 + 410 program recorder, joysticks, manuals including De/re Atari programs etc, five months old. Cost £530, sell £395. Tel: Eastbourne 641719.

ATARI VCS, seven months old, including PacMan, Space Invaders and Combat, £70. Tel: 02406 5945 (evenings).

48K ATARI 800, with disc-drive, cassettes and joysticks + various games. Value new £900, selling complete system + manuals for £550. Tel: Southend (0702) 614041.

DEMON ATTACK for Atari VCS to exchange for Parker Star Wars cartridge. Tel: 04862 70318.

ATARI VCS + five cartridges, £99.95 ono. Tel: Bookham 52289 (after 5 pm).

ATARI VCS + two cartridges, £60. Tel: Cobham (Surrey) 3503 (after 5 pm).

ATARI VCS + six cartridges will swap for Spectrum or Vic20 or sell for £125 ono. Tel: 025-671 3445 (after 4.00 pm).

ATARI VCS, as new, Space Invaders and Combat, Atari bulletins, £75. Tel: Henfield 493694.

ATARI 400 + recorder, Basic cartridges, joystick, Centipede, Missile Command, Defender, Astrom IV + manuals, four months old. Very good condition, £300 ono. Tel: 01-592 7048 (after 6 pm).

Acorns for sale

BBC MODEL B with joysticks and software, £300. Tel: Huntingdon (0480) 890803 (evenings).

TRS 80, Level 2, 16K, green monitor, manual, numerous books/tapes, £250 ono. Tel: Leamington Spa 26506 (before 9 pm).

ACORN ATOM, Acorn built 12K + 12K via software, £125. Tel: Cooper, 01-904 9210 (evenings).

For sale

SWAP ATARI 800 + 410 recorder, joysticks, books + manuals including De/re Atari, program etc, 5 months, for BBC B. Tel: Eastbourne 641719 evenings.

BUY, SELL, part-exchange or swap a Commodore 64 game. And we sell games from price range of £2.50 to £6.95. Tel: 01-450 4858.

RETAILER SEEKS WIDER RANGE of software stock for Dragon/Spectrum/ZX81/Oric. Peaksoft, 7 Hawthorn Crescent, Burton-on-Trent.

SHARP MZ 80K, with Pascal and Basic tapes, as new, £310. Tel: 0926 59658.

LOTS OF VIC20 software. Tel: Peter 577 2476.

SWAP VIC20 Count Adventure cartridge for Mission Impossible. Johnstone (Renfrewshire) 21586.

MICROTAN 65 8K Ram, Basic Rom, tool kit Rom, full keyboard, system rack, lots of games, programs + word processor, £370. Tel: Hollington (088926) 221 (Staffs). Also Epson MX80 FT1, with connecting leads for Microtan, excellent condition, £270.

SWAP SPECTRUM GAMES, lots of all varieties, including The Hobbit, Cruising, Slippery Sid, Pimania and loads of others. Also a ZX81 with 16K joysticks, graphic Rom for £100 + lots of software. Tel: Penn 5738.

£50 worth of ZX81 software for sale, including 3D Defender, Scramble, Magogs, etc. Ring for details. Tel: 0460 74667.

TEXAS TI99/4A cassette leads, joystick, TI Invaders, 6-months-old, £160, or split. Tel: 061-226 1335.

16K RAM pack for ZX81 for £18, offers welcome. Tel: 01-722 7425, after 6 pm.

ELFTONE tape recorder with 3-pin socket + counter, suitable for Oric 1, £29. Tel: 445 5989.

EXCHANGE your software with me. Send an s.a.e. to M. A. Valentine, 101A Underdale Road, Monkmoor, Shrewsbury, Shropshire SY2 5EF.

SHARP MZ 80K 48K Ram, RTTY Interface, fitted transmitter and receiver software, morse code decoder software, nights machine code, software, also other software books + magazines. Asking £320 ono. Tel: Atherton 891140.

ORIGINAL SPECTRUM software for sale, Escape £3.50, Maze Man £3.50, Night Flight £4.50, Spectral Invader £3.50, Time Gate £5.50, Drafts £5.50. Write to: 39 Framfield Road, Uckfield, East Sussex TN22 5AH or tel: 0825 2514 (Saturday between 12 am and 2 pm).

ATARI VHS tapes: Pacman £20, Defender £20, Basketball £10, Skiing £10, Demon Attack £15, Space Invaders £15. Please ring 958 6161.

INTELLIVISION + Soccer, Basketball, Horse Racing, Space Battle and Tennis cartridges, excellent condition, £150. Tel: Kings Lynn 62234 (evenings).

DAI 48K improved keyboard, user mags, £560 ono. Tel: 01-670 5909.

TI99/4A, 7 months old + cassette recorder + leads, £110 ono. Tel: 04865 2887.

VIC SUPER EXPANDER cartridge, £25. Tel: 808 6450.

BINTONE COLOUR TV GAME + Subnote table soccer + MB Logic 5, for a 1K or 16K ZX81 with leads. Tel: Neil 051-608 6126 evenings.

SWAP OR SELL VIC20 GAMES. Tel: 01-579 2129 also cartridges.

PHILIPS G7000 with three cartridges, little used, in mint condition, cost £111, will sell for £60. Tel: Lytham 733077.

LINX COMPUTER, six weeks old, unwanted gift, £220. Tel: Doncaster 856528.

SPECTRUM 48K plus cassette recorder, 3 months old, £180. Tel: Crawley 512608 (after 6 pm).

SWAP, Apple II Euro + for any software. Tel: Harrow 9527378.

20 INCH, b/w television, excellent picture, perfect working order, £15. Tel: 051-3395894 (after 4 pm).

SWAP, Vic cartridge, Adventure Land for Count or Voodoo Castle. Tel: 05432 22462.

CBM, 16K Ram, Avenger, Sargon II, Chess, 3 Stick, Intro to Basic I and II, innovative computing book, new £160, £100 ono. Tel: 074488 2325 (after 6 pm).

RD Digital tracer, mounted on a board, £40. Tel: 0274-727965.

SWAP Spectrum Football Manager for Pimania or Black Crystal Adventure. Tel: 0632-673203 (after 5 pm).

VIC 4TH cartridge, swap for Super Expander or switchable Ram or 2 games cartridges. Tel: Norwich 0603409534.

SWAP, 48K Spectrum for 16K ZX81 plus £20. Tel: 01-460 4603.

VIDEO MASTER, Star Chess, £75. Tel: 01-304 1819 (after 4.30 pm).

FURTHER PROGRAMMING for ZX Spectrum (Shiva), £4.50 + Cartridge Colour Collection (book + tape), £6. Tel: 01-346 0986.

MISSION IMPOSSIBLE for Vic 20, £15. Donney Kemp, Wacky Walters cassettes, £10. Tel: 01-508 9558.

VIC 20, software to swap. Tel: 01-205 9649.

WARRIOR + Star Trek for 16K ZX81 (Marconi Software), £2 each. Tel: 0908-568216.

CARTRIDGES including Demon Attack, Sub Hunt, Tron, 14 in all (Mattel Television), from £10 each. Tel: 041-882 8786.

TI 99/4A, unwanted Christmas present, includes speech synthesiser, speech editor module, TI Invaders module, Munchman module, joysticks, duel cassette cable, audio, cassettes and magazines. All for £250. Tel: Doncaster 0302-723571.

MZ 80A, as new + software, books, etc., £395 or exchange system. 01-908 1460.

ADULT DRAGON owner wishes to exchange tapes and cartridges, Eproms, large and varied selection from the serious and Teletext through to games and learning, tape/cartridge. Tel: Staines 58707 (after 6 pm).

OVER £100 SOFTWARE, will sell for £70, or will swap for other originals. Tel: Chester (0244) 378549.

SPECTRUM software, swap or sell. Tel: Chester 376682.

VIC 20, Mission Impossible, Type-a-Tune + Cosmias, swap for the Vic m/c monitor cartridge. Tel: East Kilbride 42853.

48K LINX, 2 weeks old, 1 year guarantee, all leads, PSU, books, manuals + software, all in perfect condition, £220 no offers, will swap for BBC model A. Tel: Waltham Cross 28173.

VIC 20 cartridges for sale, includes Gorf, Chess, £15 each, also Star Battle, Road Race + many, many more, £12 each. Tel: 01-574 4122.

VIC20 CARTRIDGES: Jelly Monsters, Omega Race, Road Race, Star Battle, Rat Race and Meteor Run — £14 each. Scot Adam's Five Adventures for £17 each. Rabbit New 6 including Orbis Linkwell, £10. Call 01-387 8751.

SUPER STAR multi-mode CB transceiver, exchange for printer compatible for BBC. Tel: Mr Guthrie, Enith 33474.

ARTHON EXPANSION UNIT, for Vic20, £65 ono. Tel: 01-650 9701.

5 SPECTRUM BOOKS, inc Spectrum Handbook, £20. Tel: 0555-71502.

VIC20 CASSETTE, Pirate Cove swap for Voodoo Castle or Count Dracula. Tel: Atherton 895119.

SWAP, Arlon 8K expansion pack + many 8K games for your Commodore 8K pack. Tel: Stevenage 811634 (after 7.30 pm).

SHARP 1780K, 48K, Ram, manuals, games, tapes, etc, £250. Tel: Peterborough 204255.

SWAP, Atari 800 + 410 program recorder, joysticks, manuals in De/re Atari programs etc, 5 months old, for similarly equipped BBC computer. Eastbourne 641719.

HOMING PIGEONS + Bowling for the 16K ZX81, exciting programs written in Basic. For both games on one tape send a cheque to the value of £2 to C. Hume, 38 Long Craigs Terrace, Kinghorn, Fife KY3 9TD.

64K TUSCON SYSTEM Z80A, working at 4 megs, CPM disc system with 190K formatted, including CPM S100, cost £1,550, sell for £1,000 or swap for something useful. Tel: 466 6246.

ATARI SOFTWARE for Atari 400/800, 3 cartridges, Star Raiders, Missile Command, Asteroids, the three £55. Protector (cassette), £12. Tel: 0702 201637.

140 COMPUTER MAGAZINES, all popular titles, sell for £13 or swap Dragon Forth. Tel: Ware (0920) 68264.

INTEL SYSTEM development kit for 80/85, any offers. Tel: Layer 342 after 7 pm.

SHARP MZ, 80K, personal computer, 48K model, immaculate condition, hardly used, as new, cost £400, selling for only £350 ono, also includes dust cover, green screen and many programs. Tel: 061-773 3445.

Wanted

WANTED, BBC MICRO COMPUTER, Model A or B, must be in good condition. Tel: Havant 473069.

VIC20, swap Omega race for any adventure cartridge. Tel: Stevenage 0438 4086.

WANTED, BBC MODEL B, plus cassette and manuals etc, pay up to £320. Tel: Worthing 0903 6783.

WANTED, FELLOW SPECTRUM OWNER, living in or around Harpenden for exchanging software and ideas. Tel: Harpenden 69152 (after 6 pm).

I WANT A BBC MODEL B, instant cash paid. Tel: Harpenden 69152 (after 6 pm) with full details of your Beeb.

WANTED, BBC MODEL B with or without accessories and software. Tel: 01-741 1745.

WANTED, Cassette Recorder, Jack, Din Plugs, Counter. Tel: Chester (0244) 378549 (6-8 pm).

WANTED, BBC 32K A or B Micro-computer. Must be in good condition. Tel: Coventry (0203) 504485 (after 5 pm).

SWAP VIC20 Asteroids for other Vic20 games. Tel: 0341 280726 (after 6 pm).

WANTED, BBC MODEL B and software, offer exchange of Yamaha 250cc, 1981, US Custom motorcycle. 1,000 miles only, immaculate. Tel: 0443 671227.

NEW RELEASES

TEERING-OFF!

Vic Golf uses defined graphics and split screen techniques to enable you to play the game on your micro.

The game requires 3K extra memory and a joystick. Those who have brought material from the manufacturers of the tape — CP White — should note the new address given below.

Program *Vic Golf*
Price £4.00
Micro Vic20 (+3K and Joystick)
Supplier CP White (Services)
52 Northfield Ave
West Ealing
London W13 9SY

KRAZY KONG



Krazy Kong is a ZX81 version of the popular arcade game of the same title.

The game features a pyramid you must climb, whilst knocking out the supports for *Krazy Kong* as you go. You reach him by climbing various ladders — and avoiding the rocks and barrels which are thrown at you.

The game has three screens and, it is claimed, all the features of the original.

Program *Krazy Kong*
Price £3.95
Micro ZX81 16K
Supplier Personal Software Services
452 Stoney Stanton Rd
Coventry CV6 5DG

INTO GEAR

Although lagging behind the seemingly endless range of books produced for the Spec-

trum, the *Dragon* book market is gradually getting into gear.

The Power of the Dragon is a new book from Microsource which uses 30 programs to illustrate different programming techniques. Each program has a line by line commentary, explaining how the program works.

Book *The Power of the Dragon*
Price £5.95
Micro *Dragon 32*
Supplier Microsource
1 Branch Road
Park Street
St Albans
(+50p P+P)

PROCESSED

Although *Telewriter* looks like becoming the flagship word-processor for the *Dragon*, its price (over £40) may lead people to look elsewhere.

Textstar is a *Dragon* word-processor which offers most of the usual wordprocessor functions like line insertion, find and display string, etc.

Total file length is up to six pages of A4 text. It is one of a developing range of *Dragon* programs from Personal Software Services.

Program *Textstar*
Price £12.95
Micro *Dragon 32*
Supplier Personal Software Services
452 Stoney Stanton Rd
Coventry
CV6 5DG

PACKAGE DEAL

Ramtop is a company offering a complete package for the small business.

The package consists of three cassettes for the 48K Spectrum — a sales journal, a sales ledger and a purchase ledger. The three cassettes come with an explanatory booklet and incorporate routines which enable them to be used with a ZX printer.

Program *DIY Book Keeping*
Price £24.95 per tape
Micro *Spectrum 48K*
Supplier Ramtop Software
12 Milnthorpe Rd
Burtonwood
Warrington
Cheshire

WORD GAMES!



Few single programs have had better advance TV coverage than *Scrabble* from Psion.

For some reason this computer version of the popular board game has grabbed the media's attention — perhaps because the idea of a computer playing around with words has overtones of artificial intelligence.

The cassette comes in a box with an explanatory booklet. The rules of *Scrabble* are outlined, as is the use of the computer. One of the many options included in the game is a chance to see the computer thinking about its next move — this involves letters whizzing about as it searches through all the possible permutations.

It is perhaps not surprising that such a likely best-seller comes at a luxury price — £15.95 — but then I suppose someone has got to be paid for typing in the dictionary of words the computer understands — there are over 11,000 of them.

Program *Scrabble*
Price £15.95
Micro *Spectrum 48K*
Supplier Psion
2 Huntsworth Mews
Gloucester Place
London NW1 6DD

SPIDER'S WEB!

Horace and the Spiders is the latest edition to the *Hungry Horace* series.

The plot sounds like a mixture of half a dozen arcade games put together. Firstly,

Horace has to climb the hills to the Spider mountains, jumping over the spiders that run at him. Then, he must negotiate the spider bridge, by using dangling threads as ropes, until finally he reaches the spider cave.

Once in the cave, *Horace* can attack the spiders and make holes in their web. *Horace* has four phials of serum which will protect him from spider bites.

Psion is now describing this game as an adventure and it certainly has a complicated plot.

What next I wonder — a 48K special *Horace enters Mastermind* perhaps?

Program *Horace and the Spiders*
Price £5.95
Micro *Spectrum 16/48K*
Supplier Psion Melbourne House
2 Huntsworth Mews
Gloucester Place
London NW1 6DD

SINGING PI!



Pimania was an extremely successful game when it was issued on the Spectrum — indeed it would probably be rated one of the very best games for the machine.

It is now available for the *Dragon 32* with most of the features of the original including an all singing and dancing PI man, a dreadful single on the reverse side, and of course valuable prize.

Program *Pimania*
Price £10
Micro *Dragon 32*
Supplier Automata
65 Osborne Rd
Portsmouth PO5 3LR

NEW RELEASES

SHOP COPI



What with all the advertisements anyone could be forgiven for thinking that *Catcha Snatcha* from Imagine Software had been out for some time — in fact, I have only just received a copy.

In the game you are a store detective whose job it is to look after the premises. Tasks include collecting lost property and lost children and even evacuating the store when bombs are found! All this in conjunction with looking out for shoplifters.

The aim of the game is to retain the manager's confidence — this is expressed in a

percentage derived from the number of written warnings received.

Program *Catcha Snatcha*
Price £5.50
Micro Vic20
Supplier Imagine Software
 Masons Buildings
 Exchange Street East
 Liverpool Merseyside
 L2 3PN

FLASHING SCREEN

Salamander Software has issued a graphics package for the Dragon 32.

The package facilitates use of the Dragon's graphics and enables text to be mixed with high-resolution, as well as various drawing routines.

The program requires one joystick and uses a flashing screen cursor to position lines on the screen.

Program *Graphics System*
Price £9.95
Micro Dragon 32
Supplier Salamander Software
 27 Ditchling Rise
 Brighton
 East Sussex

1K GAMES

Many people who buy a ZX81 lament the fact that there is nothing they can buy for their

machine, unless they also buy the extra 16K Ram.

However, Micromega is a company specialising in games for the 1K machines. *Arcade Action* is a games pack consisting of *Greedy Gobbler*, a maze hunt game, *Extra Terrestrial*, in which you are the stranded alien, and three other arcade type games.

Program *Arcade Action*
Price £4.95
Micro ZX81
Supplier Micromega
 230-236 Lavender Hill
 London SW11 1LE

MEANIE HUNT

Bonka is a game for the Dragon 32 based on the popular *Space Panic* arcade game.

Using the keyboard you must kill off the meanies by trapping them in holes dug with your hammer. There are four speed options, as well as a choice of how many meanies you have to start with.

Bonka is the first of a number of new releases for the Dragon written by John Morrison.

Program *Bonka*
Price £7.95
Micro Dragon 32
Supplier J Morrison (Micros)
 2 Glensdale Street
 Leeds LS9 9JJ

MYSTERY SET

Design and Restore is a program that enables you to create characters for games and foreign languages and *Load and Save* them as you wish.

The program comes complete with already designed characters for *Asteroids*, *Pacman* and *Robot*, the last being a "mystery set".

Program *Design and Restore*
Price £9.99
Micro Vic20
Supplier Kayde Electronic Systems
 The Conge
 Great Yarmouth
 Norfolk NR30 1PJ

COMING SOON!

Valhalla is an animated graphics adventure whose undisguised intention is to steal the title of "best micro adven-

ture game bar none" from *The Hobbit*.

The 48K Spectrum program, which will be released on July 15, uses a new operating system *MOVISOFT* and boasts a number of *Hobbit*-like features. There are 20 significant characters, each with their own aims and objectives.

You are a minor god set the task of recovering Odin's Golden Helmet. To complete this you will also have to master three lesser tasks, one of which is to rescue *Eiden* — a maiden responsible for the Golden Apples which keep the gods youthful.



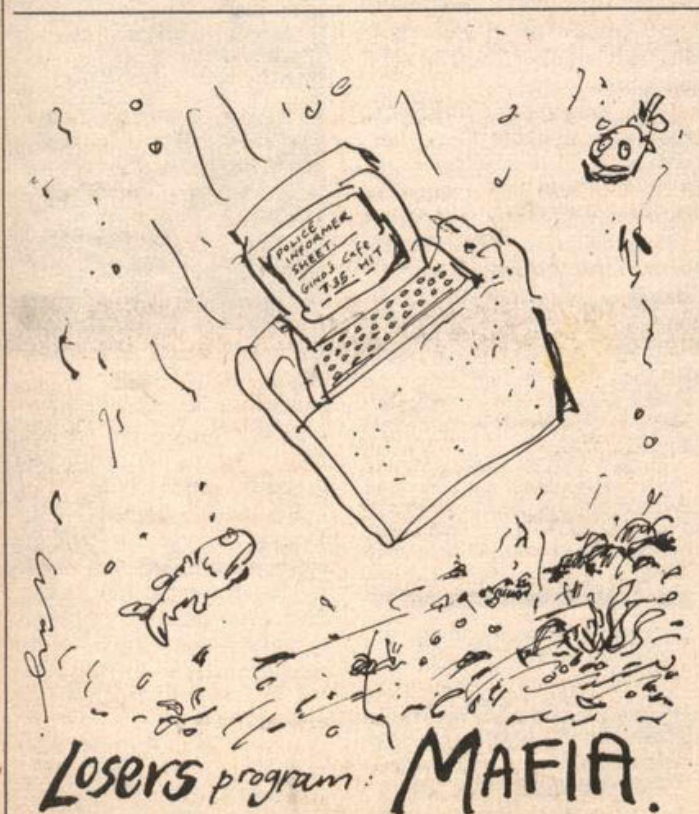
The game's designer, Legend, claims that the program involves a sophisticated degree of interaction. For example, should an enemy overhear you telling a friend some important information, he will try to ruin your plans.

Legend stresses that the personality of each of the characters is genuinely independent "as opposed to pseudo-independent behaviour like Thorin sitting down and singing about gold or Gandalf walking off with your door for no reason".

The moving graphics are reportedly of cartoon quality, with both background and foreground movement illustrating the events of the plot.

Pretty impressive claims. *Hobbit* fans will no doubt feel both intrigued and sceptical... Watch this space.

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



Ziggurat



Organising society

"A technology has no value outside of its social significance — alone it is dead metal."

So starts an interesting pamphlet by Paul Strassmann, Vice President of Xerox.

Just published, the pamphlet is a modified version of probably the most successful speech at the IT'82 Conference in the Barbican last December. At the time, the presentation was successful because it was one of the few which actually used information technology to good effect, and because it was one of the most intelligent and intelligible.

The central theme of Strassmann's talk was the productivity of organisations, and how the introduction of information technology can transform the role of people and of organisations. Paul Strassmann's first aim is the analysis of tasks, to examine how sensible automation can benefit productivity and quality. He points out that efficiency is achieved by eliminating many labour-intensive office tasks and he notes that such action will materially enlarge the work of the individuals who remain.

Attention is then turned towards the nature of administrative systems. The traditional structures are being changed — "management is not simple any more". Though the procedures remain the same, management, operations and customers are becoming increasingly diverse. This need to address wider horizons has been met by "adding more standard procedures without altering the traditional organisational concepts of division of labour". The trend towards centralisation and the increase in procedural complexity is measured by what he terms the "Parkinson Ratio" (after C Northcote Parkinson).

Parkinson's Ratio is given by the number of internal communications that are necessary to satisfy a single useful communication to a customer. Paul Strassmann reckons that for a very efficient organisation in a competitive industrial sector, it can take about 20 to 30

internal information transactions to satisfy a single customer enquiry.

In the public sector the average number of transactions is thought to be in excess of 100! The suggested reason is that only highly standardised methods of handling customers are fair and equitable to the public.

Information technology, intelligently applied, can help to reduce Parkinson's Ratio, by reducing the number of needless communications.

Strassmann's first key to information technology is, thus, the need for new forms of organisation made possible by IT. The acquisition of modern technology does not help unless new systems are created to make use of it in ways that are culturally acceptable. Smaller numbers of people will be needed to manage and organise information and this *should* (can but *might not*) be used to expand the provision of services.

"The huge coming expansion I see in the demand for information, on a global scale, will come from information being incorporated into socially useful services," says Strassmann optimistically.

Paul Strassmann considers that full employment is possible in productive or unproductive societies, and what matters is the total output of society. If output does not change with automation, then unemployment is produced. Or, to put it the other way, for a growth in output to be achieved, automation is now a necessity.

But what to do with the increased output? Strassmann suggests that the increased output be used to invest in the service sector's effectiveness, and that we should increase "value added" before cutting costs. By value added, he means that improvement investments should be channelled where they will increase value added through new services.

Improved effectiveness of organisations is derived from reduced overhead costs and decreased burdens from over complex administrations.

For maximum benefit, information technology should be used to *simplify* organisational processes rather than just to *mechanise* existing office procedures. Eliminating job steps is the key to simplification.

But the vital point is that we must think in terms of "new roles for people in organisations and in the framework of a new social economy based on new services".

The pamphlet by Paul A Strassmann is available from Rank Xerox, 338 Euston Road, London NW1.

Boris Allan

Puzzle

Down on the farm

Puzzle No 57

Within easy walking distance from Lower Muddcombe, are four farms, Hilltop Farm, Cowslip Farm, Dewdrop Farm and Mayfield Farm.

The farmyard of each is in the shape of a right-angled triangle having a perimeter fence of exactly 360 yards in length. Also, all the sides of the farmyards are an exact number of yards.

Curiously, though, the *areas* of each is different, ranging in size in the order given above, with the largest farmyard at Mayfield.

The other evening the four farmers were enjoying a drink together in *The Bull* when they each made the following statements:

Farmer Giles: My farmyard is the largest.

Farmer Miles: I live at Cowslip farm and have the longest side of all the yards.

Farmer Henry: All of my three fences are an even number of yards.

Farmer Stiles: My farmyard is the smallest.

Unfortunately, none of these statements was true. Who lives where?

Solution to Puzzle No 52

This problem requires us to find 10 primes with a common difference. The lowest prime would represent the number of soldiers sent out on the first day, and the common difference would equal the number in a full regiment. The primes are checked for in the subroutine at Line 300

```
10 LET N = 3
15 LET L = N
20 GOSUB 300
30 IF F<>0 THEN GOTO 140
40 FOR D = N + 1 TO INT (N1.1) STEP 2
50 LET M = N
60 FOR T = 1 TO 9
70 LET M = M + D
75 LET L = M
80 GOSUB 300
90 IF F<>0 THEN GOTO 130
100 NEXT T
110 PRINT N, D
120 STOP
130 NEXT D
140 LET N = N + 2
150 GOTO 15
300 LET F = 0
310 FOR B = 3 TO (VAL STR$ SQR L) STEP 2
320 IF L/B = INT (L/B) THEN LET F = 1
330 NEXT B
340 RETURN
```

This gives the results: 210 soldiers in each regiment, but on the first day only 199 soldiers were sent. After 10 days 2,089 men had been sent with 11 held back from the first regiment.

Winner of Puzzle No 52

The winner is: Angus Kerr, Golf Road, Bieldside, Aberdeen, who receives £10.

Top 10

Dragon 32

- (1) The King (Microdeal)
- (2) Space War (Microdeal)
- (3) Planet Invasion (Microdeal)
- (4) Dragon Trek (Salamander)
- (5) Defence (Microdeal)
- (6) Alcatraz (Microdeal)
- (7) Wizard War (Salamander)
- (8) Chess (Dragon Data)
- (9) Katerpillar Attack (Microdeal)
- (10) Basic Tutorial (Ampsoft)

*Cartridge (Figures compiled by Boots & Co, London)

Top 10

Spectrum

- (1) Flight Simulation (Psion)*
- (2) The Hobbit (Melbourne House)*
- (3) Penetrator (Melbourne House)*
- (4) Transylvanian Tower (Richard Shepherd)*
- (5) 3D Tanx (DK Tronics)
- (6) Planet of Death (Arcadia)
- (7) Horace Goes Skiing (Psion/Melbourne House)
- (8) Vu-3D (Psion)*
- (9) Sentinel (Abacus)
- (10) Escape (New Generation)

*Requires 48K (Figures compiled by WH Smith and Son Ltd)

Top 10

Atari

- (1) Zaxxon
- (2) Astrochase
- (3) Spider Invasion
- (4) Helicat Ace
- (5) Miner 2049er
- (6) AE
- (7) Pharaoh's Curse
- (8) Survivor
- (9) Canyon Climber
- (10) Protector 2

*Cartridge. †32K cassette. ‡32K disc. \$48K disc. (Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Top 10

Vic20

- (2) Panic (Bug-Byte)
- (1) Asteroids (Bug-Byte)
- (3) Cosmiads (Bug-Byte)
- (4) Wacky Waiters (Imagine)
- (5) Race (Commodore)
- (6) Arcadia (Imagine)
- (7) Super Expander (Commodore)*
- (8) Blitz (Commodore)
- (9) Introduction to Basic Part 1 (Commodore)
- (10) Amok (Audiogenic)

*Cartridge (Figures compiled by Boots & Co, London)

BBC*

- (1) Rocket Raid (Acomsoft)
- (2) Planetoid (Acomsoft)
- (3) Snapper (Acomsoft)
- (4) Monsters (Acomsoft)
- (5) Philosophers Quest (Acomsoft)
- (6) Arcadians (Acomsoft)
- (7) Creative Graphics (Acomsoft)
- (8) Chess (Program Power)
- (9) Meteors (Acomsoft)
- (10) Castle of Riddles (Acomsoft)

*All Model B. (Figures compiled by Micro Management, Ipswich 0473 59181)

ZX81*

- (2) QS Scramble (Quicksilver)
- (1) Mazogs (Bug-Byte)
- (3) Night Gunner (Digital Integration)
- (4) Flight Simulation (Psion)
- (5) Monster Maze (New Generation)
- (6) Galaxians (Artic)
- (7) Chess (Psion)
- (8) Space Raiders (Psion)
- (9) Avenger (Abacus)
- (10) Asteroids (Silversoft)

*All 16K. (Figures compiled by WH Smith and Son Ltd)

Books

- (4) Spectrum Machine Language for the Absolute Beginner, Tang (Melbourne House)
- (1) Enter the Dragon, Carter (Melbourne House)
- (3) Assembly Language Programming for the BBC Micro, Birnbaum (Macmillan)
- (4) Complete Forth, Winfield (Sigma)
- (2) Mastering the Vic20, Jones (Sigma)
- (3) The BBC Micro — An Expert Guide, James (Granada)
- (7) Z80 Assembly Language Programming, Leventhal (Osbourne)
- (7) Vic Programmer's Reference Guide, Commodore (Commodore)
- (9) Computer's First Book of Vic, various authors (CompuTel)
- (10) Commodore 64 Programmer's Reference Guide, Commodore (Commodore)

(Figures compiled by Watford Technical Books, Watford 0923 23324)

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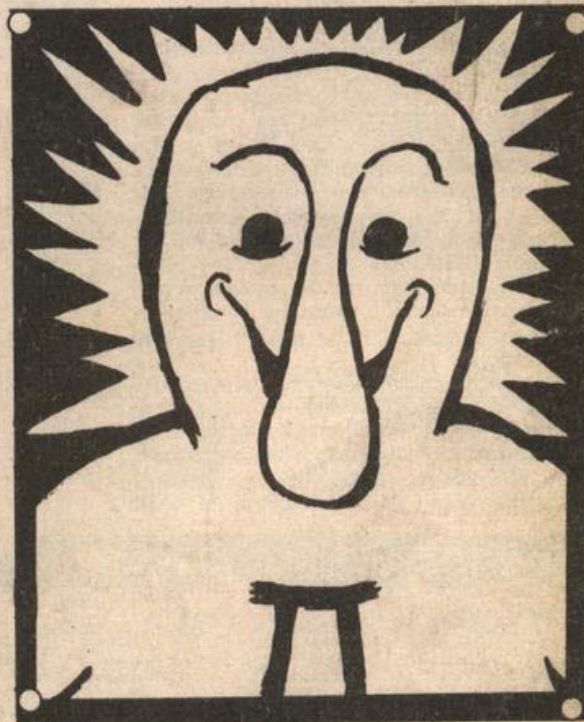
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