

40 Rock

POPULAR **Computing** WEEKLY

35p

15-21 March 1984 Vol 3 No 11

BRITAIN'S BEST-SELLING MICRO WEEKLY

CLASSIFIEDS
START
HERE

VALHALLA

NEWS FLASH
TITANIC
SEE PAGE 30

SABOTEUR
ANOTHER HIGH VOLTAGE GAME BY CABLE

AQUARIUS
SEE PAGE 52

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★ STAR
Skull Trap
on Commodore 64
See page 10
GAME★

News Desk

Business moves from Commodore

COMMODORE has been making some interesting moves since Marshall Smith took over from Jack Tramiel as president three weeks ago. The company has announced two deals to take it into the IBM compatible business market. It has signed a technology licencing agreement with the Canadian manufacturers of the IBM compatible Hyperion machine and it has concluded a deal with Intel to begin manufacture under licence of the Intel 8088 chip, used in the IBM Peanut.

continued on page 5 ▶



Commodore's new president Marshall Smith

Software houses opt for Amstrad

SOME software houses, disappointed at finding the Sinclair QL has no facility for running cassette software, have turned instead to the new computer currently being developed by Amstrad. Amstrad is aiming its micro squarely at the games market and this has also been a factor influencing some companies to opt for it in favour of the more 'serious' QL machine.

Most of the major games houses have been approached by Amstrad and a number — including Imagine, CRL and Micromega — are known to be writing for it. The machine is planned for launch in the summer and will be offered in two forms — both including a built-in cassette recorder. For £199 the computer will include a separate black-and-white monitor. For £229 the price will include a monitor quality colour display in

place of the monochrome tv. Shaped rather like the QL and styled in a cream plastic case, the Amstrad includes a full-size professional keyboard with separate numeric and cursor pads. Design of the hardware has been carried out by Ambit in Brentford. The micro is Z80-based with 64K Ram and 32K Rom. It has a three-channel sound capability. Twin Atari-standard joystick ports and a Centronics printer interface are provided. It has no RS232 or cartridge slot. Like the Oric machine, the Amstrad has a variable loading speed from its built-in cassette machine (at the right of the keyboard and numeric pad) — 300, 1200 or 2500 baud. The display has two text modes — either 40 or 80 column and two graphics modes — 192 x 256 pixels and 192 x 86 pixels. The Basic and operating system for the machine have been written by Locomotive Software, a small Leatherhead-based systems house. Amstrad Basic is similar in power to BBC Basic, but does not fea-

continued on page 5 ▶

This Week

● **Street Life** David Kelly talks to Robert Stein of Andromeda Software on page 12. ● **Programming Boris** Allan compares Motorola's 68000 and 68008 microprocessors. See page 19. ● **Dragon** Richard Dodd looks at advanced game programming on page 24. ● **New Releases** All the latest software including our Pick of the Week — Codename Mat from Micromega. See page 56.

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Popular Computing Weekly,
12-13 Little Newport Street,
London WC2R 3LD
Telephone: 01-437 4343

Published by Sunshine Publications Ltd.



Registered at
the Post Office
as a newspaper

MEMBER OF THE AUDIT
BUREAU OF CIRCULATIONS

ISSN 0265-0509

Typeset by The Artwork Group,
55-63 Goswell Road, London EC1,
in association with Ink on Paper Ltd.
Printed by East Midland Litho Printers
Ltd, Oundle Road, Woodston,
Peterborough PE2 9QR.

Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643

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How to submit articles

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

Accuracy

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

This Week

News	5
Commodore moves	
Letters	7
Tape copiers	
Star Game	10
Skull Trap on Commodore 64 by James Marsden	
Street Life	12
David Kelly talks to Robert Stein	
Reviews	16
Multi-tasking package from Skyware	
Programming	19
Motorola 68000 and 68008 processors by Boris Allan	
Spectrum	22
Mucroid Run by D Edwards, Part 1	
Dragon	24
Advanced game programming by Richard Dodd, Part 1	
BBC and Education	28
Heat calculations by Robert Crook	
Commodore 64	30
Facilities of the SID chip by Richard Barton	
Open Forum	37
Four pages of your programs	
Microradio	43
Ray Berry's column	
Adventure	47
Tony Bridge's corner	
Peek & Poke	49
Your questions answered	
New Releases	56
Latest software programs	
This Week	58
Top 10 plus all this week's software	
Competitions	59
Ziggurat, Puzzle, Losers	

Editorial

Imagine you are playing an adventure. You are happily exploring a fantasy world, indulging in a little monster bashing, when an arrow appears in the middle of your chest. With dimming eyes, you read the following message: "You have been killed by Duncan, who is in the same building two floors above you".

This type of interactive adventure game is not set in the far-off future. It is already here.

The Multi User Dungeon (or MUD as it is more affectionately known) has been up and running at Essex University since 1979. Written on a DEC System 10 by Roy Trubshaw, MUD is a multi player, real time, interactive adventure.

Players start as novices and attempt to work their way up through various stages, such as champion and necromancer, to achieve the ultimate accolade of witch. Points are obtained through experience, combat and by solving numerous puzzles and quests contained in the game. Players can even leave messages for one another by writing on objects inside the adventure.

But the main obstacle to MUD, and similar programs, gaining a wider airing is the cost of making a telephone call. Otherwise Micronet, or a similar system, could be running interactive adventures now, linking players over the telephone lines.

Next Thursday

Next week's star game is *Flight Simulator for 16K/48K Spectrum* by D Murphy, in which you must land your plane safely on the runway.

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Written by: Rainbow Software

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HALLS OF THE THINGS

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INVASION OF THE BODY SNATCHAS

Written by: Simon Brattel and Neil Mottershead



Written by: Graham Stafford



ROMMELS REVENGE

Written by: Martin Horsley



THE DUNGEON MASTER

Written by: Graham Stafford

All titles for 48K Spectrum unless otherwise stated

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QL production problems

SINCLAIR has released more information about the production problems which have affected deliveries of its QL computer.

Two design difficulties have been identified — one of the machine's semi-custom chips has required further modification and the operating system software has taken longer to complete than was originally planned. Some sources suggest that the size of the QL's Rom is to blame. The QL has been designed with only a 16K Rom. The delay appears to be associated with problems in fitting the operating system and Basic software into just 16K.

Sinclair claims, however, to be still on target to produce the first production batch of QLs — around 1000 machines — by the end of this month.

● PCW's QL order: Week 8. Still no sign. Interest gained by Sinclair from our order tips over the £3 mark.

Amstrad

continued from page 1

ture procedures. The operating system features some advanced real-time facilities at the interrupt level of Basic. It is possible, for example, to call sub-routines after a given time has elapsed. A form of windowing is also offered.

First deliveries of the Amstrad are scheduled for June and a number of high-street chains including Boots, Rumbelows, Currys and Comet are currently evaluating the machine.

Commodore

continued from page 1

The decisions follow the lukewarm reception given to Commodore's 700 Series machines.

Commodore has also decided to follow Atari and begin development of software for machines other than its own. The company is to develop a range of software for the Atari, Apple and IBM computers.

Oric shelves modem

ORIC owners hoping to buy a communications modem for the computer will have to cast their thoughts elsewhere.

Way back in December 1982, Oric advertised the modem at £79.95 along with many other peripherals for the Oric 1.

Last week, the company finally announced that plans to actually produce it had been shelved.

Oric has stated that due to insufficient demand and the commitment involved in manufacturing and making the modem available, they have decided the project is not worth pursuing.

As recently as a fortnight ago, there was confusion in the ranks as to the whereabouts and status of the modem.

Oric variously claimed it was still having finishing touches put to it at Oric itself, and that it had been submitted to British Telecom for approval.

Now a unanimous Oric voice has cleared the confusion, and also assured that all money received in response to the original advertisement has been refunded.

Floppy disc alternative

PHI Mag Systems has announced a data storage system for the BBC micro intended as a low cost alternative to the floppy disc.

Called a Phloopy, it adds 100K of memory from a cartridge containing a continuous loop of tape. Although similar in concept to the Sinclair microdrive, it works on a slightly different principle.

The tape uses a nine-track tape head to write on to ordinary ¼ inch recording tape, eight bits at a time. The ninth track is used as a "clock" track to control the data transfer.

Consequently, the data is stored in a more compressed form. The tape only needs to be 12 feet long and be driven at 15 inches per second — not much faster than on an ordinary open-reel tape recorder.

Inside the cartridge, the tape snakes loosely around the cavity, so that it is not liable to snap while in operation. Phi

Willy arrives next month

JET Set Willy, long awaited follow up to *Manic Miner* is now expected next month. It will be the first major new project from recently formed Software Projects — the Liverpool-based software house run by *Miner* author Matthew Smith and ex-Bug-Byte employee Alan Maton.

The game continues the story of *Manic Miner* — Willy the Miner is now living in a luxury mansion, thanks to the treasure he discovered in the last cavern of *Manic Miner*. Willy must move through the 50 rooms of his mansion, clearing the debris from a decadent party before he can go to bed. The various rooms include *Miner*-like obstacles, but the

rooms may be entered in any order.

The game which costs £5.95, will be issued with an unusual



piracy protection system. Before play commences the player must input a special colour code. This can only be found from a special grid supplied with the tape. Potential tape copiers would also need to copy the grid which, being in colour, would be expensive.

128K version

THE 128K version of Computers' Lynx computer is, at last, available from Laskys at £399.95.

The machine — called the Laureate — has 64K available Ram, of which 38K can be used from Basic.

Lynx have aimed the Laureate towards the small business market, with a CP/M option.

They are also offering a

special deal — Module I — providing two disc drives plus disc interface, manual and a suite of three Perfect Software packages, all for £699.95.

However, if you buy both the Laureate and Module I together, a discount sets the combined price at a few pence under £1,000.

Sinclair Rom

SINCLAIR has confirmed it is working on a new version of the Rom in the Spectrum Interface 1.

If all goes according to plan, the new Rom should appear in 12 to 15 weeks.

The company claims that there should be no problems of software compatibility between the new and old Roms. Machine code programs which use routines in the Interface 1 Rom — such as *Hunter Killer* from Protek — should run without any difficulty providing, according to a Sinclair spokesman — "the recommended accessing points and machine code hooks to the Rom have been used."

Coleco deficit

THE Adam home computer's high production costs and long delays with its US launch, has led manufacturers Coleco to announce a yearly deficit of \$7.4m. This is despite Coleco's notoriously successful Cabbage Patch Doll.



Although the Phloopy is currently only being developed for this machine, Phi Mag is considering producing an interface for other computers. Possible candidates are the Electron and the Commodore 64.

Phi Mag hopes the Phloopy will be available by mail order from the middle of May. Details from Phi Mag Systems, Tregonigie Industrial Estate, Falmouth, Cornwall.



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LANDSCAPING

Letters

Rearguard position

Your recent decision to stop accepting advertisements for tape-copying programs in *PCW* raises too many important issues to discuss in a short letter. May I nonetheless make three basic points?

A micro is a machine which has built into it, as an integral part of its operating system, the ability to record on tape or disc a program residing in its memory. Certain software manufacturers, as they are perfectly entitled to do, have decided to take steps to make such recordings as difficult as possible. Other software writers, as they are also perfectly entitled to do, have produced programs which overcome these "protection" devices and restore a perfectly natural and inherent function of the computer.

There is no question that software piracy — like any other form of piracy of books, music, radio broadcasts, pictures, photographs, articles or technical designs — is both illegal and undesirable. There is no question either that the *Save* function of a computer — like a camera, or a typewriter or a photocopier — *could* be used for illegal purposes (although as it happens, it rarely is: software pirates make tape-to-tape audio copies which sidestep all possible protection techniques). Your reasoning, however, declares that the *Save* function is *per se* illegal; that anyone who uses it is acting illegally; and that anyone who shows how it may be used is thereby party to an illegal act.

By this reasoning, anyone who advertises tape-recorders or photocopiers for sale (or indeed kitchen knives, which could be used for still nastier illegal acts) is party to a crime; and likewise the page itself in the computer manual which explains how the *Save* function works is immoral and/or illegal.

It is important here to insist on the distinction between copying for personal, instructive use and commercial pirating. Even if the law is not ideally clear, the common-sense distinction is easy to make. Photocopying an article in a book or magazine for one's own practical use is neither wrong nor

illegal; photocopying the article for sale, distribution or profit, or plagiarizing it for profit, is obviously so. You do not, in any case, attempt to solve the problem by banning photocopiers.

The US Supreme Court has recently ruled that the recording of TV programmes on home video is not illegal: to have declared it so, the Court said, would have been an unacceptable infringement of personal liberty. Informed observers believe that a similar ruling on the subject of computer software, an exactly parallel case, will follow soon. Britain traditionally lags behind the US in the field of consumer law by about a generation.

Meanwhile, I'm sorry to see *PCW* taking up its position in the rearguard, and not the vanguard, of common sense.

Dominic Gill
82 Carlton Hill
London NW8 0ER

The question of tape-copiers and the whole area of software piracy is as old as the software industry itself. In the continued absence of any government legislation on the matter, we have taken a stand against the pirates.

We would be most interested to hear the views of our readers on this subject.

Close to psychosis

I have recently bought a Memotech MTX 512 computer. Although the computer itself is excellent, the Basic manual leaves something to be desired.



"Oh, no! Don't tell me we've now got production problems with the gift to QL customers!"

This being my first computer, I have had to learn Basic from scratch out of the Memotech manual. This is proving almost impossible and what good is an excellent computer if you can't use it?

Could you please tell me if anyone has or is bringing out a book for the MTX before I pull all my hair out, burn the manual, kill all my family, send a letter bomb to Memotech and go completely psychotic.

Stuart Uwers
Skiddaw
Carlisle Road
Annan
Dumfriesshire

Granada are bringing out Memotech Computing by Ian Sinclair on March 22. It costs £5.95.

An act of faith

I feel I must write to put a different view to some of the recent articles and correspondence about the delays on the Sinclair QL. Like your anonymous correspondent who wrote under the heading 'Queue Longer?' (*PCW* 1-7 March) I have sent off my order to Sinclair Research Ltd. I am further down the queue than he is, and confidently expect to wait many months before the magic box arrives.

Having witnessed the situation at the launch of the ZX80, ZX81 and Spectrum I never expected 28 days delivery but simply decided to live in hope that my QL would reach me sometime before Christmas (Christmas 1984 that is!). Going on past experience, I expect I may then have to return my shiny new QL a couple of times before I get a model which works properly.

Why order a QL then, you may well ask? In my case, it is basically an act of faith in the genius of Sir Clive Sinclair. Quite simply, I know that after the delays and the heartache I will get a computer which far surpasses anything which any other company could produce for an equivalent price. Sinclair has already shown he can do it with his earlier computers, and the enormous sales of those machines, together with the vast influx of orders for the QL,

show that computer users are convinced that he will again work wonders.

So what if hanging on to my money for several months produces £5 interest for Sinclair. That will mean I will have paid £399 + £5 for the QL. Can anyone tell me where else I can get a comparable machine for £404 before the end of the year? And for those who aren't satisfied with the position, Sinclair Research offers the option of an immediate refund.

I hope that these comments will help put the matter into perspective for other prospective purchasers, and that they will not be deterred from placing an order by the moans and nitpicking. Join the Users Clubs which are already starting up, so you whet your appetite by reading about the QL while you're waiting for it! When you do finally receive it, you'll own a computer which is going to be at the forefront of developments in both hardware and software for the next few years — the power of the machine and number of users will ensure that.

John Simpson
56 Greenacres
Shoreham-by-Sea
West Sussex BN4 5WY

Appropriate noise

Regarding *Z-Fred* (*PCW* 16-22 February), I should like to suggest a couple of changes to give a better display — when you fall off the pyramid a more appropriate noise is given.

Any Spectrum:

```
61 PRINT AT x-1,y;"H";("I" AND
y<>15+(5-level)*2)+("P" AND
y=15+(5-level)*2); AT x,y-1;"G";
PAPER 7;" "; PAPER 0;"J" AND
y<>15+(5-level)*2)+("N" AND
y=15+(5-level)*2); AT x+1,y;"KL"
```

```
63 PRINT AT x-1,y;"O!"; AT x,y-1;"G"
AND y<>5+level*2)+("M" AND
y=5+level*2); PAPER 7;" "; PAPER
0;"J"; AT x+1,y;"KL"
```

48K only:

```
72 IF y=15+(5-level)*2 OR y=5+level
*2 OR level=0 THEN PRINT AT x,y;
PAPER 7;" "; POKE 60060,255;
RANDOMIZE USR 60059; POKE
60060,10; PRINT AT 19,10;"YOU FELL
OFF"; FOR t=1 TO 200: NEXT t
```

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 Oric Author - Adrian Sheppard
 Spectrum Author - Mike Howard
 Oric 48K - £4.95 Spectrum 16/48K - £4.95.



FOR ORIC AND SPECTRUM



Dinky Kong Attempt to rescue your lovely girlfriend who is held captive by the angry gorilla. As you climb the connecting ladders and move along the gangways, the gorilla will be throwing barrels and fireballs at you! The only way to reach her is to leap over these obstacles and progress to the top. Micode action with sound effects, full colour action graphics, skill levels etc.
 Author - Adrian Sheppard
 Oric 48K - £6.95

Quincy A superb dice game for 2 to 6 players. 3 throws per go to try and score points by obtaining certain combinations. I.e. 3 of a kind, a run, pairs etc. 13 go's to complete a game. The highest score is the winner! It's a game that is easy to learn but can be won by skillful and thoughtful play. Full colour graphics, on-screen instructions, bonus scores, etc.
 Author - Tony Churcher
 Spectrum 48K - £4.95.



FOR 48K SPECTRUM



SEVERN SOFTWARE
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Lone Raider As Captain of the space ship 'Lone Raider' your mission is to save earth from the alien Zugs, who are aiming to destroy all forms of intelligent life in the Universe. The 'Lone Raider' possesses formidable weaponry such as phaser cannons and neutron bombs. Armed with these you will need to battle through the planetary defences to seek the mother ship. She is heavily guarded and your chances of surviving long enough to even glimpse her are slim. Superb graphics, volume control, hi-score, 4 screen scenarios, missiles, fuel dumps, mines, sharks, octopi, mother ship etc. Can be played with keyboard or joystick using the Pose M/Interface.
 Author - Adrian Sheppard
 Oric-1 48K - £7.50



Moria A challenging adventure game set in the mines of Moria. You'll have to try and survive encounters with the monsters of middle-earth while trying to locate Durins Ring. The Wizard and the Trader may help or hinder you on your journey to find and open the hidden doors to freedom - a game that will really test your character and staying power.
 Oric Author - Adrian Sheppard
 Spectrum Author - Mike Howard
 Spectrum 48K - £4.95 Spectrum 16/48K - £4.95.



FOR ORIC 48K

Oric Extended Basic A must for the programmer! Extended Basic offers the user 13 additional commands to the present Oric-1 48K commands and yet only takes up 2K of RAM.
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 Author - Adrian Sheppard
 Oric-1 48K £7.50



FOR ORIC 48K

All Oric titles available from Laskys.
 Dinky Kong for Oric also available from W H Smith.
 Mail order service available on all titles.

Encounter A complex and intriguing classic-style text adventure. A girl has been kidnapped by thugs - your job is to locate and rescue her! Everything you need can be found in the game but sometimes you may have to manufacture items. Chemistry knowledge will help! Most commands are verb followed by noun although abbreviations can be used. If the alarm sounds you too are caught. It's worthwhile making a map noting what you find and where as the time limit is only 500 moves.
 Oric-1 48K - £7.50
 Spectrum 48K - £5.95
 CBM 64 - £7.50

ORIC UTILITIES

Oricade A combined assembler/disassembler and editor for the Oric.
 * Handles full 6502 Mnemonics.
 * Features Save and Reload M/C.
 * Assembles and disassembles at any address.
 * An essential tool for any serious programmer.
 Author - Adrian Sheppard
 Oric 48K - £8.50.

NEW

Address File Manager This is a new departure for software for the ORIC-1 micro. It will allow you to keep ALL your important records of NAMES & ADDRESSES. Up to 255 can be SAVED & each file and files can be SAVED & LOADED using an ordinary cassette recorder. This means an unlimited amount of information can be permanently stored in a convenient format.
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 Author - Mike Howard
 Oric-1 48K - £4.95

NEW

Oric titles recommended by ORIC PRODUCTS INT. LTD.
 All Spectrum Software is available on Micronet 800.
 TRADE ENQUIRIES WELCOME.



VALHALLA

Skull Trap

A new game for Commodore 64 by James Marsden

This program is a strategy game where the object is to destroy the computer's seven playing pieces by laying mines. The computer, in turn, is trying to trap and kill you.

There are nine levels of difficulty, number one being the easiest.

Six of the computer's pieces are deadly if they touch you. The seventh piece is fatal if you are on the same line —

either x or y axis.

Pressing F1 before you start the game will raise the skill level, which is indicated at the top left-hand side of the screen. Press any other key to start. To move your piece, use the following keys:

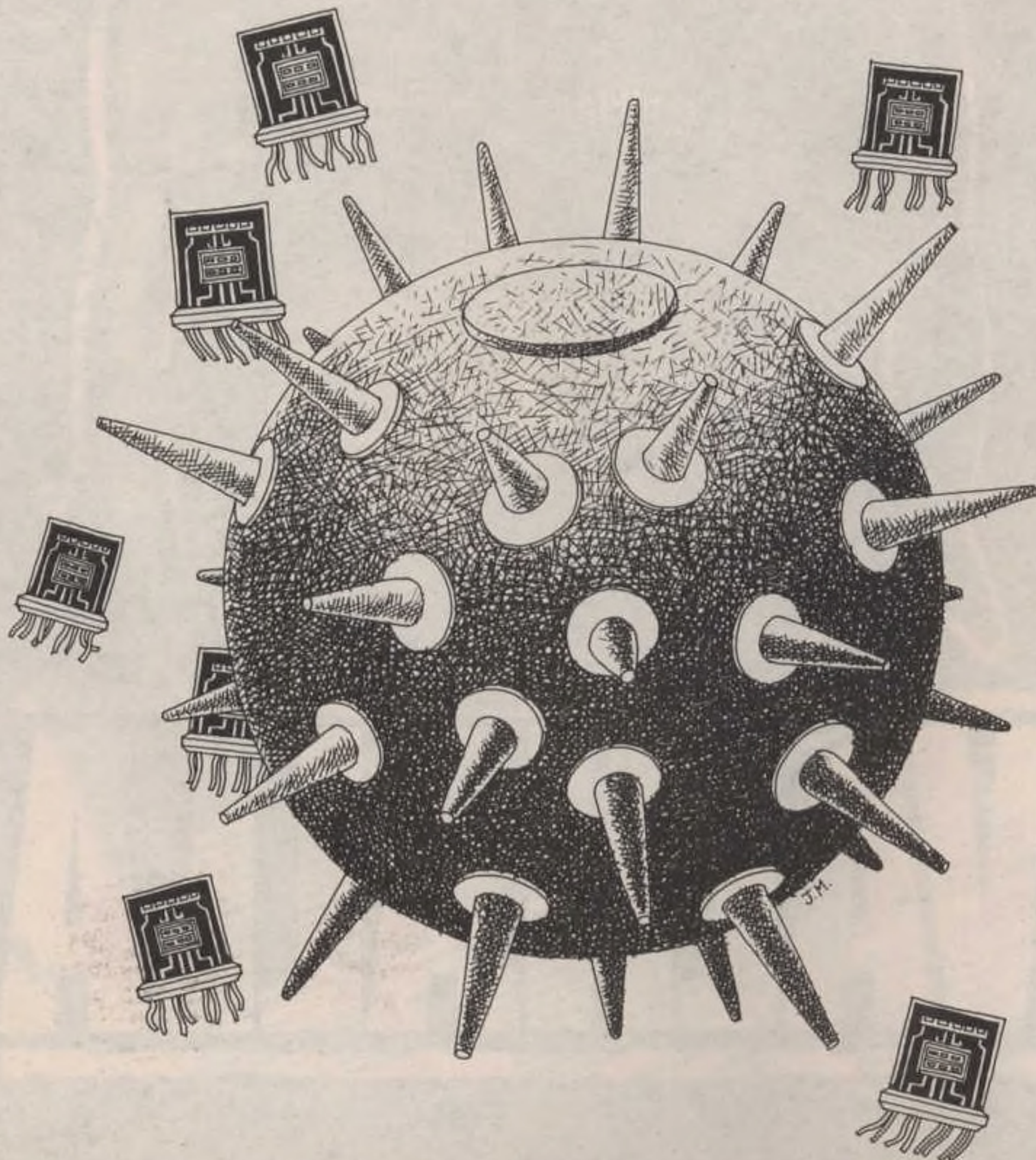
Y U I J M N B H

To drop a mine press F7 — to pick it up again, press F1.

Notes

40-260
280-320
470-720
740-1040
1050-1140
1160-1240
1250-1450
1460-1560

defines graphics
prints screen
your go
computer's go
computer wins
you win
wait for a key press to start game
or F1 to raise skill level.
control characters used in the
program



Hungarian rhapsody

David Kelly talks to Robert Stein of Andromeda Software

Few people are aware Andromeda Software even exists. It's hardly a household name.

Yet the company currently employs 120 programmers writing games software — making it one of the bigger outfits. The games it produces, mainly for the Commodore 64, are acknowledged to be among the most original on sale for the machine.

The reason for the company's comparative obscurity is two fold. First, its programs are marketed under the names of the companies to which they are sold — such as Commodore. Second, none of its authors are working in this country — they are based in Hungary.

Andromeda is a joint venture between Robert Stein and Novotrade — a Hungarian company set up with money from Hungary's Innovation Fund specifically to develop computer software.

Explains Robert Stein: "I am Hungarian myself and that gave me the geographical reason to go home.

"My company Vulcan Electronics was one of the major importers of chess computers to the UK and, knowing that literally everybody in Hungary plays chess, I started trying to export Sci-Sys chess machines into Hungary. We held a chess symposium in a hotel in Budapest where we exhibited eight different chess machines and demonstrated them to the Hungarian press.

"Most things in this world happen by coincidence! We got known to the Hungarian companies and one of them has a puzzle — a hand-held game called *The Hungarian Ring*. The project was one of a number financed by the Hungarian Innovation Fund and we were asked to help import the game into the UK. Very soon after that we were asked to attend to a very much bigger project called XL-25 — an electronic game.

"Our task was to take the Hungarian idea, develop it abroad, manufacture it in Hong Kong and distribute it world-wide."

On XL-25 Robert worked closely with the state-owned Hungarian banks backing the Innovation Fund and so became involved with Novotrade when it was formed a year ago.

At that time, what Hungarian software there was consisted of specialised application software packages — engineering programs, drug dose rate software etc.

Robert realised that the Hungarian programming expertise could be turned to produce games software for what was then a fast-growing world demand.

"One lousy day in November 1982 John Baxter — Commodore's marketing mana-

ger — and I went to Hungary to talk with Novotrade and meet its managing director Renyi Gabor to persuade him to write games.

"We collected together as many programmers as possible — none of these people had ever written a game before — and we told them what we wanted. As it turned out it is just as well they didn't take our advice. We told them things like *Space Invaders* and *Frogger*. What in fact they produced was far more inventive."

A national television competition was organised for anyone to send in ideas for games software.

"We ended up with 1,500 storyboards. We were day and night sifting out the best. Finally, Commodore selected 30 titles and we gave the go ahead to write the software for the Commodore 64.

"By the time we had produced the first four cassette programs for Commodore — six months later — they had switched to Rom software. Faced with having to start all over again we thought — 'What the hell, Commodore isn't the only company in the market'.

"Commodore went ahead and published *Dancing Monster* on cassette. Others have been sold to Mirrorsoft and to Ocean."

At present, Andromeda has 42



titles at various stages of completion. Eighteen are now finished and most of those have been sold and are soon to be launched by a number of companies.

More will be released by Mirrorsoft, Ocean and Commodore, and some will come out through Virgin and PSS. Talks are continuing with Quicksilver, and it is hoped to work with Thorn EMI and K-Tel.

Quicksilver will be selling *Dancing Monster* in the US. Other titles will be released in the US through Creative Software.

So why is Andromeda attracting so much attention? "Not one of our programs resembles other titles written in the West-

ern World," says Robert. "The Hungarians as a people tend to be extremely creative. Their imagination is running away with them without being influenced by what is happening in the Western software world."

The programmers draw a lot from Hungarian folklore for their inspiration. Graphically, the programs are very strong — Hungary is famous for its animated cartoons.

"With Novotrade you have a software development that is not based on computer literacy. In the UK we have over 1 million machines. In Hungary three dozen computers in the whole country.

"In other words, it is more of a creative activity. If we suddenly turned round and said 'Don't do software — write story books or films' the result would be equally as good."

If the Novotrade software is lacking in any respect, it is in the area of playability. This is where Andromeda comes in — advising on the game flow and on its competitiveness.

Software publishers interested in buying Andromeda software are first shown a storyboard — a few pages of simple



sketches showing roughly how the game might look. "Some people commit to buy at the storyboard stage. Then they get some control over the program's development from that point on."

Novotrade's programmers work in teams of three or four. Each is a specialist in a particular area — one may program the sprites, or the background

graphics or the sound. Most of the teams are writing for the Commodore 64. A few work with the Spectrum and BBC computers. "Invariably, each program is written first for the Commodore 64 and then converted to the other machines."

The first thing a team will program for a game is a series of short graphic routines to give an idea of how the finished work will look. These are then taken to Andromeda and to the prospective publisher and discussed. Comments are then passed back and incorporated in the final version.

"We see ourselves as partners with Novotrade. The moment we sell a program the copyright is transferred to Andromeda.

There are laws which prevent us, as a UK company, buying into Novotrade but, as and when we are able, we are committed to doing so on a 50:50 basis."

So far, only three Andromeda titles have arrived in the shops. Each — *Caesar the Cat*, *Dancing Monster* and *The Juggler* — is quite unlike any other game. A main feature of the programs is the large size of the moving graphics.

Within the next three months, another 10 titles will have been released. These include (tentative titles only):



Spatial Billiards: an outstanding three-dimensional billiards game. Instead of the balls being played on a table, they appear

'weightless' inside a cube. The balls can move up and down in space, as well as in the plane of the cube base.

In *Catastrophe* you have to construct a building as quickly as you can, competing



either with a friend or with the computer. Along the way your building is subject to a number of natural disasters.

The object of *Save Our Seals* is to balance a floating iceberg in such a way that figures on it are saved from the cold water.

Unlike the West, most of Novotrade's 120 programmers are past their 21st birthdays. In fact, between them they have over 300 university degrees. "Most are working as

computer engineers in colleges when they are not programming for Novotrade," says Robert. "They can program in machine code more easily than in Basic."

Royalties earned by Novotrade are split 50:50 with the programmers. And half of that is given in foreign currency. "That gives them the ability to travel where they like or buy anything they want — so the programmers are extremely happy."

The Hungarian banks are also pleased because of the foreign currency the venture brings in. "The government would be pleased too if they were really aware of what we are doing. But government influence in the Hungarian economy is absolutely minimal. They would only sit up and take notice if we hit upon another Rubik cube. Then suddenly we would find ourselves with additional government help and support."

"If I had to describe in a nut-shell what we are engaged in it would be the mass production of computer software with a strong creative input. Programming is considered as an art in Hungary — the computer just happens to be the medium.

"Our approach seems to be working. The biggest problem at the moment is how to work with everybody who wants to work with us."

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Learning the lingo

Andy Wilson looks at the multitasking package from Skyware Software for the ZX81

Beginners All-purpose Symbolic Instruction Code, or as it is better known, Basic, is a much criticised language. Yet practically every microcomputer on the market uses Basic as its host language.

One honourable exception was the Jupiter Ace, now sadly demised. The Ace's Rom contained not Basic but Forth, the makers claiming that Forth was as easy to learn as Basic. Despite this, sales were disappointing. More and more buyers began to judge micros on their ability to play colourful, noisy games rather than as machines on which to learn programming.

Nevertheless, micro owners looking for a second language for their machine often choose Forth. As far as the home market is concerned, Forth competes with Logo for second place in the popularity stakes.

At what is generally considered to be the bottom end of the market, Artic have had ZX81 Forth available on cassette for some time. Now David Husband of Skyware Software has released a very extensive and innovative implementation of Forth for the ZX81 — not on cassette but on Eprom.

For £29 you can now convert your ZX81 into a very powerful Forth based machine. The Eprom is a drop-in-replacement for the Sinclair Basic Rom, which means that when it is installed you can no longer use Basic.

A very good 75 page manual gives a step by step guide to swapping the Roms. If your Basic Rom is in socket, there are no problems. You simply open the case, remove the Basic Rom, and replace it with the Eprom.

If, however, you are unfortunate enough to own a ZX81 with the Rom soldered in, it needs to be removed and replaced with the 28 pin socket supplied. The manual tends to make this sound easier than it is. Desoldering an ic from a double-sided pcb is not an operation to be recommended to the faint-hearted and, if you are less than 100 per cent confident of your ability to do so, in my opinion you would be foolish to try as you could well end up 'lifting' pcb tracks or even damaging other components through overheating.

So, if you are considering ordering a Forth Rom, check your ZX first. If you are dubious about replacing the Rom, or maybe just opening the case, it is possible to obtain a ready converted machine.

It is also worth noting that if you don't have a Ram pack you will need one, as the Forth needs at least 2K of Ram to operate. For the purposes of this review I used a ready converted ZX81 complete with 16K Ram pack.

Once you have fitted the Eprom, or

unpacked the machine, the first question to be asked, as with most micros, is what to do with it? Although this implementation of Forth is designed primarily for control applications, many potential purchasers will simply want to learn a new language.

David Husband is keen to emphasise that the manual is not a Forth tutorial. For beginners he recommends the book *The Complete Forth* by Alan Winfield.

It is difficult for a Forth novice such as myself to review this Rom without reviewing the language itself. Forth combines the versatility of a low level language with the structure and power of a very high level language. Programs are written in a similar way to a procedural language such as Algol or Pascal.

The Rom contains an extensive dictionary of commands or words, from which new words can be defined which themselves become part of the dictionary. Through this process of defining words in terms of previously defined words we eventually end up with a single word, which when typed executes the entire program. This method of writing programs makes the programmer attack a problem from a top-down approach, which is often considered one of the main prerequisites of good programming.

ZX81 Forth is extremely fast, the example program given in the manual executes 300 times faster than Basic. The main data structure in Forth is the stack.

To the beginner, one of the most daunting aspects of Forth is the use of Reverse Polish Notation. This notation, although unfamiliar to most, is very easy to adapt to. The use of the stack and the manipulation of memory contents should present no problems to anyone who has attempted to use assembly language.

Getting back to the Rom, when first switched on we are presented with a blank screen. Anything typed in will be obeyed immediately, just like a direct command in Basic. If you type in a new word definition, this is compiled straight away and becomes part of the dictionary.

The interpreter does not even wait for you to press *Newline*, as since soon as you type a space the previous word is accepted.

This takes us to the normal modus operandi of the Rom. Pressing *Shift/Edit* presents us with a split screen, divided by an inverse line, or Pad, on which one line of text may be stored. The bottom seven lines are the execution screen, which behaves in the same way as the initial screen, scrolling automatically when the screen becomes full.

The top 16 lines are the Edit screen. Anything typed in here is not compiled or executed immediately, but can be edited using a full screen text editor. A flashing cursor is driven around with the cursor keys and characters and lines can be inserted or deleted. Both insertion and deletion work in the opposite directions to the Basic editor, which can be rather confusing, especially as the Rubout key backspaces as normal when using the execution screen.



The other quibble with the editor is that when text is inserted in the middle of a line, making it more than 32 characters long, the characters at the end of the line do not wrap round to the next line, but are lost.

If *Shift/Q* is pressed, the current line is compiled and printed on the execution screen. If it is not part of a definition, it will be obeyed immediately. The whole edit screen can be compiled by typing the word *CPL* in the execution screen. Toggling between the two screens is a simple matter of pressing *Shift/Edit*. The word *EOff* returns you to the power-up screen format.

Only one edit screen can be held in memory at a time, the usual practice being to write one screen of program, compile it, then delete the source code and write the next screen until the program is finished. If you require a permanent copy of a program, or wish to save a screen for future amendments, the entire edit screen, 512

bytes, can be saved on cassette as a numbered block using the word *Store*. In theory, it can be reloaded using *Load* but in practice I was unable to load a screen.

To enable me to change earlier definitions when writing a program, I was prompted to write the set of words in Figure 1 for storing named screens in Ram as part of the dictionary.

Scr saves space for the screen in the dictionary, eg, *Scr Screen1*. To save the current screen use *Save*, eg, *Screen1 Save*, and to retrieve it use *Get*, eg, *Screen1 Get*. The last routine *Pred* dumps the edit screen to the ZX printer.

ZX81 Forth has the normal *Fast* and *Slow* modes of Basic, as well as an *Auto* mode in which the screen blanks if a process takes longer than a quarter of a second.

In his promotional material, David Husband states that the keyboard is restored to normal operation. This means there are no keywords and everything has to be typed in full. Not having used the infamous ZX81 touch keyboard for some time, my finger-

characters from *Space* (32) to *Underline* (95) are available, and several of the control codes (0-31) are used as well. The internal codes, as with Sinclair, range from 0 to 63 and are found by subtracting 32 from the Ascii code. Curiously, Ascii 38, the ampersand (&), is not available from the keyboard, but it is there, try *38 Emit*.

David Husband has saved memory, and programming effort for the user, by not bothering with the *Newline* characters in the display file. This reduces the possibility of crashes when *Poking*, or in Forth *Cl ing*, the screen.

ZX81 Forth is integer only, but a full set of arithmetic and logical operations are available using two's complement arithmetic on two byte words. There are also a large number of words for unsigned and double precision (four byte) operations.

One of the package's many useful features is the ability to work in any number base. Two bases are immediately available, using the words *Decimal* and *Hex*, but any other base can be chosen simply by changing the value of the Integer variable *Base*.

In the usual Forth standards, character strings are stored as strings of Ascii numbers on the parameter stack. David Husband has simplified string manipulation by incorporating a second stack specifically for strings. This means that ZX81 Forth contains a very powerful set of instructions for printing strings, converting from Ascii strings to

numbers, in hex or decimal, and formatting numeric output.

The other data structure programmers feel is a necessity is the array. ZX81 Forth has the standard *Allot* word to save space for an array and the *Builds Does* construct to allow for extremely versatile 'intelligent' arrays.

Fig Forth and Forth 79 both have a full set of control structures, ie, *Begin . . . Again, If . . . Else . . . Then, Do . . . Loop, Begin . . . Until* and *Begin . . . While . . . Repeat*. ZX81 Forth has all of these — although the syntax of *While* is slightly non-standard — as well as a very simple to use *Case* command. This word did however make me wonder where I had gone wrong when I first tried to use it, the problem being that a semi-colon, usually used to end a definition, is also used to delimit a list of *Case* words, meaning that in a definition two semi-colons are required.

A few printer control words are included. **A**P toggles the printer on and off — when on, any text typed or output to the execution screen is also sent to the printer. *PATR* takes an Ascii value from the stack and

outputs it to the printer and there is also a facility to control an RS232 interface.

Programmers who wish to use machine code routines in their programs, essential for i/o control, are not forgotten either, the words *Code* and *;C* allow machine code to be included as strings of hex bytes.

If the facilities offered by ZX81 Forth stopped there it would be very good value, but I have not yet mentioned two of its most exciting capabilities. The advertisements for the Sinclair QL make much of the possibilities offered by user-defined windows and multitasking. David Husband beat Clive Sinclair to it by offering both facilities in ZX81 Forth.

Independently scrolling windows of any size are easily defined on any part of the screen. Combined with the multitasking, this means you can have several programs running simultaneously, each with its own screen, and still continue to type in another program!

Multitasking is made possible by a real time clock. Any word can be defined as a task and scheduled to operate using *In*, *At* or *Every*, eg, *Every 10 Ts* (task seconds) *Task1*. The timing periods available are *Tt*, *Ts*, *Tm*, *Th*, *Td*, *Tw* and *Ty* (ticks of 1/50th second, seconds, minutes, hours, days, weeks and years). In theory you could write a program:

```
: LEAP " LEAP YEAR" ; (print "leap year")
TASK LEAP YEAR LEAP
EVERY 4 TRY LEAP YEAR
```

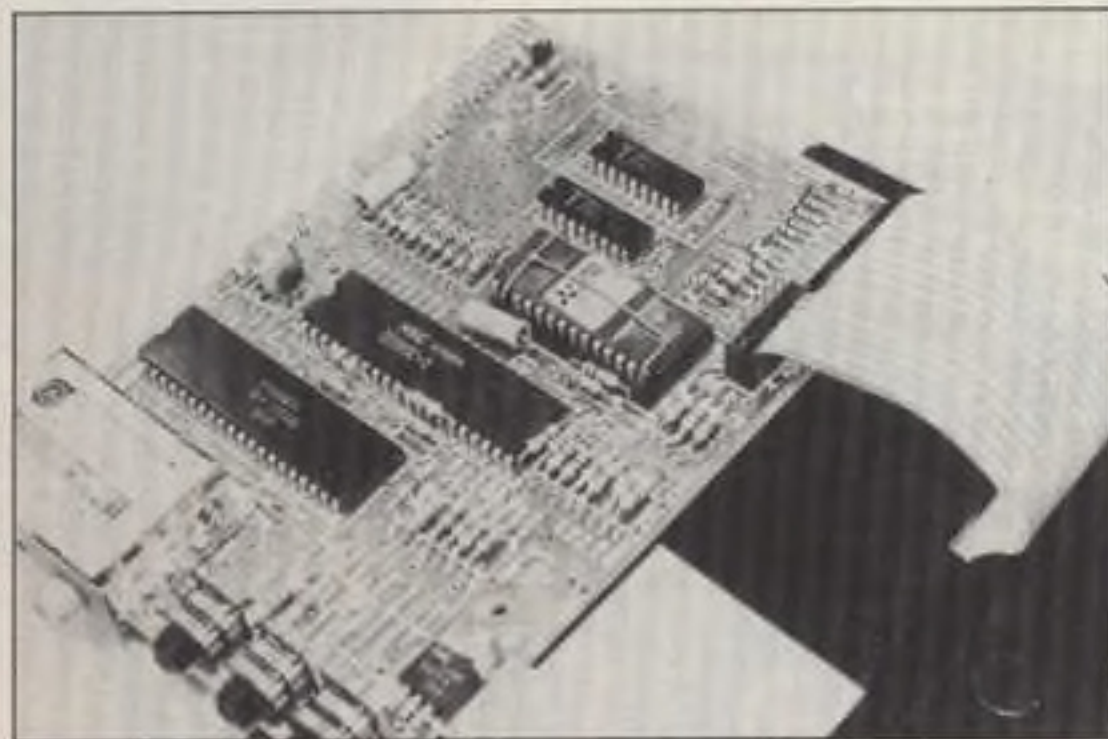
but you would have to leave your ZX81 switched on for a very long time!

The manual warns that most simple demonstrations of multitasking can be trivial, but goes on to give a very useful program to continuously display the contents of the stack at the bottom of the screen, whilst you continue to use the machine as normal. The obvious use for the multitasking capabilities is in the control of external devices — maybe a ZX81 could run a power station after all.

Overall, the Forth Rom is almost as big an innovation as the introduction of the ZX81 itself. David Husband and Skywave Software should soon make an even greater impact when they introduce versions for the Spectrum and BBC.

The Spectrum version will be produced as a plug-in module complete with i/o port and Rs232 interface, eliminating the need to remove the Basic Rom, all for £59. Although David Husband says that the module will not be primarily for the home market, it will be interesting to see if any games programmers take advantage of the possibilities offered by multitasking.

Back to ZX81 Forth again — I cannot recommend it highly enough to anyone who feels they might have an application for it, or simply wants to learn Forth and experiment with multitasking. My only misgivings are with the loading, the lack of documentation of the system variables and the fact I have to return the review model.



tips were soon longing for real keys. With this Rom a proper keyboard becomes less of a luxury and more of a necessity.

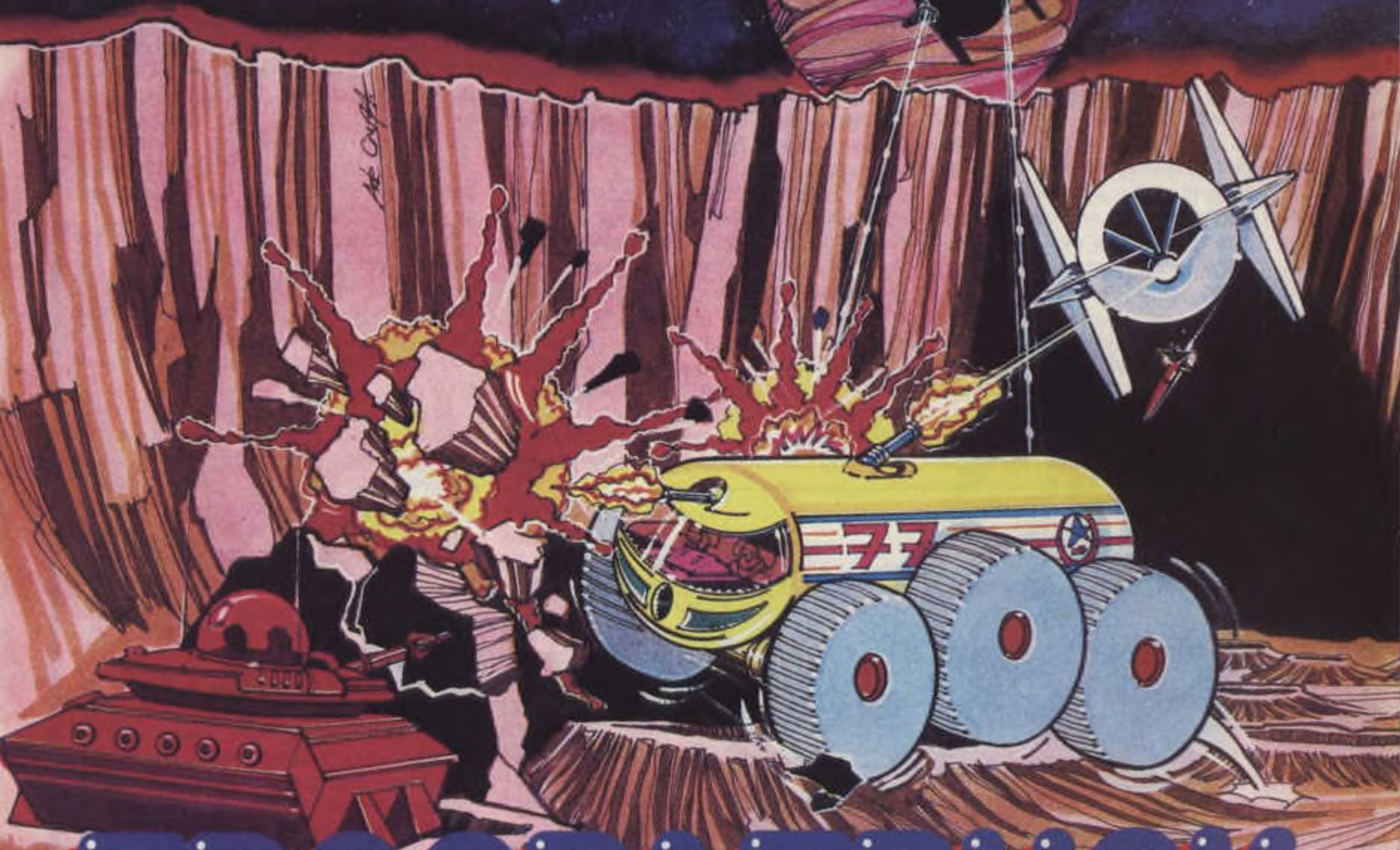
The inability to tell if a key has been pressed becomes a serious problem when attempting to break a program or reset the stack with a 'Warm' restart. *Break* on the Forth ZX81 is a shifted space. Unfortunately, if *Shift/Space* is held down for over half a second a 'Cold' restart is executed, the equivalent of pulling out the power plug.

The character set no longer contains the familiar block graphics, these are replaced with Ascii characters. All of the Ascii

```
: SCR <BUILDS S12 ALLOT DOES>
: SAVE FBUF SWAP COPY ;
: GET FBUF COPY ;
: PRED FBUF S12 + FBUF
  DO
  I 08 32 + PATR
  LOOP ;
```

Figure 1

On a hostile planet deep in space
an earth patrol is marooned.
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Programming

Bits and pieces

Boris Allen compares the Motorola 68000 and 68008 microprocessors in the first of a three-part series

Sinclair Research claims that the QL uses a 32-bit processor. Motorola Semi conductors think that its MC68000 series are 16-bit microprocessors. And the MC68008 processor used in the QL fetches information from memory a byte at a time, like popular 8-bit microprocessors such as the MDS Technology MCS6502 or Zilog Z80.

When Sinclair Research designate the

MC68008 a 32-bit microprocessor, they are concentrating on the internal structure of the chip. The MC68008 has a large and powerful complement of 17 32-bit registers.

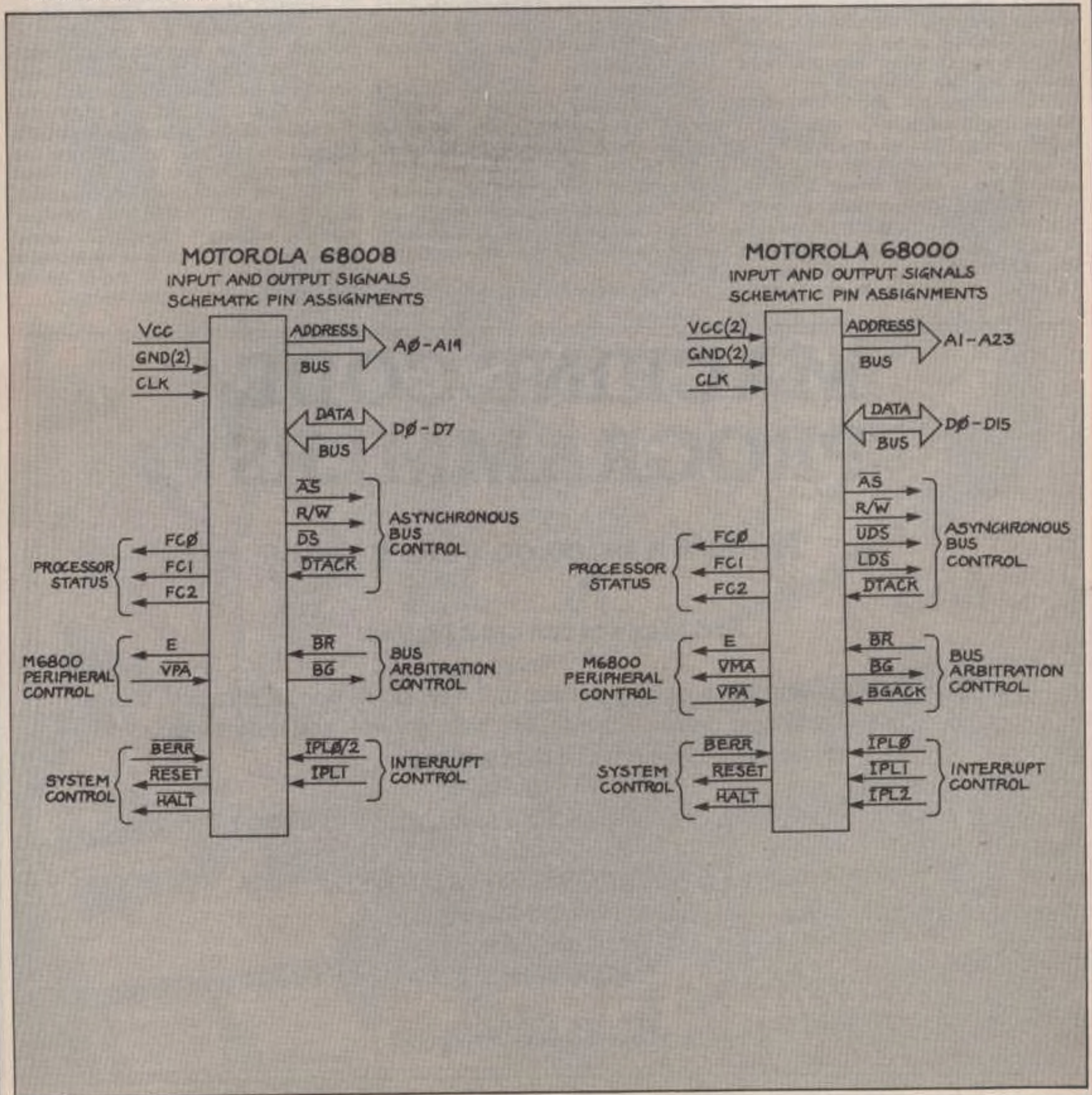
The 32-bit registers of the MC68008 may be compared to the MCS6502's four 8-bit registers, and the Z80's more expansive set of seven 8-bit registers (of which six can be combined to form three 16-bit

registers) — not forgetting that the Z80 has twin banks of registers.

The internal structure of the MC68000 is something we will examine next week.

For any microprocessor to be used in the real world, it has to have some way in which it can talk to the world. The world for a microprocessor principally consists of banks of memory (Ram and Rom), and the conversation uses the language of the addresses of locations in memory, together with their contents.

continued over the page



The microprocessor points to locations in memory by giving their address. The 'giving of an address' is performed by the 'address bus'. In both the MCS6502 and the Z80, there is a special register called the program counter, which consists of 16 bits. The program counter is used to hold the address of a location in memory.

A 16-bit program counter can take values from 0 to 65535 (a total of 64K possible different values). Each bit of the program counter corresponds to one electrical connection between the microprocessor and the computer's memory.

Each electrical connection corresponds to one pin on the microprocessor package (the chip) — and the pins usually are at a high or low voltage, depending upon whether the corresponding bit value in the program counter is set to one or zero. These 16 pins (and their respective highs or lows) are then considered jointly, and form the address bus. The 16 lines of the address bus are then converted to point to specific bytes. The lines only point in one direction (ie, to a location) and so the address bus is called 'un-directional'.

When a location is activated by being 'addressed', either the content of the byte is used to activate special lines (on the data bus) or the lines are used to leave a bit pattern in the byte. In other words,

either information about the content of the byte is sent to the processor, or information is placed in the location. The data bus is 'bi-directional'.

Data transfer happens by activating high or low potentials at the pins to the processor. Another pin is needed to inform the processor whether information is being sent or received (usually called *Read/Write*). As a byte consists of eight bits, on the MCS6502 or the Z80 the data bus is eight bits wide, which corresponds to eight pins.

The MC68000 has a program counter which is 32 bits wide (like the other registers), of which only 23 bits are used for the address bus. The MC68000 deals in units of two bytes at a time (that is, it has a 16-bit data bus), so there are two other pins — to indicate if the lower and/or upper byte is required.

Effectively, there are 25 pins to isolate bytes, equivalent to a 24 bit address range. The MC68000 can, therefore, address 16M bytes (or 16777216 bytes).

The MC68000, because it transfers data in chunks of 16 bits, is usually called a 16-bit chip, even though the registers are 32-bit. It recognises individual bits, bytes, words (two bytes), and long words (two words).

The MC680008 (as used in the QL) is a

modified version of the MC68000, though as far as the programmer is concerned the two processor are identical. That is, if a machine code program runs on the MC68000 it will run without modification on the MC68008. So, where are the differences?

The most obvious difference, is that the MC68008 has an 8-bit data bus, just like the MCS6502 or Z80. Whereas the 8-bit chips only fetch or send data in byte size chunks, the MC68008 can, however, transfer data in long word chunks (even if a byte at a time). The only data types for 8-bit chips are bits and bytes.

By reducing the data bus by eight bits, the number of pins is reduced by eight, and thus the processor package (the chip) is simplified. Many other system features are also simplified. For example, it is possible to use standard 8-bit support chips. The MC68008 is effectively a slower version of the MC68000 (but faster than normal 8-bit chips) and is a 16-bit chip.

A further difference between the MC68008 and the MC68000 is the address bus — rather than being an (effectively) 24-bit bus (25 pins), the address bus consists of 20 bits (20 pins). The MC68008, therefore, can only address 1 Mbytes. With some other savings, the 64 pins of the MC68000 are reduced to 48 pins for the MC68008 (the MCS6502 and Z80 have 40 pins).

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```

5 REM *****MUCROID RUN*****
*
*
*
D.EDWARDS ***
10 PAPER 0: BORDER 0: INK 7: OVER 1: C
LS 1: GO SUB 30: GO SUB 70: PRINT AT 9,1
5: INK 0: PAPER 0: " ": AT 10,15: " ": L
ET s=USR 65050: GO TO 160: REM
WHICH GOES ON TO DEFINE
VARIABLES
30 BRIGHT 0: BORDER 0: PAPER 0: INK 7:
OVER 1: CLS 1: INK 1: PLOT 0,175: DRAW 8
8,0: PLOT 88,175: DRAW 80,0: PLOT 168,17
5: DRAW 86,0: PLOT 86,175: DRAW 0,-16: D
RAW 82,0: DRAW 0,16
31 LET gy=18: LET gc=6: FOR q=1 TO 6:
PLOT -1,192-gy: DRAW 84,0: PLOT 169,192-
gy: DRAW 85,0: PLOT 1,gy: DRAW 253,0: LE
T gc=gc-1: LET gy=gy+gc: NEXT q: PLOT 0,
16: DRAW 255,0: DRAW 0,159: PLOT 0,175:
DRAW 0,-159: FOR f=1 TO 150: PLOT INK
RND *4+1: RND *235+10, RND *100+45: NEXT
f: PRINT AT 21,0: PAPER 2: INK 7: BRIG
HT 1:"SECTOR: TRACTOR: MUCROIDS: " :
PRINT BRIGHT 1: AT 20,0: PAPER 2: INK
7:"POWER: SCORE: POWER LOSS: " : IN
K 7: RETURN
40 REM ACTIVATE SHIELDS
50 PAPER 1: INK 6: FLASH 1: PRINT OVE
R 0: AT 1,11:"SHIELDS ON": LET sh=1: FOR
f=-40 TO -20 STEP 4: BEEP .1,f: NEXT f:
PRINT AT 1,11: OVER 0:"SHIELDS: " : shpo
: FOR f=1 TO 40 STEP 2: BEEP .001,f: NEX
T f: FLASH 0: PAPER 0
60 LET s="(sh)(ee)lds o(n)": PAUSE 60
: BEEP .1,12: LET sh=1: LET po=po-shpo*2
: GO SUB 460
65 RETURN
70 REM DRAW CROSSHAIRS
72 INK 6: BRIGHT 1: PLOT 119,96: DRAW
-30,0: PLOT 136,96: DRAW 30,0: PLOT 127,
104: DRAW 0,30: PLOT 127,87: DRAW 0,-30:
BRIGHT 0
89 RETURN
90 REM CHARGE LASER CANNON
100 BRIGHT 1: FOR f=5 TO 0 STEP -1: INK
f: LET click=USR 65030: PLOT 85,104: D
RAW 35,35: PLOT 134,139: DRAW 35,-35: PL
OT 170,89: DRAW -35,-35: PLOT 119,54: DR
AW -35,35: NEXT f: BRIGHT 0
101 IF str AND box>10 AND box<14 AND bo
y>10 AND boy<21 THEN PRINT AT 1,11: PA
PER 1: INK 6: FLASH 1: OVER 0: "CYCLOID
": FOR f=0 TO 7: LET click=USR 65030:
NEXT f: PRINT AT 1,11: PAPER 1: INK 6:
FLASH 1: OVER 0: "DAMAGE " : LET sound=
USR 65002: PRINT AT 1,11: INK 0: PAPER
0: OVER 0: FLASH 0: " ": LET da=
da+INT (RND *10): GO SUB 460
105 LET po=po-25: IF ATTR (9,15)=6 AND
ATTR (9,16)=6 THEN GO TO 108
106 GO SUB 460: IF ATTR (10,15)=6 AND
ATTR (10,16)=6 THEN GO TO 108
107 GO SUB 70: GO SUB 70: RETURN
108 LET kk=kk+1: PRINT OVER 1: INK 6:
AT x1,y1:kk: OVER 0: GO SUB 70: OVER 1:
PRINT INK 6: AT x1,y1:kk: LET sc=sc+10:
LET k(s)=k(s)-1: GO SUB 460: FOR i=7 TO
0 STEP -1: INK i: FOR b=1 TO 0 STEP -1:
BRIGHT b: PRINT OVER 1: AT x1,y1:"III"
: PAUSE 3: BEEP .01,f: PRINT AT x1,y1:
OVER 1:"HHH": NEXT b: NEXT i: LET disp=
USR 65064: GO SUB 460: LET c=c+1: IF cry
=1 AND k(s)=0 THEN GO TO 1050
109 GO SUB 490: GO TO 330
110 REM MUCROIDS FIRE BACK
111 RESTORE 121
112 IF x >= 17 THEN RESTORE 122
113 LET s="(wat(ch) owt)": PAUSE 50
120 OVER 1: LET dan=0: FOR f=0 TO 6 STE
P .5: INK f: PRINT AT x1,y1:kk: PRINT
OVER 1: AT x1,y1:kk: NEXT f: FOR i=0 TO
1: READ ink: INK ink: BRIGHT 1: PLOT y1*
8+10,165-x1*8: DRAW -10,-5: PLOT y1*8+10
,165-x1*8: DRAW -15,-5: PLOT OVER 1:y1*
8+10,165-x1*8: DRAW OVER 1:-10,-5: PLOT
OVER 1:y1*8+10,165-x1*8: DRAW OVER 1:
-15,-5: NEXT i: BRIGHT 0: LET sound=USR
65002: FOR f=10 TO 50 STEP 5: OUT 254,-
f*2: OUT 254,234-f: BORDER 0: NEXT f
121 DATA 2,0
122 DATA 2,1
125 LET dan=INT (RND *10): IF sh=1 TH
EN LET dan=dan-shpo
126 IF dan <= 1 THEN LET dan=1
130 IF x >= 9 AND x <= 10 AND y >= 14 A
ND x <= 15 THEN LET dan=dan+INT (RND
*10)
131 IF INT (RND *20)=1 AND da >= 5 TH
EN LET da=da-RND *5
135 LET da=da+dan
136 PRINT AT 1,11: OVER 0: PAPER 0: FL
ASH 0: " "
140 IF da >= 99 THEN GO SUB 550
150 BORDER 0: LET sh=0: LET mov=INT (
RND *2)+1: GO SUB 460: RETURN
160 REM SET UP SECTORS AND
POSITION MUCROIDS
170 LET kkk=0: DIM p(8,20): DIM k(8): F
OR a=1 TO 8: LET p(a,1)=INT (RND *3)+1
: NEXT a
180 REM If p(subscript,i) <= 2 then
Klingons are in that sector
190 FOR a=1 TO 8: IF p(a,1) <= 2 THEN
LET no=INT (RND *aki11)+1: LET kkk=kkk
+no: LET k(a)=no: FOR c=1 TO no: LET p(a
,1+c)=INT (RND *5)+1: LET p(a,8-c)=IN
T (RND *15)+5: NEXT c
191 NEXT a
192 FOR a=1 TO 8: IF INT (RND *10) >=
4 AND k(a) >= 1 THEN LET p(a,20)=1
193 NEXT a
194 LET a=INT (RND *8)+1
195 IF p(a,20)=1 THEN LET p(a,20)=3: G
O TO 200
197 LET p(a,20)=2
198 IF k(a)=0 THEN LET p(a,20)=0: GO T
O 194
220 REM DEFINE VARIABLES
230 LET t=900: LET box=INT (RND *12)+
5: LET boy=INT (RND *20)+3: LET mov=I
NT (RND *2)+1: LET muc=1: LET shpo=1: L
ET kk=0: LET cry=0: LET tra=0: LET str=1
: LET tr=20: LET sh=0: LET c=0: LET po=7
00: LET ch=0: LET k="ABC": LET da=0: LE
T s=INT (RND *7)+1: LET sc=0
240 LET c=1
250 LET p=0: LET o=0: GO SUB 460: GO SU
B 490: REM PHASORS ETC+ X AND Y POSITION
S FROM ARRAY
260 PRINT AT 15,1:"LONG RANGE SCANNER
ACTIVATED " : FOR f=1 TO 90: NEXT f: PRIN
T OVER 1: AT 15,1:"LONG RANGE SCANNER A
CTIVATED: BEEP .1,12
270 IF SGN k(s)=0 THEN LET ch=1: GO S
UB 280
280 LET i=INKEY$: IF i >= "1" AND i
<= "8" THEN LET s=CODE i-(48): LET
display=USR 65064: LET ch=0: FOR f=0 TO
68 STEP 5: BEEP .01,f: NEXT f: LET po=p
o-s*5: GO SUB 460: GO SUB 490: BEEP .1,-
12: GO TO 300
290 IF ch=1 THEN BEEP .01,-12: PAUSE
RND *5+1: GO TO 280
310 LET rn=INT (RND *8)
330 REM POSITION+ MOVE MUCROIDS
331 LET t=t-.1: IF INKEY$="q" OR INK
EY$="w" THEN LET shpo=shpo-(INKEY$="
q" AND shpo>1)+(INKEY$="w" AND shpo<9)
: PRINT AT 1,11: PAPER 1: INK 6: OVER 0
: FLASH 1:"SHIELDS: " : shpo: BEEP .1,shpo
: REM PRINT AT 1,11: PAPER 0: OVER 0: "
"
335 PRINT AT 9,15: PAPER 0: INK 0: " "
: AT 10,15: " "
340 PRINT INK 6: AT x,y:kk: LET x1=x:
LET y1=y: IF str=1 THEN PRINT INK 6: A
T box,boy:"D": LET b1=box: LET b2=boy
342 IF muc AND INT (RND *100)=48 THEN
GO SUB 525
343 LET x=x+1: IF mov=1 AND x<(rn-10) THE
N LET y=y+1
344 IF mov=1 AND x>10+rn THEN LET y=y-
1
345 IF INT (RND *20)=2 THEN GO SUB 1
10
348 IF str THEN LET box=box+RND *4-R
ND *4: LET boy=boy+RND *4-RND *4: IF b
ox<4 OR box>15 OR boy<2 OR boy>27 THEN
LET box=INT (RND *11)+4: LET boy=INT
(RND *25)+2
354 IF tra THEN GO SUB 460
355 IF INKEY$="t" THEN LET tra=1: PR
INT PAPER 1: INK 6: OVER 0: FLASH 1: AT
0,11:"TRACTOR " : FOR f=1 TO 10: BEEP
.04,f*2: NEXT f: PRINT PAPER 1: INK 6:
OVER 0: FLASH 1: AT 1,11:" BEAM ON " : F
OR f=1 TO 8: LET click=USR 65030: NEXT
f
356 IF cry AND tra AND x=9 AND y=15 OR
cry=1 AND tra=1 AND x=9 AND y=16 OR cry=
1 AND tra=1 AND x=10 AND y=15 OR cry=1 A
ND tra=1 AND x=10 AND y=16 THEN GO TO 2
000: REM YOU FIND CRYSTAL
357 IF tra THEN LET tr=tr-1: IF tr<1 T
HEN GO TO 3000: REM YOU LOSE
358 IF kk=kkk THEN GO TO 1050
360 IF mov=2 AND x<10+rn THEN LET y=y-
1
365 IF mov=2 AND x>rn-10 THEN LET y=y+
1
380 IF INKEY$="a" THEN GO SUB 40
390 IF INKEY$="h" THEN FOR g=0 TO 2:
FOR b=0 TO 7: BORDER b: BEEP .01,b: NEX
T b: NEXT g: BORDER 0: LET x=INT (RND
*14)+4: LET y=INT (RND *24)+3: LET po=
po-20: GO SUB 460
400 IF x>14 THEN LET x=x-4
401 IF y>26 OR y<3 THEN LET y=5 OR y=2
0
402 IF x<5 THEN LET x=INT (RND *12)+
5
405 IF INT (RND *15)=5 THEN LET mov=
INT (RND *2)+1
430 LET po=po-(INKEY$="y")-(INKEY$="
u")-(INKEY$="i")-(INKEY$="o"): LET
x=x+(2*(INKEY$="u"))-(2*(INKEY$="i"))
: LET y=y+(2*(INKEY$="o"))-(2*(INKEY
$="y")): IF INKEY$="p" THEN GO SUB 9
0
445 PRINT OVER 1: INK 8: AT x1,y1:kk:
IF str=1 THEN PRINT OVER 1: INK 8: AT
b1,b2:"D"
450 GO TO 280
460 PAPER 2: INK 7: PRINT BRIGHT 1: OV
ER 0: AT 21,71s: AT 21,18: INT (tr): " "
: AT 21,30:kk(s): PRINT BRIGHT 1: OVER 0:
AT 20,6: INT (po): AT 20,16: INT (sc):
AT 20,30: INT (da): PAPER 0
461 IF po <= 1 THEN GO TO 600
462 IF da>99 THEN GO TO 550
480 RETURN
490 LET cry=0: LET str=0: LET x=p(s,1+c
): LET y=p(s,20-c): IF p(s,20)=2 AND k(s
)=1 OR p(s,20)=3 AND k(s)=1 THEN LET cr
y=1
491 IF p(s,20)=1 OR p(s,20)=3 THEN LET
str=1: IF str=1 THEN LET box=INT (RN
D *11)+4: LET boy=INT (RND *24)+3
492 IF cry=1 AND k(s)=0 THEN GO TO 105
0
493 IF SGN k(s) <> 1 THEN GO TO 510
494 IF po <= 20 THEN PRINT FLASH 1: P
APER 1: INK 6: AT 1,11:" POWER LOW"
495 IF c >= 9 THEN GO TO 510
496 IF x=0 OR y=0 THEN LET x=INT (RN
D *12)+5: LET y=INT (RND *25+4)
497 IF po <= 1 THEN GO TO 600
498 IF cry=1 THEN PRINT FLASH 1: PAPE
R 1: INK 6: AT 1,11:" CRYSTAL "
499 RETURN
510 REM NO MUCROIDS MESSAGE
520 LET s="NO MORE MUCROIDS ARE PRESEN
T": FOR w=1 TO LEN s: PRINT AT 16,w:"
": CHR$ 8: OVER 0:ms(w): NEXT w: LET ms
=" "
521 LET c=1: LET ch=1: GO TO 280
525 REM GRAND MUCRON ATTACKS
526 PAUSE 10: LET s="(h(ar)h(ar)": PAU
SE 10: PRINT OVER 0: AT 0,11: PAPER 1:
INK 6: FLASH 1: " GRAND " : AT 1,11:
MUCRON " : INK 8: FOR f=4 TO 8: PRINT A
T f,20-f:"EFG": BEEP .07,f: IF f >= 7 TH
EN BORDER f-3: PLOT 105,160-f*8: DRAW -
40,-f*3: PLOT 110,160-f*8: DRAW 40,-f*3:
PLOT OVER 1:110,160-f*8: DRAW OVER 1:
40,-f*3: PLOT OVER 1:105,160-f*8: DRAW
OVER 1:-40,-f*3
527 BORDER 0: PRINT AT f,20-f: OVER 1:
"EFG": NEXT f: PRINT OVER 0: PAPER 0: I
NK 7: FLASH 0: AT 0,11: " " : AT
1,11: " " : PLOT OVER 0: INK 110
,175: DRAW OVER 0: INK 1:255,0

```

continued next week

Cut and run

Richard Dodd looks at advanced game programming in the first of a three part series

In this three part article for the Dragon 32 computer, I will be going through the stages of development of a fairly simple game. It is called *Lawn Mower* and uses high resolution graphics and sound. To obtain detailed graphics I have had to use the highest graphics resolution, which limits you to black and white.

The game puts you in charge of a runaway lawn mower, which you must try to steer around the garden avoiding the trees. When you have cut enough of the grass, you will go on to the next level with the lawn mower now going faster. To add to your problems, the fuel is running out. When it runs out, you will lose one of your three lives. To refuel you must run over one of the fuel cans.

When you are designing a game, there are three main sections:

- 1... GRAPHICS & SCREEN & USER DEFINABLES
- 2... MOVEMENT & CHECK ROUTINES
- 3... FINISHING TOUCHES

GRAPHICS

When writing a game, the design of the screen layout is one of the first tasks. An attractive screen using good graphics can make all the difference.

An example of a screen is shown in figure 1. The screen should be designed on a 32 x 24 grid, with each square being made up of 8 x 8 dots, which are either black or white.

When you have decided what the screen is to look like, you will more than likely need to define some special characters, eg, the

fence, lawn mowers, trees, and fuel cans in figure 1. The easiest way to produce these characters is to *Poke* them to the screen.

The character must first be drawn on an 8 x 8 grid, as shown in figure 2, with each square being black or white. The character can then be divided into 8 rows of 8 dots and the value for each row can be worked out as shown in figure 3.

Once all eight values have been worked out using this method, they can be stored in a *Data* statement. Program 1 shows the *Pokes* needed for the characters included in this program. As the Dragon cannot print either numbers or letters on the high resolution screen, the *Pokes* for these also have to be worked out.

To save you the effort of working these out, all the *Pokes* for the letters and numbers are shown in program 2. The *Data* statements are arranged in order of their Ascii codes. The special characters replace some of these characters. The first nine characters are special characters for use with my program. More next week.

Figure 1

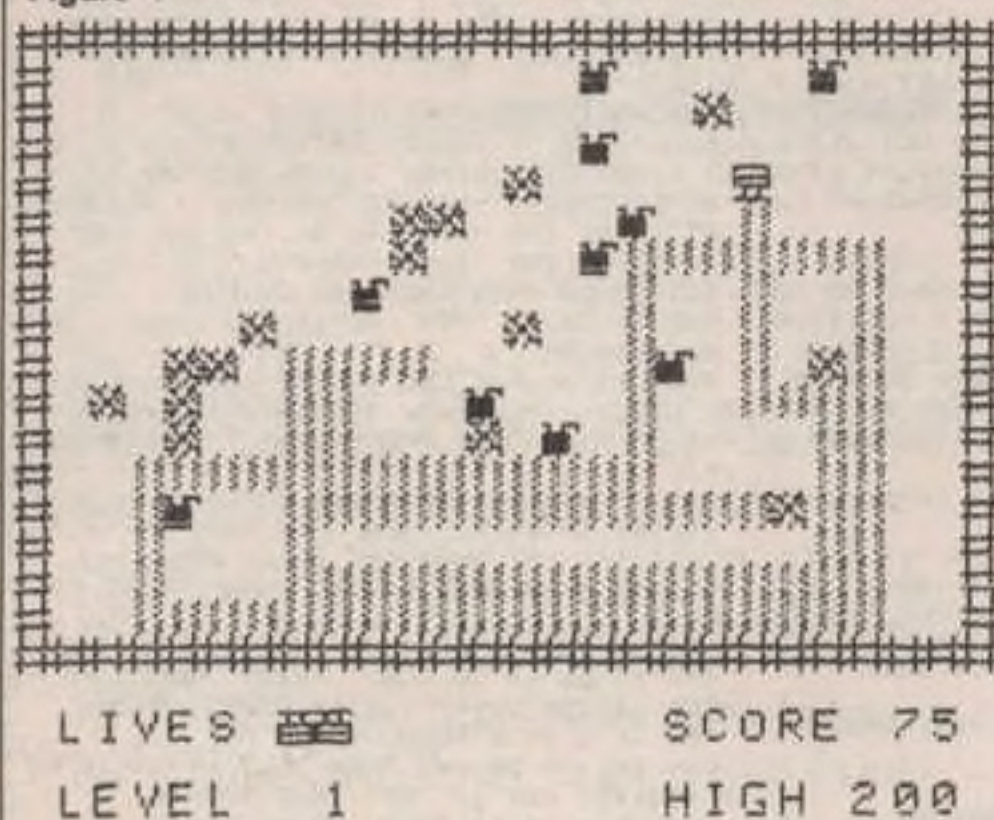
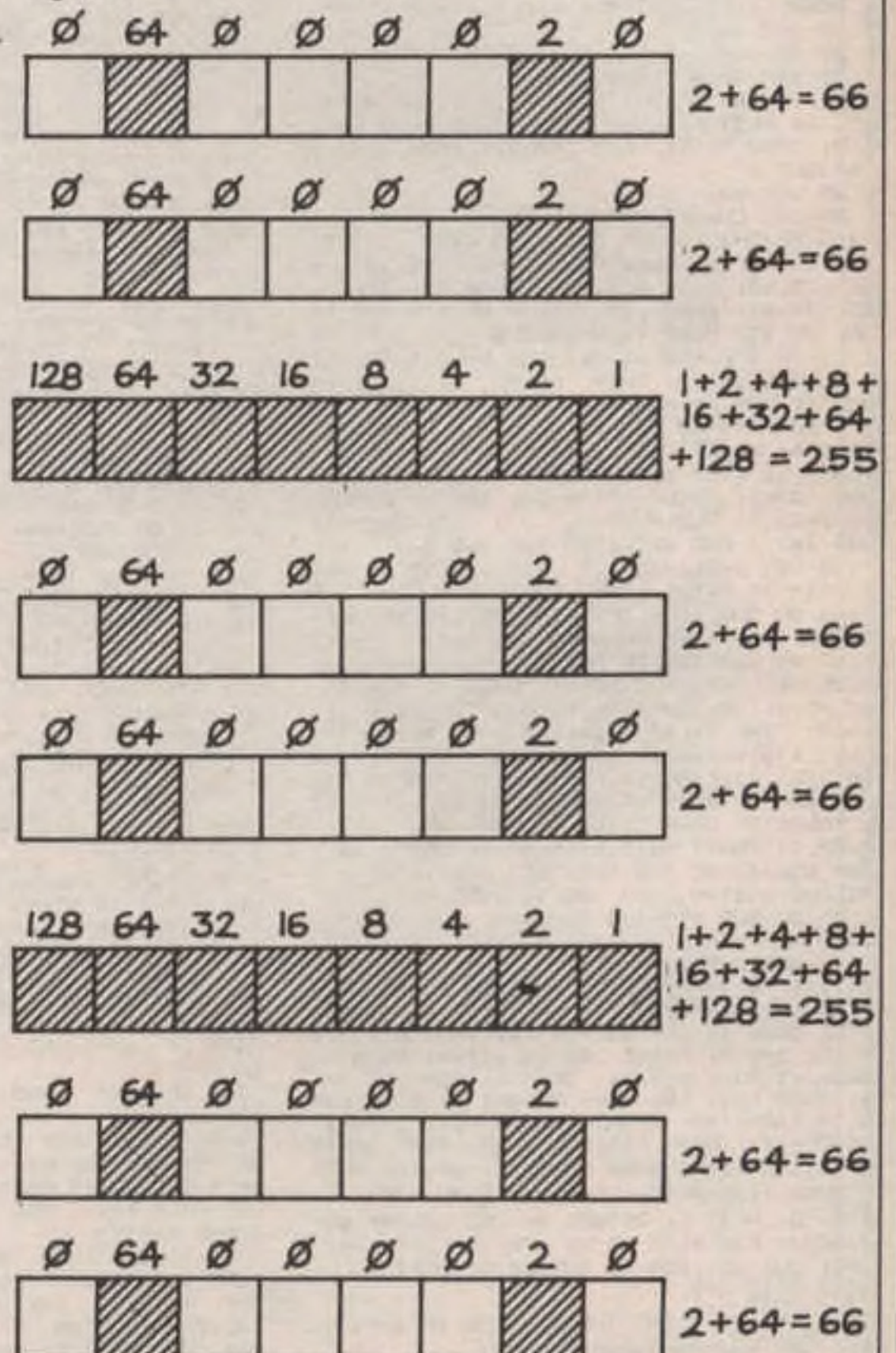


Figure 2



Figure 3



TO POKe THIS CHARACTER USE THE VALUES 66, 66, 255, 66, 66, 255, 66, 66.

PROGRAM 1

890 DATA 0,0,0,0,0,0,0,0
 900 DATA 255,36,36,255,129,255,129,255
 910 DATA 255,129,255,129,255,36,36,255
 920 DATA 159,149,245,149,149,245,149,159
 930 DATA 249,169,175,169,169,175,169,249
 940 DATA 66,66,255,66,66,255,66,66
 950 DATA 17,34,17,34,17,34,17,34
 960 DATA 146,102,37,154,217,36,231,73
 970 DATA 0,207,73,252,252,252,252,252
 980 DATA 24,24,60,60,60,60,24,24

PROGRAM 2

990 DATA 8,42,28,8,28,42,8,0
 1000 DATA 0,8,8,62,8,8,0,0
 1010 DATA 0,0,0,0,8,8,16,0
 1020 DATA 0,0,0,62,0,0,0,0
 1030 DATA 0,0,0,24,24,0,0,0
 1040 DATA 0,2,4,8,16,32,64,0
 1050 DATA 28,34,38,42,50,34,28,0
 1060 DATA 8,24,8,8,8,8,28,0
 1070 DATA 56,68,4,24,32,64,124,0
 1080 DATA 28,34,2,12,2,34,28,0
 1090 DATA 4,12,20,36,62,4,4,0
 1100 DATA 62,32,60,2,2,34,28,0
 1110 DATA 14,16,32,60,34,34,20,0
 1120 DATA 62,2,4,8,16,32,32,0
 1130 DATA 28,34,34,28,34,34,28,0
 1140 DATA 28,34,34,20,2,4,56,0

1150 DATA 0,0,8,0,0,8,0,0
 1160 DATA 0,0,8,0,8,8,16,0
 1170 DATA 2,4,8,16,8,4,2,0
 1180 DATA 0,0,62,0,62,0,0,0
 1190 DATA 32,16,8,4,8,16,32,0
 1200 DATA 20,34,4,8,8,0,8,0
 1210 DATA 28,34,42,58,26,2,60,0
 1220 DATA 28,34,34,62,34,34,34,0
 1230 DATA 60,34,34,60,34,34,60,0
 1240 DATA 28,34,32,32,32,34,28,0
 1250 DATA 112,72,68,68,68,72,112,0
 1260 DATA 124,64,64,120,64,64,124,0
 1270 DATA 124,64,64,120,64,64,64,0
 1280 DATA 30,32,32,32,38,34,30,0
 1290 DATA 34,34,34,62,34,34,34,0
 1300 DATA 28,8,8,8,8,8,28,0
 1310 DATA 2,2,2,2,2,34,28,0
 1320 DATA 34,36,40,48,40,36,34,0
 1330 DATA 32,32,32,32,32,32,60,0
 1340 DATA 34,54,42,42,34,34,34,0
 1350 DATA 34,34,50,42,38,34,34,0
 1360 DATA 28,34,34,34,34,34,28,0
 1370 DATA 60,34,34,60,32,32,32,0
 1380 DATA 28,34,34,34,42,36,26,0
 1390 DATA 60,34,34,60,40,36,34,0
 1400 DATA 28,34,32,28,2,34,28,0
 1410 DATA 62,8,8,8,8,8,8,0
 1420 DATA 34,34,34,34,34,34,26,0
 1430 DATA 34,34,34,20,20,8,8,0
 1440 DATA 34,34,34,42,42,54,34,0
 1450 DATA 34,34,20,8,20,34,34,0
 1460 DATA 34,34,20,8,8,8,8,0
 1470 DATA 62,2,4,8,16,32,62,0



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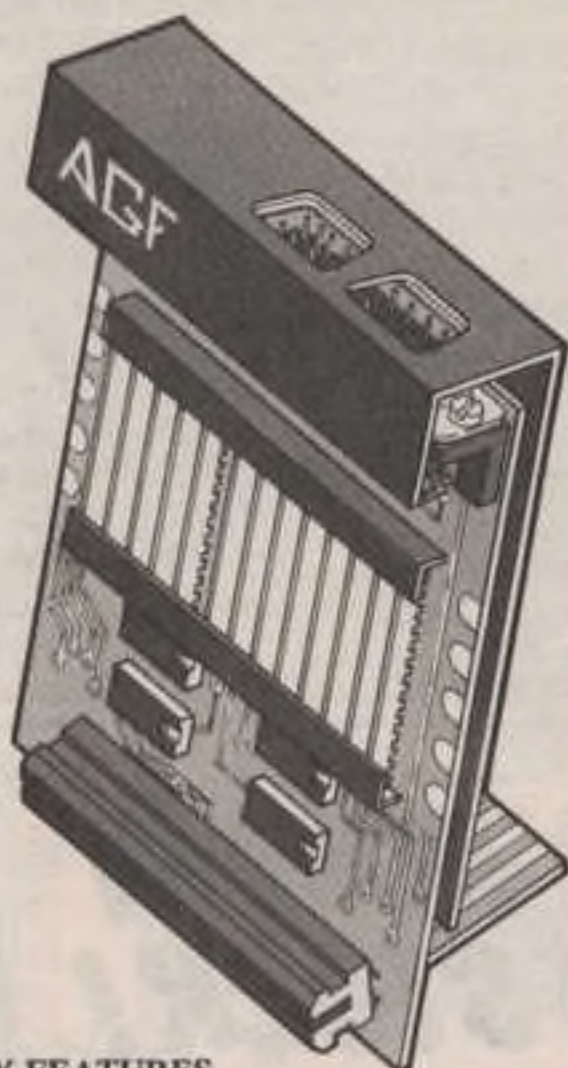
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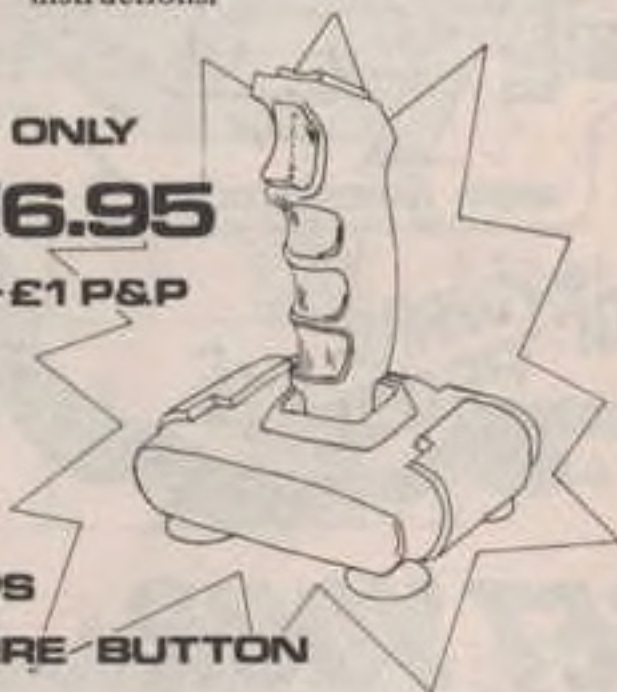


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Heated exchange

Robert Crook presents the second part of a program for calculating the effects of heat

Last week we looked at a fairly simple problem involving heat calculations; this following problem is more difficult.

What mass of steam must be condensed in 500g of water contained in a calorimeter of mass 200g and specific heat capacity 840 J/Kg/deg C, to raise the water from its initial temperature to its boiling point?

The initial temperature of the steam is 100 deg C

The initial temperature of the water is 20 deg C

To solve this problem input the following information in the correct order.

0.2 (Mass of container is given)

RETURN (We are not told what the container is made of)

WATER

RETURN (The water undergoes no physical change)

20

100

F (Here we can ask the computer to find the temperature range)

0.5 (There is 500g of water present)

G (We can tell the computer to look up this value)

840 (We are told that this is the specific heat capacity of the container)
 STEAM (This is the name of the additional substance)
 F (The purpose of the question is to find the mass of steam used)
 100 (The initial temperature of the steam is 100 deg C)
 G (This tells the computer to get the value for the Sp.Ht.C.— In this case it will put in the value for that of water because after condensing the steam will turn into water)
 F (Find the heat energy lost and gained in this experiment)

RETURN
 RETURN
 G

RETURN
 Note: when the computer asked for the specific heat capacity of the container, you could not have entered G for Get value. This is because the material from which the container was made is unknown.

```

1270DEFPROCCTMCT
1280IF B$(5)() "F" AND B$(5)() "" AND B$(13)() "F"
    AND B$(13)() "" AND A(5)=A(13) THEN
    PROCNOCHANGE:ENDPROC
1290IF B$(5)() "F" AND B$(6)() "F" AND B$(13)() "F"
    THEN 1720
1300IF B$(6)() "F" THEN 1430
1310A=(A(1)+A(10))
1320B=(A(8)+A(9))
1330C=(A(12)+A(14))
1340D=(A(1)+A(10))+A(5)
1350E=(A(8)+A(9))+A(5)
1360IF A(5)A(13) THEN F=(A(8)+A(18)):G=(A(12)
    +A(19)):H=0:I=0
1370IF A(13)A(5) THEN H=(A(8)+A(19)):I=(A(12)
    +A(18)):F=0:G=0
1380J=(A(12)+A(14))+A(13)
1390IF A(5)A(13) THEN FT=(-D-E-F+G+J)/(A+B-C)
    ELSE FT=(D+E-H+I-J)/(C-A-B)
1400PROCORISE
1410PRINTA$(6):"=":FT:A(6)=FT:B$(6)=""
1420IF A(15)=0 OR B$(15)="F" THEN A(15)=ABS
    (C+A(6)+G+I+J):PRINTA$(15):"=":A(15)
1430IF B$(5)() "F" THEN 1570
1440A=(A(8)+A(9)):B=(A(1)+A(10))
1450C=(A(8)+A(9))+A(5)
1460D=(A(1)+A(10))+A(5)
1470IF A(6)A(13) THEN E=(A(12)+A(14))+A(6)-A
    (13)) ELSE E=(A(12)+A(14))+A(13)-A(6))
1480IF A(6)A(13) THEN F=(A(8)+A(18)):G=(A(12)
    +A(19)):H=0:I=0
1490IF A(13)A(6) THEN H=(A(8)+A(19)):I=(A(12)
    +A(18)):F=0:G=0
1500IF A(6)A(13) THEN IT=(-C-D+E-F+G)/(A+B)
    ELSE IT=(C+D+E-H+I)/(-A-B)
1510PRINTA$(5):"=":IT:A(5)=IT:B$(5)=""
1520IF A(15)=0 OR B$(15)="F" THEN A(15)=ABS(E+G+I)
    :PRINTA$(15):"=":A(15)
1530IF B$(13)() "F" THEN 1720
1540IF A(5)A(6) THEN 1630
1550A=(A(8)+A(9))+A(5)-A(6))
1560B=(A(1)+A(10))+A(5)-A(6))
1570C=(A(12)+A(14))+A(6)
1580D=(A(12)+A(14))
1590E=(A(8)+A(18))
1600F=(A(12)+A(19))
1610G=0:H=0
1620GOTO 1690
1630A=(A(8)+A(9))+A(6)-A(5))
1640B=(A(1)+A(10))+A(6)-A(5))
1650C=(A(12)+A(14))+A(6)
1660D=(A(12)+A(14))
1670G=(A(8)+A(19)):H=(A(12)+A(18))
1680E=0:F=0
1690IF A(5)A(6) THEN A(13)=(A+B-C+E-F)/D ELSE
    A(13)=(A+B-C+G-H)/D
1700PRINTA$(13):"=":A(13):B$(13)=""
1710IF A(15)=0 OR B$(15)="F" THEN A(15)=ABS
    (A+B+E+G):PRINTA$(15):"=":A(15):B$(15)=""
1720C(1)=A(1)+A(10)+A(7)
1730C(2)=A(8)+A(9)+A(7)
1740C(3)=A(8)+A(19)
1750C(4)=A(8)+A(18)
1760D(1)=A(12)+A(14)+ABS(A(13)-A(6))
1770D(2)=A(12)+A(19)
1780D(3)=A(12)+A(18)
1790IF B$(3)() "ICE" AND B$(4)() "ICE" THEN C(3)=0
1800IF B$(3)() "STEAM" AND B$(4)() "STEAM"
    THEN C(4)=0
1810IF B$(11)() "STEAM" THEN D(3)=0
1820IF B$(11)() "ICE" THEN D(2)=0
1840IF B$(18)="F" AND B$(11)() "STEAM" THEN 1920
1850IF B$(19)="F" AND B$(11)() "ICE" THEN 1920
1860T=C(1)+C(2)+C(3)+C(4)
1870IF B$(12)="F" THEN A(12)=T/(D(1)+D(2)+D(3))
    :PRINTA$(12):"=":A(12)
1880IF B$(14)="F" THEN A(14)=(T-D(2)-D(3))/D(1):
    PRINTA$(14):"=":A(14)
1890IF B$(18)="F" THEN A(18)=(T-D(1)-D(2))/D(3)
    :PRINTA$(18):"=":A(18)
1900IF B$(19)="F" THEN A(19)=(T-D(1)-D(3))/D(2):
    PRINTA$(19):"=":A(19)
1910GOTO 2020
1920IF B$(18)="F" THEN D(3)=0
1930IF B$(19)="F" THEN D(2)=0
1940T=D(1)+D(2)+D(3)
1950IF B$(1)="F" THEN A(1)=(T-C(2)-C(3)-C(4))
    /C(1):PRINTA$(1):"=":A(1)
1960IF B$(10)="F" THEN A(10)=(T-C(2)-C(3)-C(4))
    /C(1):PRINTA$(10):"=":A(10)
1970IF B$(7)="F" THEN A(7)=(T-C(3)-C(4))/
    (C(1)+C(2)):PRINTA$(7):"=":A(7)
1980IF B$(8)="F" THEN A(8)=(T-D(1)-C(4))/C(2)
    +C(3):PRINTA$(8):"=":A(8)
1990IF B$(9)="F" THEN A(9)=(T-C(1)-C(3)-C(4))
    /C(2):PRINTA$(9):"=":A(9)
2000IF B$(18)="F" THEN A(18)=(T-C(1)-C(2)-C(3))
    /C(4):PRINTA$(18):"=":A(18)
2010IF B$(19)="F" THEN A(19)=(T-C(1)-C(2)-C(4))
    /C(3):PRINTA$(19):"=":A(19)
2020ENDPROC
2030DEFPROCTEMPERATURE
2040IF B$(7)() "" AND B$(7)() "F" THEN PRINTA$(7)
    :"=":A(7):GOTO 2060
2050IF B$(6)() "F" AND B$(5)() "F" AND A(6)() 999
    AND A(5)() 999 THEN A(7)=ABS(A(6)
    -A(5)):PRINTA$(7):"=":A(7)
2060IF B$(6)() "F" AND B$(5)="F" AND B$(7)() ""
    THEN A(5)=A(6)-A(7):PRINTA$(5):"=":A(5)
2070IF B$(6)="F" AND B$(5)() "F" THEN A(6)=A(5)
    +A(7):PRINTA$(6):"=":A(6)
2080ENDPROC
2090DEFPROCNOCHANGE
2100PRINT"The temperatures are the same. There
    will be no heat transfer."
2110PRINT"The final temperature of the mixture
    will be the temperature"
2120PRINT"of both the substances:"A(5):"
    degrees C."
    
```

```

2130ENDPROC
2140DEFPROCSTART
2150PRINT TAB(0,5)CHR$(141);CHR$(131)"
    Physics Heat Calculations "
2160PRINT TAB(0,6)CHR$(141);CHR$(131)"
    Physics Heat Calculations "
2170PRINTCHR$(141);CHR$(131)"
    Copyright (c) 1984 "
2180PRINTCHR$(141);CHR$(131)"
    Copyright (c) 1984 "
2190PRINTCHR$(141);CHR$(131)"
    By R.Crook "
2200PRINTCHR$(141);CHR$(131)"
    By R.Crook "
2210FOR XX=0 TO 37:PRINTTAB(37-XX,3)CHR$(
    146);CHR$(252);:NEXT
2220FOR XX=0 TO 37:PRINTTAB(37-XX,14)CHR$(
    146);CHR$(252);:NEXT
2230R=GET
2240ENDPROC
2250DEFPROCNDRISE
2260IF FT<0 THEN PRINT"There is not enough heat
    energy to cause a temperature rise"
2270ENDPROC
2280DEFPROCALTER
22850X=310
2290FOR AX=1 TO 19
2300IF B$(AX)="" AND A(AX)()<0 THEN B$(AX)="F"
2310IF AX<10 THEN G$=" " ELSE G$=""
2320PRINTCHR$(131);AX;" ";G$;A$(AX);TAB(31)
    CHR$(134);B$(AX)
2330NEXT
2340VDU 28,0,24,38,20
2350CLS:PRINTCHR$(131)"Which one to alter ";
2360INPUT " "Y:PRINTCHR$(130)A$(Y);"=";
2370INPUT B$(Y)

```

```

2380IF Y=2 OR Y=3 OR Y=11 THEN PROCCALCNUM
2390PRINTCHR$(130)"Change another(Y/N)"
2400C#=GET#:IF C#="" THEN GOTO 2400
    ELSE IF C#="Y" THEN 2350
2410VDU 26
2420FOR AX=1 TO 19
2430A(AX)=VAL(B$(AX))
2440IF B$(AX)="F" AND AX<5 AND AX<15 AND AX<13
    THEN A(AX)=1
2450NEXT
2460ENDPROC
2470DEFPROCGET(LX)
2480IF LX=18 THEN I$="2260000"
2490IF LX=19 THEN I$="336000"
2500IF LX=9 THEN I$=B$(3)
2510IF LX=10 THEN I$=B$(2)
2520IF LX=14 THEN I$=B$(11)
2530IF LX=9 THEN PROCDATA(I$,LX)
2540IF LX=10 THEN PROCDATA(I$,LX)
2550IF LX=14 THEN PROCDATA(I$,LX)
2560ENDPROC
2570DEFPROCALCNUM
2580IF Y=2 THEN PROCGET(10)
2590IF Y=3 THEN PROCGET(9)
2600IF Y=11 THEN PROCGET(14)
2610ENDPROC
2620END
2630CLS
2640IF ERR=17 THEN END
2650PRINTTAB(6,8)CHR$(134)"There are no unknowns"
2660PRINT TAB(10,10)CHR$(130)"Press any key."
2670D=GET
2680RUN

```



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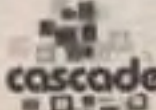
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PCW 1/3/84

The sound of music

Richard Barton presents a program to demonstrate the facilities of the SID chip

This program is written for the Commodore 64 and demonstrates all the facilities of the SID chip. Upon Running, the program immediately defaults to a continuous major chord which can be *Reset* at any time during the running of the program. Several menus are available from which the user can select many options for sound manipulation.

The three SID chip voices can be selected, either wholly or in part only, and the pitches can be selected either from the keyboard, or by external control via an analogue joystick. Likewise, on all other "controllable" or variable sound parameters, control can be either from keyboard or joystick.

The program is easy to operate and in

addition to the three voice pitches, full control is available for waveform selection, pulse width, ring-modulator, full filtering and special control of one voice by another, etc.

When Run with the sound output connected to an amplifier, especially with reverberation effect, the result is pretty impressive. I Run this program through a 60 watt power amplifier!

The listing is structured and quite self-explanatory. I have used Rems to clarify the various sections of the program.

NB. This program will be continued next week.

```

1 REM SID CHIP DEMO (CBM 64)
2 REM RICHARD BARTON 1984
3 PRINT "J"
4 POKE53291,1
5 REM PRESET TO MAKE A CHORD *****
6 H1=8:L1=97:H2=10:L2=143:H3=25:L3=39:W1=17:W2=17:W3=17:
  RG=0:RE=1
7 FN=0
8 FORI=1TO28:POKE54272+I,0:NEXTI:REM ZERO ALL ADDRESSES
  IN SID CHIP
9
10 POKE54296,(15+FN+ZZ):REM SET VOLUME/FILTER MODES/V3 DISABLE
20 POKE54277,190:POKE54278,240:REM ADSR(VOICE ONE)
21 POKE54284,190:POKE54285,240:REM ADSR(VOICE TWO)
22 POKE54291,190:POKE54292,240:REM ADSR(VOICE THREE)
23 IFXD=0:RNDG3=0:RNDG3=0:THENPOKE54293,0:POKE54294,R:REM
  C/O FILTER
24 IFXD=1:THENPOKE54293,PEEK(54298):POKE54294,PEEK(54298):
  REM EXTERNAL CONTROL
25 IFG3=1:THENPOKE54293,PEEK(54299):POKE54294,PEEK(54299):
  REM FILT.CNTL BY V3
27 IFG3=1:THE:POKE54293,PEEK(54300):POKE54294,PEEK(54300):
  REM FILT.CNTL BY ENV3
29 POKE54295,(7+RE):REM RESONANCE FILTER
30 IFD1=0:THENPOKE54275,J1:POKE54274,K1:REM DUTY
  CYCLE - VOICE ONE
31 IFD2=0:THENPOKE54282,J2:POKE54281,K2:REM DUTY CYCLE -
  VOICE TWO
32 IFD3=0:THENPOKE54289,J3:POKE54288,K3:REM DUTY CYCLE -
  VOICE THREE
33 IFD1=1:THENPOKE54275,PEEK(54298)/15:POKE54274,PEEK(54298):
  REM EX.PULSEV1
34 IFD2=1:THENPOKE54282,PEEK(54298)/15:POKE54281,PEEK(54298):
  REM EX.PULSEV2
35 IFD3=1:THENPOKE54289,PEEK(54298)/15:POKE54288,PEEK(54298):
  REM EX.PULSEV3
39 IFXA=0:RNDG1=0:RNDG1=0:THENPOKE54273,H1:POKE54272,L1:REM
  VOICE ONE PITCH
40 IFXB=0:RNDG2=0:RNDG2=0:THENPOKE54280,H2:POKE54279,L2:REM
  VOICE TWO PITCH
44 IFXC=0:RNDG3=0:THENPOKE54287,H3:POKE54286,L3:REM VOICE
  THREE PITCH
45 IFXA=1:THENPOKE54273,PEEK(54297):POKE54272,PEEK(54297):
  REM EXT.CNTRL(VOICE1)
46 IFXB=1:THENPOKE54280,PEEK(54297):POKE54279,PEEK(54297):
  REM EXT.CNTRL(VOICE2)
47 IFXC=1:THENPOKE54287,PEEK(54297):POKE54286,PEEK(54297):REM
  EXT.CNTRL(VOICE3)
48 IFC1=1:THENPOKE54273,PEEK(54299):POKE54272,PEEK(54299):
  REM CNTL FROM3(VOICE1)
49 IFC2=1:THENPOKE54280,PEEK(54299):POKE54279,PEEK(54299):
  REM CNTL FROM3(VOICE2)
50 IFG1=1:THENPOKE54273,PEEK(54300):POKE54272,PEEK(54300):
  REM V1 CNTL BY V3
52 IFG2=1:THENPOKE54280,PEEK(54300):POKE54279,PEEK(54300):
  REM V2 CNTL BY V3
59 POKE54276,W1+RG+S1:POKE54283,W2+RG+S2:POKE54290,W3+RG+S3
70 GOSUB1000:GOTO10

1000 REM MENU DISPLAY *****
1010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
1020 PRINT"  MENU SECTION R.BARTON84"
1030 PRINT"SELECT CONTROL FROM FOLLOWING--"
1040 PRINT" 1 [ ] ← VOICE ONE PITCH"
1050 PRINT" 2 [ ] ← VOICE TWO PITCH"
1060 PRINT" 3 [ ] ← VOICE THREE PITCH"
1070 PRINT" 4 [ ] ← VOICE ONE WAVEFORM"
1080 PRINT" 5 [ ] ← VOICE TWO WAVEFORM"
1090 PRINT" 6 [ ] ← VOICE THREE WAVEFORM"
1200 PRINT" 7 [ ] ← ALL VOICE FILTERS"
1210 PRINT" 8 [ ] ← ALL VOICE RING MOD."
1220 PRINT" 9 [ ] ← SECTION TWO MENU"
1225 PRINT" V [ ] ← VIEW ALL CURRENT VALUES SET"
1227 PRINT" R [ ] ← COMPLETE RESET OF ALL VALUES"
1230 PRINT"
1240 PRINT" WHEN SELECTING 'EXTERNAL CONTROL'
  (WHERE AVAILABLE);
1250 PRINT" A SET OF GAMES PADDLES OR AN ANALOGUE JOYSTICK
  SHOULD BE PLUGGED";

1260 PRINT" INTO CONTROL PORT 1"
2000 GET# IF#=" " THEN RETURN
2003 IF#="Y" THEN 4000
2004 IF#="R" THEN 5000
2006 IF#="V" THEN 2000
2008 A=VAL(#)
2009 PRINTCHR$(147)
2010 ONA GOTO 4000,6000,8000,10000,12000,14000,16000,
  18000,20000

4000 REM *****
4010 REM VOICE ONE PITCH CONTROL
4020 REM *****
4030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
4040 PRINT" VOICE ONE PITCH CONTROL RB84"
4050 INPUT"INPUT HIGH CODE-";H1
4060 INPUT"INPUT LOW CODE-";L1
4065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)";X1
4070 PRINTCHR$(147):RETURN
6000 REM *****
6010 REM VOICE TWO PITCH CONTROL
6020 REM *****
6030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
6040 PRINT" VOICE TWO PITCH CONTROL RB84"
6050 INPUT"INPUT HIGH CODE-";H2
6060 INPUT"INPUT LOW CODE-";L2
6065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)";X2
6070 PRINTCHR$(147):RETURN
8000 REM *****
8010 REM VOICE THREE PITCH CONTROL
8020 REM *****
8030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
8040 PRINT" VOICE THREE PITCH CONTROL RB84"
8050 INPUT"INPUT HIGH CODE-";H3
8060 INPUT"INPUT LOW CODE-";L3
8065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)";X3
8070 PRINTCHR$(147):RETURN
10000 REM *****
10010 REM VOICE ONE WAVEFORM
10020 REM *****
10030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"

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continued on page 35



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```

10040 PRINT "3 VOICE ONE WAVEFORM CONTROL          R884 ☐"
10045 PRINT "CODES ARE 17-33-65-129"
10050 INPUT "INPUT WAVE CODE-" ; W1
10051 IF W1 > 17 AND W1 < 33 AND W1 < 65 AND W1 < 129 THEN PRINT "T";
      :GOTO10050
10052 IF W1 < 65 THEN 10070
10054 PRINT "INPUT DUTY CYCLE REQUIRED-X"
10056 INPUT "ENTER HI CODE (0-15)-" ; J1
10057 IF J1 > 15 THEN PRINT "T"; GOTO10056
10059 INPUT "ENTER LO CODE (0-255)-" ; K1
10060 IF K1 > 255 THEN PRINT "T"; GOTO10059
10065 INPUT "EXTERNAL CONTROL (1=YES/0=NO)-" ; I1
10070 PRINT CHR$(147) ; RETURN
12000 REM *****
12010 REM VOICE TWO WAVEFORM
12020 REM *****
12030 PRINT "SOUND GENERATOR CHIP EXPERIMENTS"
12040 PRINT "3 VOICE TWO WAVEFORM CONTROL          R884 ☐"
12045 PRINT "CODES ARE 17-33-65-129"
12050 INPUT "INPUT WAVE CODE-" ; W2
12051 IF W2 > 17 AND W2 < 33 AND W2 < 65 AND W2 < 129 THEN PRINT "T";
      :GOTO12050
12052 IF W2 < 65 THEN 12070
12054 PRINT "INPUT DUTY CYCLE REQUIRED-X"
12056 INPUT "ENTER HI CODE (0-15)-" ; J2
12057 IF J2 > 15 THEN PRINT "T"; GOTO12056
12059 INPUT "ENTER LO CODE (0-255)-" ; K2
12060 IF K2 > 255 THEN PRINT "T"; GOTO12059
12065 INPUT "EXTERNAL CONTROL (1=YES/0=NO)-" ; I2
12070 PRINT CHR$(147) ; RETURN
14000 REM *****
14010 REM VOICE THREE WAVEFORM
14020 REM *****
14030 PRINT "SOUND GENERATOR CHIP EXPERIMENTS"
14040 PRINT "3 VOICE THREE WAVEFORM CONTROL          R884 ☐"
14045 PRINT "CODES ARE 17-33-65-129"
14050 INPUT "INPUT WAVE CODE-" ; W3
14051 IF W3 > 17 AND W3 < 33 AND W3 < 65 AND W3 < 129 THEN PRINT "T";
      :GOTO14050

```

```

14052 IF W3 < 65 THEN 14070
14054 PRINT "INPUT DUTY CYCLE REQUIRED-X"
14056 INPUT "ENTER HI CODE (0-15)-" ; J3
14057 IF J3 > 15 THEN PRINT "T"; GOTO14056
14059 INPUT "ENTER LO CODE (0-255)-" ; K3
14060 IF K3 > 255 THEN PRINT "T"; GOTO14059
14065 INPUT "EXTERNAL CONTROL (1=YES/0=NO)-" ; I3
14070 PRINT CHR$(147) ; RETURN
16000 REM *****
16010 REM ALL VOICE FILTERS
16020 REM *****
16030 PRINT "SOUND GENERATOR CHIP EXPERIMENTS"
16040 PRINT "4 FILTER CONTROL          R884 ☐"
16045 INPUT "INPUT HIGH CODE-" ; Q
16046 INPUT "INPUT LOW CODE-" ; R
16049 INPUT "EXTERNAL CONTROL (1=YES/0=NO)-" ; X3
16049 IF X3 > 1 THEN PRINT "T"; GOTO16048
16050 INPUT "TYPE OF FILTER (L/V/N)-" ; FM# ; GOTO16055
16053 PRINT "T"; GOTO16050
16055 IFFM# = "L" AND FM# = "B" AND FM# = "H" AND FM# = "N" AND FM# =
      "V" THEN 16053
16058 IFFM# = "L" THEN FM# = 16
16062 IFFM# = "B" THEN FM# = 32
16064 IFFM# = "H" THEN FM# = 64
16065 IFFM# = "N" THEN FM# = 20
16080 INPUT "RESONANCE SETTING (1-15)-" ; RS
16081 IF RS < 1 OR RS > 15 THEN PRINT "T"; GOTO16080
16083 RE = RS * 16
16130 PRINT CHR$(147) ; GOTO10
18000 REM *****
18010 REM RING MODULATOR
18020 REM *****
18030 PRINT "SOUND GENERATOR CHIP EXPERIMENTS"
18040 PRINT "RING MODULATOR CONTROL          R884 ☐"
18050 INPUT "RING MODULATOR? (1=YES/0=NO)-" ; R0

```

continued next week

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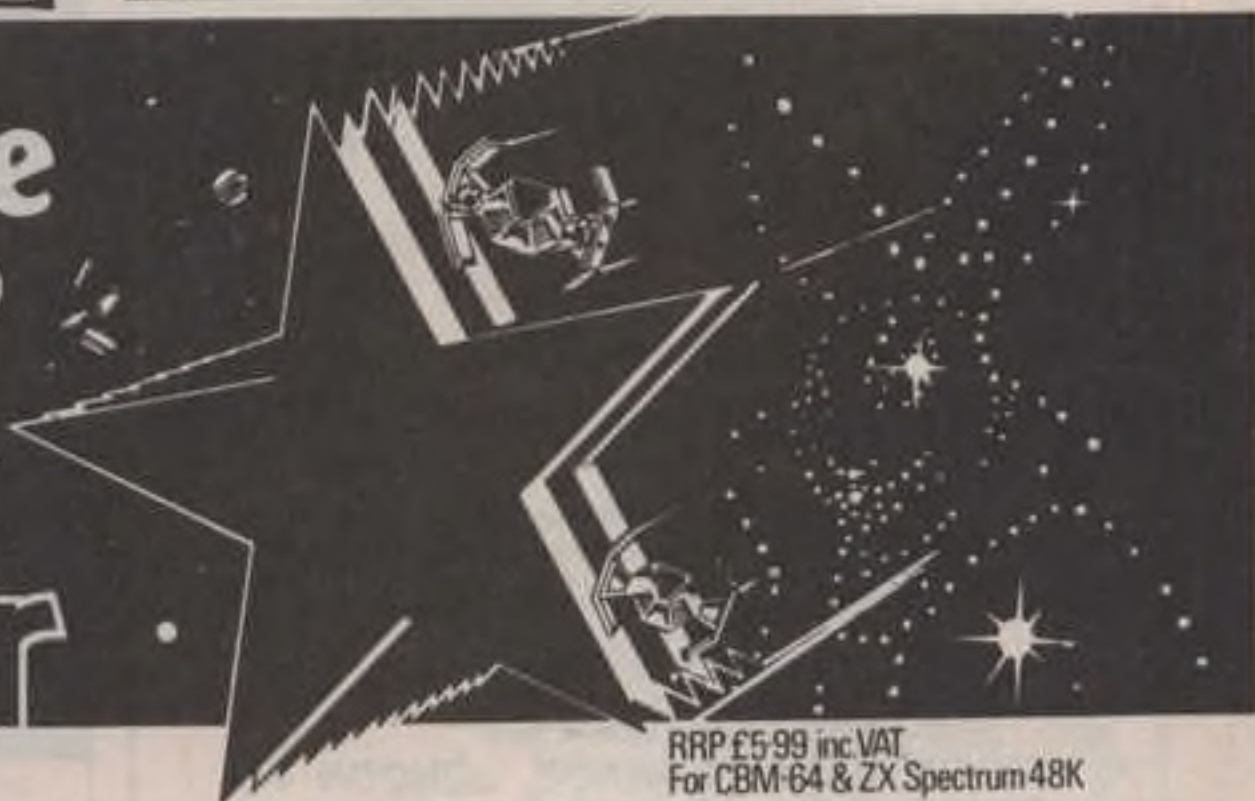
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Death Star

Three-dimensional terror



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Open Forum

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

Submarine Mission

on Dragon 32

This program for the Dragon uses just over 6K in PMODE 3. The idea of the game is to guide your submarine through the underground cavern steering clear of the debris from depth charge explosions and minefields.

The program constantly reads data which is terminated by XXX. Ships, planes, minefields and subs are called by SH, PL, MI, SU respectively. The data line can easily be extended and changed to suit your tastes and skills.

To change the data or add to it line 390 must also be changed as this line skips the first set of data in order to read in the machine code routine for the explosion.

Every item of data added to lines 580-590 must be added to 143 in line 930. I.e. If 2 items of data were added to line 580 then line 930 should be edited so the 143 = 143 + 2 giving 145. The line should then read: 930 FOR D=1 TO 145:READ A\$:NEXT: FOR A=31712 TO 31712+51

Program notes

60-110 Sets up variables and clears space for machine code.
120 Pokes machine code scroll routine into memory.
220-270 Instructions and speed choice.
300-360 Definitions.
380-560 Main loop.
570-590 Data lines.
620-650 Torpedoe routine.
660-880 Ship, plane, sub and mine routines.
890 Explosion routine.
910 Blown up routine.
930-970 Pokes machine code into memory.

SUBMARINE MISSION.

BY JONATHAN HALE COPYRIGHT (C) 1983.

```
10 *****
20 SUBMARINE MISSION (C) 1983
30 COPYRIGHT BY J.HALE 1/3/83
40 *****
50 *****
60 CLEAR
70 PMODE3:CLS:SCREEN 1,0:COLOR 4,1
80 CLEAR 200,31000
90 P=31000
100 PD=75:PP=150
110 TE=20
120 POKE P,4H0E:POKE P+1,4H07:POKE P+2,4H00:POKE P+3,4HEC:POKE P+4,4H01:POKE P+5,4HEC:POKE P+6,4H01:POKE P+7,4H0C:POKE P+8,4H1D:POKE P+9,4HFE:POKE P+10,4H20:POKE P+11,4H77:POKE P+12,4H33
130 GOSUB 330
140 CLS:FOR A=0 TO 63:SET(A,0,3):SET(A,2,3):SET(A,29,3):SET(A,31,3):NEXT
150 FOR A=0 TO 31:SET(0,A,3):SET(2,A,3):SET(01,A,3):SET(03,A,3):NEXT
160 PRINT@199,"submarine";CHR$(128);"mission";PRINT@227,"copyright 1983 by";CHR$(128);"J";CHR$(128);"ha1e";
170 PRINT@425,"PRESS ANY KEY";EXEC41134
180 LINE(250,192)-(0,185),PSET,BF
190 COLOR 2:LINE(250,184)-(0,184),PSET
200 A=RND(131)+60:IF A>110 THEN 200
210 B=70
220 CLS:PRINT@5,"INSTRUCTIONS";
230 PRINT:PRINT" USE THE UP/DOWN ARROW KEYS"," TO MOVE YOUR SUB AND USE THE"," 5
FACEBAR TO FIRE TORPEDOES."," THE NUMBER OF REMAINING "," TORPEDOES ARE DISPLAYED AT THE"," TOP OF THE SCREEN."
240 PRINT@425,"PRESS ANY KEY";EXEC41134
250 CLS4:PRINT@200,"FAST OR SLOW?";FOR A=1224 TO 1237:IF PEEK(A)<128 THEN POKE A,PEEK(A)-64:NEXT:POKE 4HFFD7,0
260 A=INKEY$:IF A="" THEN 260 ELSE IF A="O" THEN 260 ELSE IF A="F" AND A="O" THEN 260
270 IF A="F" THEN POKE 4HFFD7,0
280 SCREEN 1,0
290 LINE(0,0)-(255,0),PSET
300 SU0="C3R105R2U505R3D5R10D1RD1RD1LD1LD1L25ULULULULULULR5"
310 ET0="C4RUR7DRUD2LULDL7UL"
320 SH0="C2R7UR2LUL3R5D2R2D3L7R7R5UR2LOR50R1SOLDL0L0L0L0L0L0L2LULULULULULULULULR10
330 TP0="C2D2RUR7DRDL7ULD2LUL4"
340 PL0="C4D2RUR5URURURURUR7DRDR5U4R3D7L0L7DL16LULUL02"
350 BO0="C3RDL0SRURUSLUR2"
360 DEP0="C3R2D5L2U5"
370 UI=3:FOR NT=1 TO TE:DRAW"R"+STR$(UI)+".2"+TP0:PLAY"O4T255L255O003":UI=UI+12:NEXT
380 MAIN LOOP
390 DRAW"R"+STR$(PO)+", "+STR$(PP)+SU0:PAINT(PD+2,PP+1),5,5
400 FOR SC=PP TO PP+7:IF PPOINT(PO+32,SC)=3 OR PPOINT(PO+32,SC)=4 THEN 310 ELSE NEXT
410 READ ZX0
420 IF ZX0="X00" THEN RESTORE:HS=HS+100
430 IF ZX0="SH" THEN T=1 ELSE IF ZX0="SU" THEN T=2 ELSE IF ZX0="PL" THEN T=3 ELSE IF ZX0="R" THEN T=4 ELSE IF ZX0="CL" THEN T=0
440 ZZ=ZZ+WVL(ZX0)
450 LINE(255,0)-(247,0),PSET
460 IF T=0 THEN 400
470 ON T GOTO 060,740,820,800
480 COLOR 4:LINE(250,192)-(247,192-ZZ-5),PSET,BF:COLOR 2:LINE(247,192-ZZ-6)-(255,192-ZZ-6),PSET
490 COLOR 4:LINE(250,192-ZZ-60)-(247,0),PSET,BF:COLOR 2:LINE(247,192-ZZ-60)-(255,192-ZZ-60),PSET
500 IF PEEK(345)=223 AND TE<1 THEN SOUND 1,1
510 IF PEEK(345)=223 AND TE>0 THEN TE=TE-1:GOTO000
520 LINE(0,7)-(0,131),PRESET,BF
530 COLOR 1:LINE(PO-6,PP-10)-(PO+30,PP+7),PRESET,BF
540 IF PEEK(341)=223 AND PP>0 THEN PP=PP-4 ELSE IF PEEK(342)=223 AND PP<170 TH
```

TITANIC SINKS. (THE "UNSINKABLE" STRIKES ICEBERG)

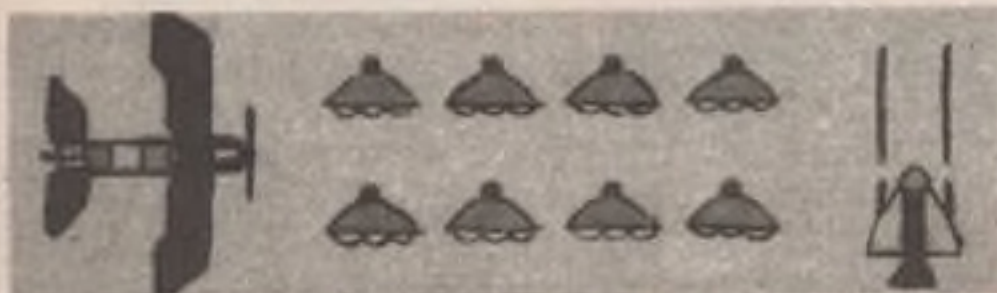
Our American correspondent via wireless telegraphy reports: Late last night the S.S. TITANIC, pride of White Star line, was in collision with an

iceberg approximately 300 miles off the coast of Newfoundland, it is feared that many lives have been lost. Further reports to follow.

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HOME COMPUTING WEEKLY REVIEW, FEB 6, 1984

Multi-Coloured Sprite Graphics 48K £6

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If sprite graphics mean nothing to you then look at Ultimate's games. Its great graphics are the result of using sprites, and with this package you can and sprites of equal standard to your BASIC and machine code programs.

The package contains three programs: first, three demonstration routines showing just how attractive and effective well manipulated sprites can be. The second allows you to define your own sprites (up to full screen size with each character given it's own attributes) and save

them to tape. Section three explains how to use your creations, including a ready-made collision checking routine, essential for games.

Perhaps the most interesting and useful are the machine code routines enabling use of sprites.

For the initiated, this package will no doubt be well received and well used. However, not much thought is given to the novice. A small manual accompanying the game would have been helpful. My only other criticism is that the instructions on use were on-screen, and I had to laboriously copy them for reference while the computer was in use.

	T.B.
instructions	50%
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value for money	90%

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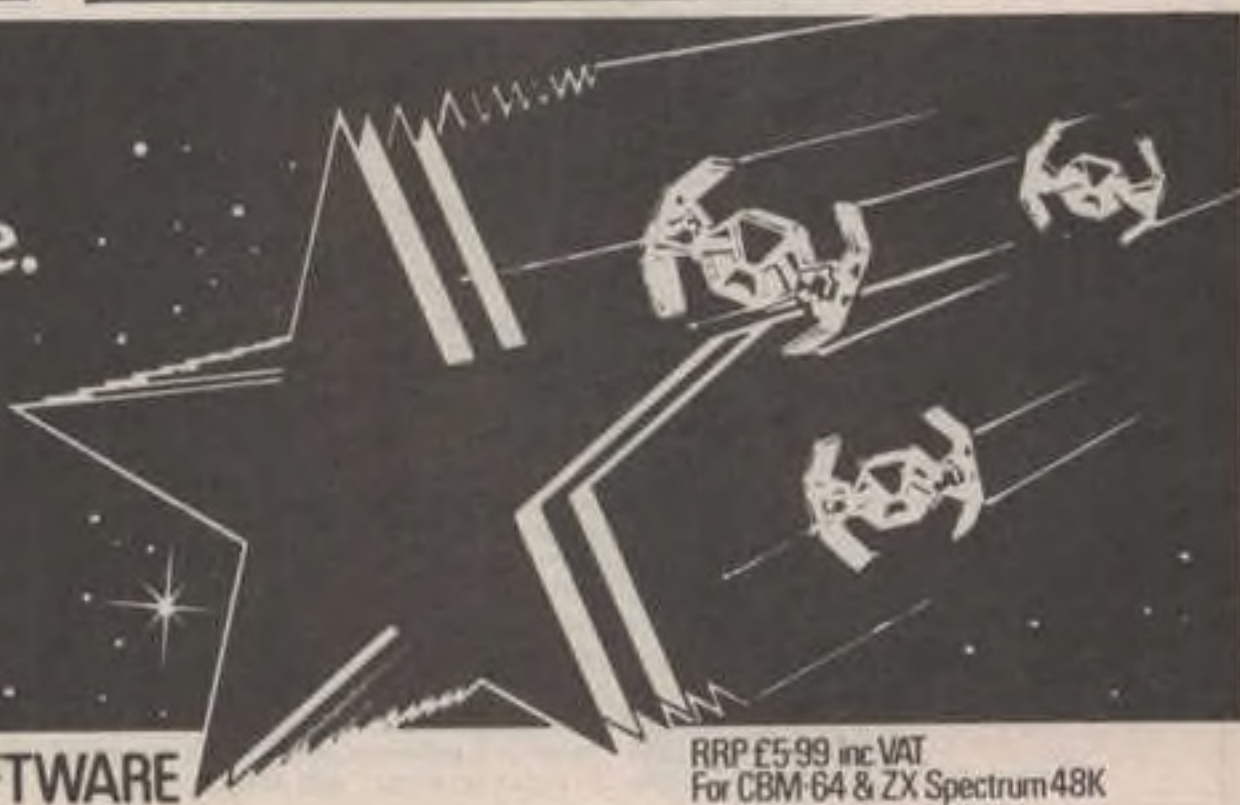
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Death Star.

Death Star

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```

EN PP=PP+4
550 EXEC31033
560 GOTO 300
570 '
580 DATA 1,1,1,1,1,1,0,0,0,-1,-1,-1,0,0,0,-1,0,-1,1,1,SH,1,1,1,1,2,2,1,5U,-1
,-1,-1,-2,-2,-2,0,0,0,-1,PL,2,-1,-3,-1,-1,0,0,0,0,1,1,5U,1,10,0,0,0,1,-10,0,0,
20,0,0,0,NI,10,0,-1,0,0,-10,0,0,-20,-2,0,0,1,1,1,PL
590 DATA 0,0,0,0,0,NI,SH,1,10,1,5,5,0,0,0,PL,0,-1,-1,-1,-10,-10,-1,-1,-7,0,0,0,1
,0,1,1,1,1,1,5U,0,-1,-1,-1,-1,-1,-1,0,NI,,0,1,5U,1,-1,0,-1,-),SH,XXX
600 'TORP
610 COLOR 4,1
620 FOR X=PD+30 TO 244 STEP 8:DRAW"BM"+STR$(X)+", "+STR$(PP)+TP#IFOR SE=PP-2 TO PP
+0:IF PPOINT(X+10,SE)=4 OR PPOINT(X+10,SE)=3THEN 630ELSE NEXT SE
630 LINE(X,PP)-(X+11,PP+7),PRESET,BF:LINE(PO-0,PP-10)-(PO+30,PP+10),PRESET,BF:LI
NE(0,7)-(0,101),PRESET,BF:EXEC31035:DRAW"BM"+STR$(PO)+", "+STR$(PP)+SU#COLOR 4:LI
NE(250,192-XX-00)-(247,0),PSET,BF:LINE(247,192-XX-00)-(255,192-XX-00),PSET:NEXT
640 COLOR 1:LINE(0,2)-(255,0),PRESET,BF:UI=9:FOR TL=1 TO TE:DRAW"BM"+STR$(UI)+",
2"+TP#UI=UI+12:NEXTTL
650 GOTO320
660 'SHIP
670 DRAW"BM1215,"+STR$(B-12)+SH#PAINT(220,B-0),4,2
680 PLAY"1255L255EDCEDCEDCEDCED"
690 FOR CO=1 TO 3
700 DO=B-25:FOR DP=240 TO 190-DES-(RND(3)-2)*30-15 STEP -4:DO=DO-1:DRAW"BM"+STR$
(DP)+", "+STR$(CO)+DEP#PLAY"FGWFGW":LINE(DP,DO)-(DP+4,DO+6),PRESET,BF:NEXT
710 FOR FF=00 TO PP-(RND(3)-2)*10 STEP 8:DRAW"BM"+STR$(DP)+", "+STR$(FF)+DEP#PLA
Y"CACA":LINE(DP,FF)-(DP+3,FF+7),PRESET,BF:NEXT:CI=(RND(3)-2)*10:CIRCLE(DP,FF+CI)
,13,2:PAINT(DP,FF+CI),4,2:EXEC31712
720 DES=RND(50):NEXT CO
730 T=0:GOTO330
740 'SUB
750 TRS=192-XX-20
760 FOR TA=1 TO 3:LINE(210,TRS-3)-(255,TRS+19),PRESET,BF
770 DRAW"BM225,"+STR$(TRS)+SU#PAINT(200,TRS+1),2,3
780 PLAY"FGFGFGFGFG":FOR EF=200 TO PD STEP -8:DRAW"BM"+STR$(EF)+", "+STR$(TRS)+E
T#FOR SCA=TRS-2 TO TRS+2:IF PPOINT(EF-3,SCA)=3 OR PPOINT(EF-3,SCA)=4 THEN 300 E
LSE NEXT SCA:LINE(EF-1,TRS-1)-(EF+12,TRS+2),PRESET,BF
790 NEXT EF
800 TRS=TRS-12:NEXT TA
810 T=0:GOTO400
820 'PLANE
830 DRAW"BM225,15"+PL#PAINT(200,19),4,4
840 PLAY"1255L255CDDCCDDCCDDCCDDCCDD":FOR DO=20 TO PP STEP 10:DRAW"BM 225,"+STR
$(DO)+BO#PLAY"1255L255FAF":LINE(225,DO)-(229,DO+10),PRESET,BF:NEXT:CIRCLE(225,P
P),17,3:PAINT(225,PP),4,3:EXEC31712
850 T=0:GOTO400
860 'MINE
870 IF RND(50)>40 THENPA=192-XX-10-RND(50):CIRCLE(247,PA),7,3:PAINT(247,PA),4,3
:COLOR 2:LINE(247,PA)-(247,PA+60),PSET
880 GOTO400
890 EXEC31712:FOR DF=1 TO 2:FOR C=1 TO 13:CIRCLE(X+10,PP),C:NEXTC:COLOR 1,3:NEXT
DF:COLOR 3,1:HS=HS+10:LINE(0,2)-(255,0),PRESET,BF:UI=9:FOR TL=1 TO TE:DRAW"BM"+S
TR$(UI)+", 2"+TP#UI=UI+12:NEXTTL
900 GOTO330
910 EXEC31712:0=3:FORML=1TO2:FORFI=1TO120STEP3:CIRCLE(120,90),FI,0,.75:NEXTI0=1:
NEXTML:CLS:PRINT"YOU BLEW UP!",,PLAY"0210L10CDEF9AMP2DEF9AB03C02P2EF9AB03CO"
:PRINT"YOU SCORED":HS:"POINTS", "YOU HAD":TE:"TORPEDOES LEFT", "PRESS ANY KEY":E
XEC41194:RLN
920 SOUND 10,10:RETURN
930 FOR D=1 TO 143:READ A#NEX:FOR A=31712 TO 31712+51
940 READ A#:POKE A,UWL("M"+A#):NEXT
950 DATA 12,00,3F,07,FF,23,10,0E,00,00,CC,10,00,FD,00,F7,00,00,C0,40,5A,20,FD,07
,FF,20,10,0C,1E,00,25,04,10,0E,00,00,FC,00,F7,00,00,01,FD,00,F7,10,00,00,00,20,0
D,30
960 RESTORE
970 RETURN
980 EXEC31712:FOR RT=1 TO 3:CIRCLE(EF+5,TRS),RT:NEXT:T=0:TRS=TRS-12:NEXT TA:GOTO
400

```

Submarine Mission by Jonathan Hale

Dodgem

on Spectrum

This program will run on the 16 or 14K machines. In this game you must guide your car between the tyres. You lose points

if you do not move left or right. If you get 200 points you have completed your mission.
Keys: 4 - left
5 - right

Program notes

10-130 Defining variables and positions for tyres

200-270 Main loop. Checking if you have hit anything and updating your position
250 Scrolling instruction for tyres
300-320 Inputting
350-370 Death routine
400-420 Successful mission routine
600-640 Graphics
Tyres Graphic A
Car Graphic B

```

10 LET g=1: LET h=15
20 BORDER 1: PAPER 5: INK 1: C
LS
30 GO SUB 300
35 LET k=1
40 LET sc=0
45 GO SUB 600
100 DIM a(50)
110 FOR n=1 TO 50
120 LET a(n)=INT (RND*15)
130 NEXT n
200 FOR n=1 TO 50
210 PRINT INK 0; PAPER 5; AT 21,
a(n)+8; "●"
215 PRINT INK 0; PAPER 5; AT 21,
7; "■"; AT 21,24; "■"
220 PRINT AT b+6,h; "■"
225 PRINT AT b+5,h+k; " "
227 LET k=0
230 IF INKEY$<>"4" THEN LET h=h
+1: LET k=k-1
233 IF INKEY$<>"5" THEN LET h=h
-1: LET k=k+1
235 IF sc=200 THEN GO TO 400
237 IF INKEY$="" THEN LET sc=sc
-1
240 IF ATTR (b+7,h)=40 THEN GO
TO 350
243 IF INKEY$="" THEN LET k=0
245 LET sc=sc+1
250 RANDOMIZE USR 3200
260 NEXT n
270 GO TO 200
300 INPUT "Input difficulty (1-
10)"; b

```

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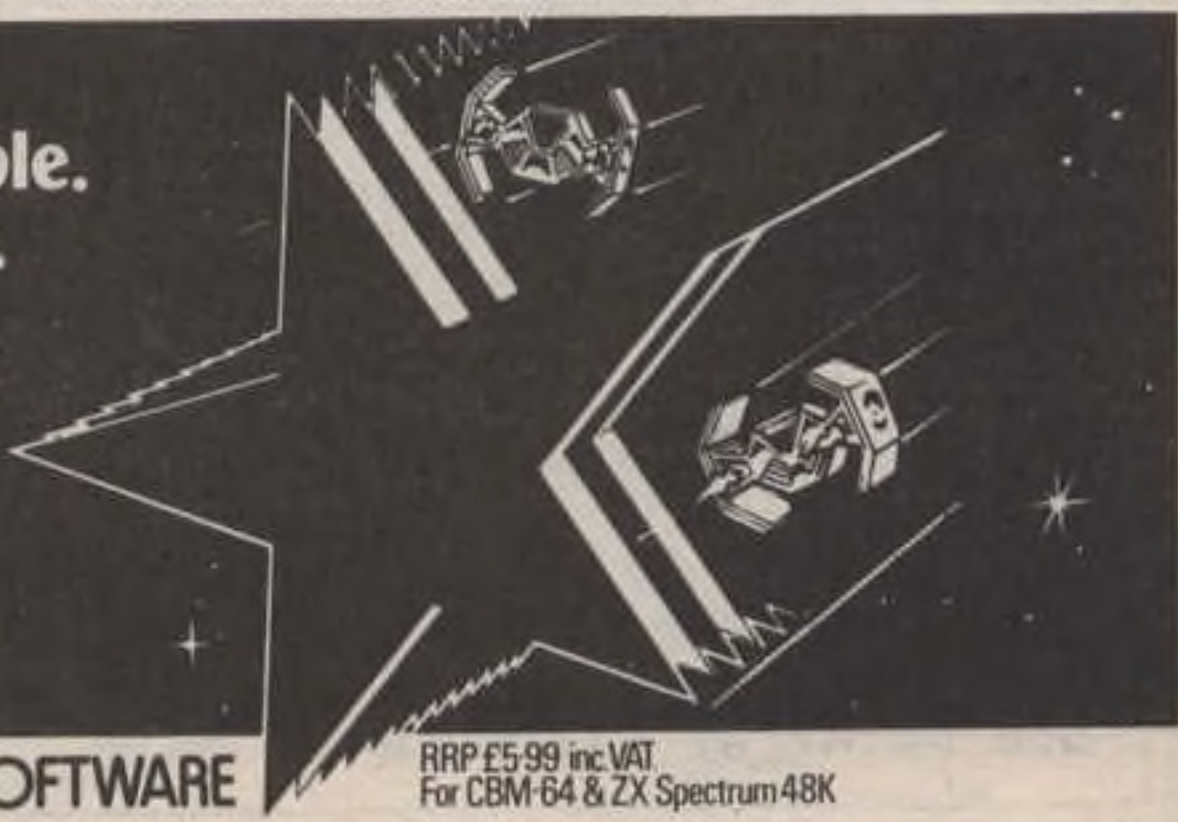
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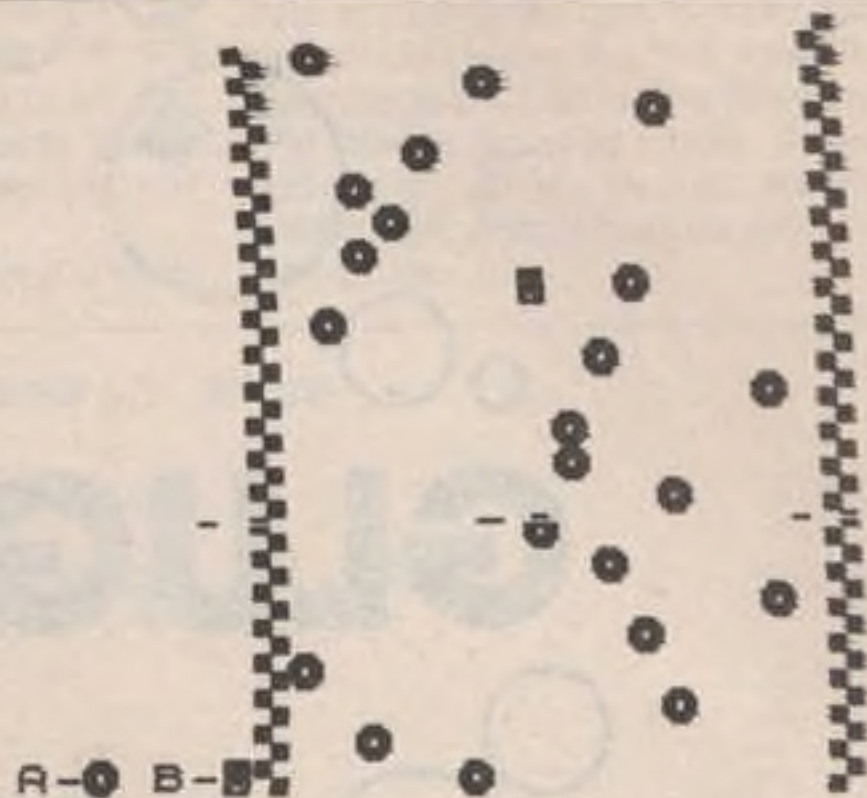
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Open Forum

```

310 IF b>10 OR b<1 THEN GO TO 3
00
320 RETURN
350 PRINT AT 10,3;"YOU      AR
E   DEAD"
360 PRINT AT 11,3;"YOU      SCORE
D   ";s
361 FOR n=0 TO 200: NEXT n
365 PAUSE 100
370 GO TO 10
400 FOR n=-20 TO 20: BEEP .1,n:
NEXT n
410 CLS : PRINT AT 10,5;"MISSIO
N  ACCOMPLISHED"
420 PAUSE 200: GO TO 10
600 RESTORE : FOR n=0 TO 7: REA
D  a: POKE USR "a"+n,a: NEXT n
610 DATA 60,126,255,231,231,255
,126,60
620 FOR n=0 TO 7: READ a: POKE
USR "b"+n,a: NEXT n
630 DATA 126,126,126,126,126,90
,102,126
640 RETURN

```



Dodgem
by Clifton Pointon

Cube Root

on BBC

The BBC and most similar computers have no Cube Root function and this decimal search program overcomes that problem. It prints the whole search on the screen, but

taking out line 130 would make it only print the answer.

Program notes

10 - 20 The name of a proud BBC user
30 Puts the Beeb into an 80-column mode (easier for reading the numbers once the numbers become "long")
40 Same effect as Ctrl "N" — Prevents

screen from scrolling, SHIFT must be pressed to move on

50 Gets the number to be "worked on"
60 Shows that the computer has begun its job
70-110 The mathematical part
120 If the root has been found, this prints it on the screen
130 Shows the workings out, and the basis of decimal search
140 Returns to the loop

```

10 REM Decimal Search
20 REM By Sunil Singh
30 MODE 3
40 VDU 14
50 INPUT "The number "x
60 PRINT "The Cube Root of ";x;" is"
70 A=0
80 B=x
90 C=A+(B-A)/2
100 IF x > C^3 THEN A=C
110 IF x < C^3 THEN B=C
120 IF x = C^3 THEN PRINT "The Cube Root is ";C:END
130 PRINT C;"^3=";C^3,A;" < x < ";B
140 GOTO 90

```

By changing the powers in lines 60,100,110,120 and 130 this program could work out any root from Square root to the Nth root.

Cube Root
by S Singh



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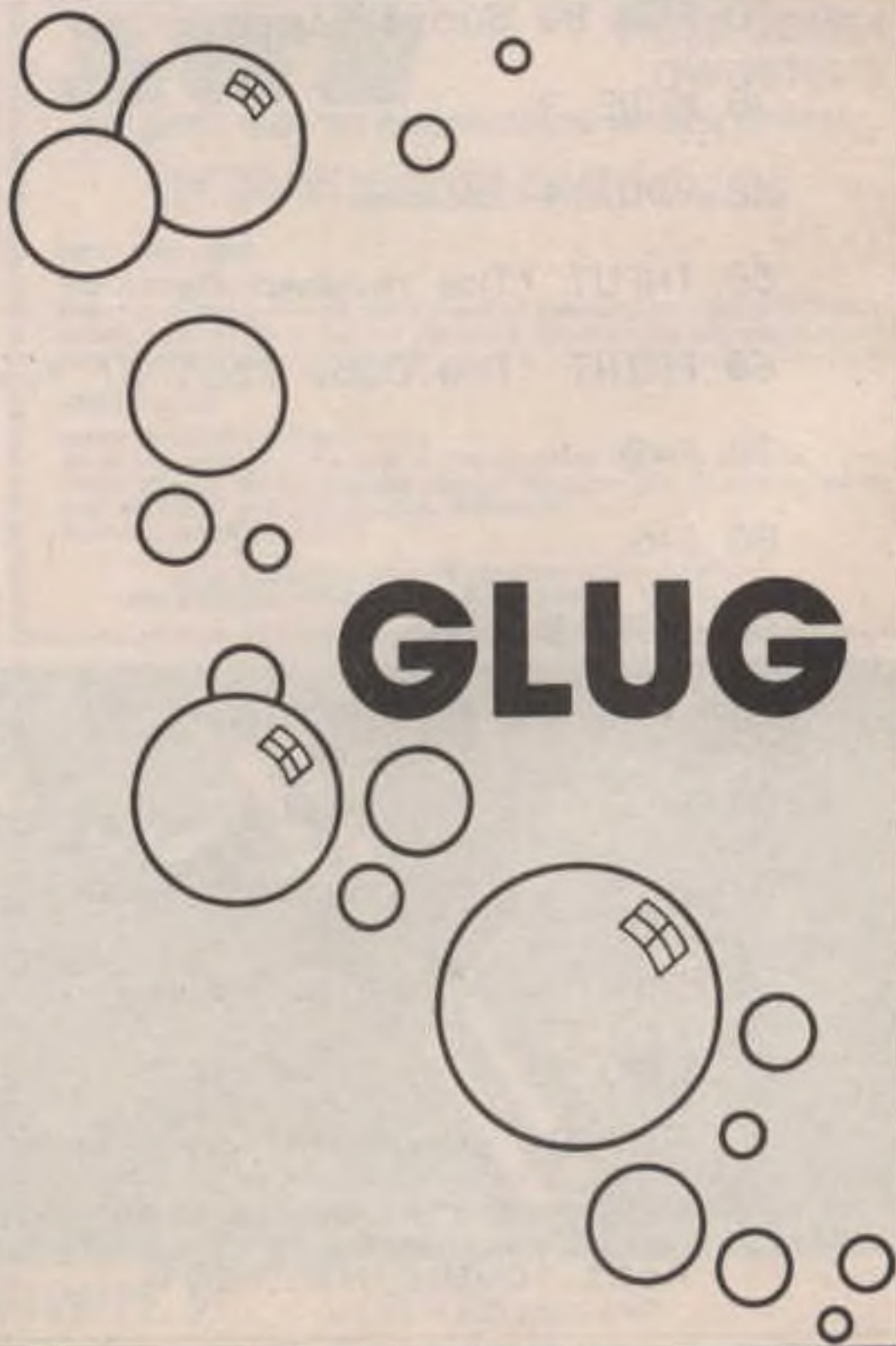
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Open Forum

Patterns

on Spectrum

These routines produce patterns using POKES. The first one enables you to see

the POKES addresses and what they do. The other program fills the screen with one colour and then covers over it in another colour. This produces good effects. Sometimes you can get 4 colours flashing onto the screen at once.

One routine produces set patterns using

data to arrange the data for other patterns. Remember, leave the last figure on the Data line as 21. One routine fills the screen with random coloured blocks, some flash some don't. All the routines print on the bottom two lines which usually can't be printed on.

```
1 10 FOR a=23007 TO 20511 STEP -
20 READ n
21 IF n=21 THEN RESTORE
30 POKE a,n
40 DATA 12,76,200,255,56,23,98
,12,76,198,200,23,65,18,21
50 NEXT a
9000 GO TO 9000

1 1 BORDER 0
10 FOR b=1 TO 255 STEP 10
15 FOR a=23300 TO 22528 STEP -
20 POKE a,b
30 NEXT a
35 NEXT b
40 GO TO 1

10 LET a=INT (RND*30000)
20 LET b=INT (RND*255)
22 PRINT a,,b
30 PAUSE 0
35 POKE a,b
40 GO TO 10

1 CLS
10 FOR a=23297 TO 22499 STEP -
20 POKE a,INT (RND*255)
30 NEXT a
40 GO TO 40
```

Patterns

by Thomas Hyde

Microradio

GW6JJN



Standard audiocode

Last week I spoke about the need for an Esperanto in computer terms — a language that different types of computer could use to communicate with each other. Radio enthusiasts will understand this need now that amateurs and broadcast stations can send computer programs over the air. The problem is simply that your mate has a BBC-B and you have a Commodore 64. With NOS *Basicode*, that is no longer a problem.

As far as Radio Netherlands

were concerned, NOS *Basicode 2* was the answer. Now, through their overseas broadcasts, they share it with the world and programs have been received in Australia, USA, Canada, Sweden and Africa as well as the UK.

Each different type of computer not only uses different baud rates on the cassette interface, they also use different tones, frequencies and codes. NOS *Basicode* has established a standard audiocode that each computer has to be programmed with initially.

The *Basicode* specifications are as follows. Two tones are used to record data consisting of 1200 and 2400Hz. A logic '0' is defined as one full cycle of 1200Hz and a logic '1' is two full cycles of 2400Hz. The transmit rate is 1200 baud, consisting of 'bytes' that are made up of one startbit (logic 0), eight databits (least signifi-

cant first) and two stopbits (logic 1). A cassette tape recording of a *Basicode* program will begin with a leader of five seconds of stopbit, hex 82 (Ascii) which signifies 'start text', then the basic information in Ascii and finally a checksum and an end trailer also consisting of five seconds of stopbit.

For the past few years, radio amateurs in the Netherlands have used *Basicode* to communicate over VHF and shortwave very successfully. With BBC Radio Four doing the same thing, radio-computing is going places. Among the computers that *Basicode* has been implemented on are Apple, BBC, all Commodores, CP/M, TRS80 and Video Genie, most of which are based on Microsoft Basic. Other machines will follow, including the Sinclair Spectrum.

The cost of the *Basicode*

translation tape, which includes several programs and games in *Basicode*, as well as a book on the subject and an instruction guide, is 30 Dutch Guilders. Full details regarding *Basicode* can be obtained from *Hobbyscoop*, PO Box 1200, Hilversum, The Netherlands. Please do not send cash to this address — it is better to write to them for details and information before you make any orders.

Basicode was developed by the Dutch Radio Service in conjunction with the Dutch equivalent of the Open University.

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



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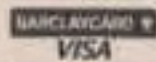
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Mission Impossible!

This week, some more problems, and (I hope) some help. We'll start with some letters about Scott Adams adventures. The first problem is from Alan McCullough, of Lisburn.

"As an avid reader of your magazine, I have decided to ask for the assistance of your readers. After reading your Adventure Corner, I decided to try my hand at adventure gaming, so obtained Scott Adams *Mission Impossible* for my trusty Vic. Well, *Mission Impossible* it turned out to be! I was in difficulty right from the start. I couldn't even remove the envelope from the table in the briefing room. I moved on a bit further and spotted a key on a ledge, but when I broke the window to get at it I started the final countdown.

If you print this letter, perhaps someone can come to my rescue. I would appreciate hearing from anyone out there who has defused the bomb!"

Can anyone help Alan? I think you might find the pail is very useful around the bomb — if in desperation, Alan, try moving it!

Another Vic-er who is currently stuck in an Adams adventure, is Joseph Klimkouski, from Swindon. This time it is *The Count* who is proving difficult. Joseph is quite a way into the adventure, but feels that he has more locations to visit yet (remembering the observations that a couple of readers made some time ago about the stairs and the roof).

A vent in the work room is a bit of a puzzle, as is the bell-pull outside the castle. Can anyone offer help on these problems? If the Count is being a bit naughty and nicking things, Joseph, try finding a dusty place, where Dracula can't find you — you might get a good night's rest in this way!

Mr Valentine has sent a long letter, informing me that he has "solved *Mission Impossible* in just 2 hours, 5 minutes — and *Pirate's Cove* in a little under 2 hours. Is this a record?

I'm not, I must admit, one of the "speedster" adventurers, preferring instead to "smell the roses along the way" and "listen to the butterflies in the field next door". In

other words, I would rather take my time and explore all the details and "wrinkles" of an adventure, than rush through it, intent only on how to finish in the quickest possible time. This really stems from my comments of some weeks ago about "atmosphere" in adventures. If the program has this elusive quality, I find myself gripped by the action.

Mr Valentine carries on to list some of the adventures he has played on his Vic, with a rating for each one. This is an excellent idea that I would like to see more people take up. Having read through this list, see if you could draw up a similar one of adventures that you have enjoyed (or otherwise!), and write in to me and let us all know of your likes and dislikes:

COLONEL'S HOUSE	(RABBIT)6/10
Could be better!	
TOMB OF DREWAN	(AUDIOGENIC)8/10
Good, but a lot of time needed	
STARSHIP ESCAPE	(SUMLOCK)5/10
Boredom sets in fairly quickly	
THE DUNGEONS	(ANIROG)9/10
Graphics very good, pity about the awkward method of buying goods after going inside the maze	
QUEST	(COSMA)5/10
Too difficult (well, I couldn't do it anyway!)	
CRUSH, CRUMBLE & CHOMP	(EPYX)10/10
Costs about £20, but WOW! what graphics! A very addictive game/adventure	
THE VALLEY	(ASP)4/10
Not worth the effort	
ALARIAN'S REVENGE	(WESSEXSOFT)
Same program as THE VALLEY	
TRADER	(PIXEL/QUICKSILVA)7/10
Quite fun, but not really worth £15	



Scott Adams, author of *Mission Impossible*, *The Count* and *Pirate's Cove*

MOONBASE ALPHA/COMPUTER ADVENTURE	(RABBIT)3/10
2x3 1/2K programs: save your money for C,C & C!	
PHAROAH'S TOMB	(ANIROG)6/10
Quite good, graphically, but needs a fluke to get past potholes	
ZOK'S KINGDOM	(ANIROG)6/10
See PHAROAH'S KINGDOM	
ORB	(IMPACT)5/10
Relies too much on chance	

Thanks for those comments, Mr Valentine — I can't possibly see all the adventures available now (and I am always pleasantly surprised to see the sheer number of adventuring games released nowadays), and thus I have to rely on other adventurers to keep us informed of what they're playing (or hating!). In this way we can all, hopefully, make up our minds about which adventures we would like to purchase.

Now for some more Hobbit Hall of Fame.

Paul Shreeve, with a score of 87.5 per cent on Spectrum and Commodore (clever clogs!) — interestingly enough, Paul gets

the same score with exactly the same solution on both machines. Try using the Golden Key in the Magic door on the side of the mountain, Paul, you may find that you get a few more points that way. In the Spectrum version at least, you might find that you can "Drop" the Treasure into the chest at the end. If so, the game will continue, leaving you free to go back and do a bit of Goblin-bashing (if you're clever, you might be able to persuade a friend to use the Bard's bow and arrow to accomplish this! — this will amass the points).

The problem with *Lake Town* has often been mentioned by Spectrum owners. On the subject of Bard's destinancy, Jim Coyle gave me this little couplet that might be of some use:

IF YOU TALK TO BARD, AND BARD SAYS "NO"
YOU MUST TELL HIM WHERE TO GO

The authors seem to have applied a bit of their experience to the Commodore version and rounded the corners of the program a bit — thus the score are a bit more generous, and the characters are, on the whole, not quite so unpredictable.

To change the subject, David Lloyd, who is stuck in *Aztec Tomb Adventure*, will find that he needs to climb the house to find the plank of wood, which he will need to cross the river. "I keep drowning on the rocks before I get to the Tomb! How do you get the boat onto the cliff-top? Perhaps someone out there knows!"

Michelle Warner, who is 15, and didn't tell me her high score — Congratulations anyway Michelle! And finally for this week (there is a huge pile of names to be gone through yet, they will have to wait for another week!) *Justin Eames*, of Winchester, with 92.5 per cent.

To round off this week's Corner (what pun?), a couple of problems, and some help. *Lynne Brooks* is playing *Aztec Tomb*, that was mentioned in *Paul Shreeve's* letter. I hope that the comment there was of some help, *Lynne*. She says that she has managed to catch a magical fish, which says "plants need water" and then vanishes. Can anyone tell her where the plants are, and how to water them?

And to *Alex Steele*, of London E1, who is having trouble with *Voodoo Castle*, one of the Scott Adams Adventures for the Vic 20, here is some help in the Lab:

ATRR MYOT RHYE

Next week, some more letters, and some more programs.

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*, 12-13 Little Newport Street, London WC2R 3LD.



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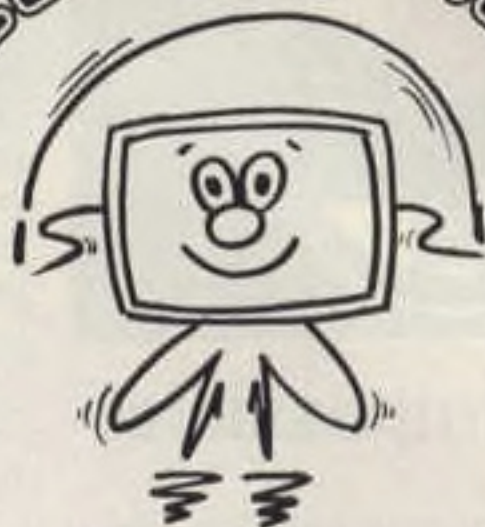
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SOUND EFFECTS

Malcolm Tallis of Woodhouse Lane, East Timperley, Cheshire, writes:

Q I am a very puzzled CGL M5 owner. In the Basic 1 manual there is no mention of how to create music and sound effects, or how to use *Peek & Poke* for drawing dots and straight lines. Can you give me any help?

A The information you want is available. If you write to the M5 product division at Computer Games Ltd, C.G.L. House, Goldings Hill, Loughton, Essex, they will send you a free 16-page booklet with all the information you need. While Basic 1 is not as comprehensive as Basic G, many of the functions are available in Basic 1, usually by using *Pokes*. The details are in the booklet.

VIC20 UPGRADED

Shaun O'Connor of Tyldesley Road, Atherton, Manchester, writes:

Q I own a Vic 20 computer and have heard that it is possible to obtain an expansion pack to upgrade it to a CBM 64. Could you tell me where the pack is available from, how much it will cost and who makes them?

A I have had several letters from disappointed Vic 20 owners, who want to know if any company does make this up-grade. As far as I know the answer is no. It is a pity, but you are faced with up-grading your Vic as far as it will go, or else getting rid of it and buying a CBM 64.

SPECTRUM CONTACTS

G. Orderly of Moatview Park, Dundonald, Belfast, writes:

Q Please could you tell me of any computer clubs near me?

I have a Spectrum 48K.

A There is a computer club in Belfast, that meets monthly, at the Ashby Institute, Stranmills Road, Belfast 9. Meetings start at 7pm, and are on the first Monday of the month. You can contact Patrick Roodie at Holywood 3212 for more details.

Someone else who may well have contacts in your area are the International Sinclair User Group, who are based at 176 Todmorden Road, Burnley, Lancashire. Please include an SAE if you write to them.

SCANNING SYSTEM

Alan Perse of Bulfin Road, Dublin 8, Ireland, writes:

Q I shall be going to America soon and I may buy another computer while I'm there (I have a 48K Spectrum). Now I know they use a different scanning system there, but could I not just open the case and replace the Pal modulator with an Nstc one?

A I doubt it very much. Along with the changes inherent with a different modulator, there are changes as regards timing and screen definition. With the Nstc that means 100 less screen lines (525 as opposed to our 625) and 10 frames a second more (60Hz as opposed to our 50Hz).

I am afraid that you must either take a British television and transformer with you (but beware the FCC Regulations), or else you will have to buy another computer when you get there.

SPRITELY VERSION

Christopher Sutherland of Kingsmills, Inverness, Scotland, writes:

Q On a computer running interrupt-based sprites, will the sprites on the American

(60Hz) version be faster (ie, move more pixels per second), than a British (50Hz) version?

In other words, are games on the Commodore 64 faster in America than they are on the equivalent British machine?

A We are talking about small gains and losses here. Yes, as the American system uses 10 extra frames a second, if all else was equal, then they would be faster. The trade-off is resolution. Nstc is a 525 line standard, ours 625. Thus, we will have slightly better resolution at the expense of a slightly slower speed. The differences to some extent will depend on the internal hardware of the computer. I have seen one game for an American computer used on its British counterpart which had annoying break-up lines constantly appearing and disappearing on the screen. Certainly it did not stop the program being usable, but it was a nuisance.

STACKED UP

Owen Robertson of Caerphilly, Wales, writes:

Q I am interested in the language Forth, but I have been told that I need to understand how a 'Stack' works. Is this true, and could you tell me what a Stack is and how it works? I know it is for storing and 'working out', but what else?

A Understanding how a Stack works will be useful, if you are going to take up Forth. Essentially, if you put the numbers two, three and four on a stack, and then wanted to use the two, for example, it would not be possible to just access the two. You would have to move it to the top. This can be done in various ways — you might use the two numbers above it — leav-

ing just the two on the stack. You might try to rotate, so that a lower number is moved higher up.

It is easier to manipulate the Stack in Forth than in Basic, which has no direct commands for using the Stack. In Basic, you might try using some very carefully thought out *Peeks* and *Pokes*. But you would be more likely to use machine code to *Push* and *Pop* numbers (you *Push* numbers on to the Stack, and *Pop* them off).

As for what a Stack is, well a register in a Cpu is a sort of stack. Perhaps it is better described as a reserved area of Ram used for storing data. The kind of data it stores is the addresses of the various beginnings and endings of *Goto* and *Gosub* routines, as well as such things as the number of repetitions in a *For/next* loop.

Most computers have a separate area called Workspace, for such things as 'workings out'. Depending on the computing, you can usually see what the Stack is doing by using the command *Peek*, at the addresses around the Stack Pointer, which is the name usually given to the flag systems variable that records the empty space in the Stack. As a warning, do not try and *Poke* this variable unless you are very sure of what you are doing.

One of the most creative hardware modifications I have ever come across has been sent in by Mrs A. J. Ekma of Princes Mary Avenue, Brompton, Gillingham, Kent, who writes: 'Could you please print this letter for the benefit of Matthew Smith of Stourport on Severn, and other Vic 20 owners. My husband owns a Vic and has had the same problem of overheating. He has now solved this problem by using Lego bricks (!). He made two simple stands from our two son's Lego set, one for each end of the computer.'

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW, 12-13 Little Newport Street, London WC2R 3LD.*

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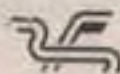
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ATARI VCS cartridges. Over 50 unused titles from £4.50. Atari compumate, unused, cost £69. Will accept £39. Quickshot Mark II Joystick, unused £9.50. Tel: 01-952 5923.

ATARI 400 16K. Excellent condition with tape recorder, basic cartridge and s/w, including Star Raiders and Air Strike. £200 ono. Tel: 01-223 4184.

ATARI 2600 plus many games. 11 cartridges which include Missile Command, Star Raiders, Pac-Man and many more popular titles. All for £85. Phone Ingebourne 40519 after 5pm.

ATARI 400, 16K with program recorder, joystick and books. Also inc Basic Cartridge worth £180. Only 2 months old. Bargains at £120 ono. Tel: 0732 454527.

ATARI VCS in perfect condition, only 12 months old, with six cartridges. Pac-Man, Space Invader, Combat Surround, Breakout, Black Jack with joysticks and paddles. £100 ono. Tel: 0452 822413.

ATARI VCS cartridges, 19 cartridges for £60. Inc, Yars Revenge, Pac-Man, Video Chequers, Missile Command and E.T. Tel: Bicester 242408 after 5pm.

ATARI VCS with joysticks, paddles and touchpad. 20 cartridges for sale, worth over £500. Will sell for £150 ono. Tel: 01-346 4467.

For sale

SPECTRUM S/W. Molar Maul, Chess, Jumping Jack, Plantoids, Horace, Lunar Jetman, Galaxian, Star Trek, Schizoids. All for £30. £3.25. Tel: Bungay 2043.

SPECTRUM GAMES. Lunar Jetman. Bugabo the Flea. 3D Tunnel (not in 3D), Froggi, Lazer Snaker and Birds and Bees. Very good condition. £3.50 each. Phone 0272 676436 after 4pm.

40 POPULAR COMPUTING Weekly's dated from January 20, 1983 to February 1, 1984. Worth £14. Sell for £6.95 ono. Sinclair users 15 including annual, sell for £5. Tel: 061 881 4496.

NEWBRAIN AO Amber 2400 Printer. Perfect condition, complete with book, manual, s/w inc. Newbrain Chess, Newbrain Fourth, Hisoft devpac three. Only £250. Tel: Robert 01-965 6031 ext 54.

SORD MS COMPUTER. Basic I and Basic G. All leads, power pack and manuals. Immaculate. £125. St Austell (0726) 63501.

RADIO SHACK Typing Tutor Cartridge for Dragon 32 on TRS-80. £8.00. Tel: Sue on 01-253 8661.

HP 41C with 2 memory modules, extended functions module, synthetic programming and games books. £160. 41C Carb Reader £90, or £230 the lot. Tel: 01-907 4243 after 6pm.

BBC S/W. Acornsoft, program power and software invasion original tapes, £5 each. Wanted, Level 9 Colossal Cave, Dungeon and Lords of Lime adventures, Bug Byte Dragonquest. Tel: Stevenage (0438) 60537.

48K LYNX, including manual, Denio tape, all leads and Lynx computing books by Sinclair. Ring 01-571 5567.

SCRABBLE 48K Spectrum. Very good condition, £10, Pyramid Krakatoa, Jet pack, Tape Copier. £3.50 each. Tel: 0272 676 436 after 4pm.

ZX MICRODRIVE and interface, 2 microdrive books, one cartridge. Best offer. Tel: Leeds 692948 evens.

LYNX 48K. Boxed as new and colossal adventure. Lynx user mags, books, leads, under guarantee. £170 ono. Tel: 021 742 8758.

T1994A. Minchman module, £10. Hunchback havoc cassette, £3. Hornchurch 42642.

VIDEO GENIE 16K complete with tape deck and four games. £99. Tel: Stourbridge (03843) 70181.

PAIR OF TI JOYSTICKS. Still boxed, £15. Plus connect for cartridge. £7. Tel: 0440 702863.

SHARP MZ80A 48K. Unused, boxed with manual plus basic and demo tapes. £275. Also Sharp PC1500 with printer and cassette interface. As new. £150. Tel: Bathgate (0506) 832689.

Wanted

WANTED, 48k Spectrum, any issue, all leads etc needed, must be good condition, £50-£70. Ring 0299 403132, after school hours.

WANTED, COMMODORE C2N cassette and any daisy wheel printer. Tel: 0865 54084, evenings and weekends.

WANTED, EPSON HX-20, with accessories, in good condition. Phone Reading (0734) 596456, office hours, with details and price.

CBM 64 GAMES to swap, originals only. Manchester 061-7952165.

WANTED, reasonably priced printer for T.I. 59 programmable calculator and T.I. 59 solid state software modules. Tel: Worcs (0905) 840 294.

VIC 20, swap Voodoo Castle for any other Scott Adams adventure, or trader. Tel: 0738 52146. I also have Avenger (cartridge) for £6.

BBC PROGRAMS: Superior's Crazy Painter, Hunchback, Ok Bert, swap for Zalaga, 1JK's Star Soccer, Superior's Centipede, will swap individually. Tel: (0484) 41488, after 5pm.

SPECTRUM WANTED, 16/48K, non-working, or any condition, wanted for parts, will pay reasonable price. Send details and price to: Richard Hasty, Hegel Strasse 13D, 6520 Worms, West Germany.

SWAP VIC 20 The Count, for Voodoo Castle. Tel: Nottingham 615554.

MICRODRIVE order form for sale, any offers? Printer needed (ZX), will swap software such as Games Designer & Chequered Flag, and many more. Phone Staines 57086, after 4.30pm.

SWAP Adventureland, Avenger cartridges for 8k memory expansion, or sell for £7 each (VIC 20). Phone Seaford 890122 and ask for Martin Walker, also Wacky Waiters, swap for Night Flight.

WANTED, COMMODORE 64, leads and manuals, no tape recorder needed, good working condition, s/w also needed, £100, £130 paid. Tel: 958 8643 (Andy).

WANTED, 48k Spectrum with as much equipment and s/w as possible, cash waiting. Tel: Sherbourne (0935) 812472.

WANTED, H.U.R.G. or Quill, will give in exchange Crazy Kong, Arcadia, Cruising and GB Ltd! (or sell £15). Dominic Hare, 12 Prenton Farm Road, Prenton, Birkenhead, Wirral, L43 3BN. Originals only.

ADVENTURE HELPLINE

Micro: Vic 20

Adventure: Adventureland

Problem: How can you get or examine the object in the tova. Also how do you blow up the bricked up window?

Name: Paul Watkins

Address: 67 Saxonhurst Road, Northbourne, Bournemouth, Dorset, BH10 6JE.

Micro: Spectrum

Adventure: The Hobbit

Problem: Cannot get out of Goblin's Dungeons: Cannot get past Bulbous eyes in forest.

Name: Tony Slater

Address: Flat 3, 87 Dunsmure Road, London N16 5PT.

Micro: Sinclair ZX Spectrum 48K

Adventure: Ship of Doom - Espionage Island

Problem: I cannot melt the ice in Ship of Doom. Also in Espionage Island I can't do anything on the dark corner or climb the rock face.

Name: Anthony Watson

Address: 6 Ennerdale Grove, Farnworth, Bolton, Lancs BL4 0PX.

Micro: Vic 20 (Unexpanded)

Adventure: Moon Base Alpha (Rabbit Software)

Problem: How do I get the gloves, which are contaminated with a deadly virus, to the autoclave without dying, because I need them to pick a battery up. Help!

Name: Rene Oulten

Address: Greyhound Cottages, 1 Manor Road, Woodford Bridge, Essex IG8 8BU.

ANY QUESTIONS

Computeristic Software is a new software company whose first software releases are basic educational programs for the Spectrum.

The programs cover various subjects and age ranges and are straightforward question and answers with some facilities to help the child find the correct answers.

All of the tapes are divided into two sections, the first already contains questions and answers, the second can be adapted to hold whatever questions you require via a simple inputting procedure.

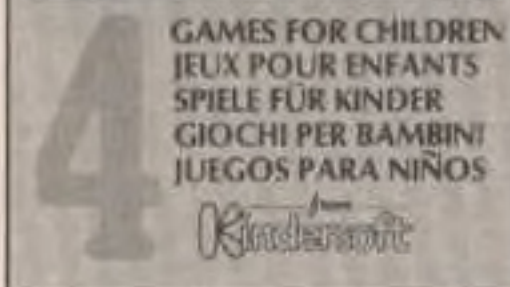
Program *Questor*
Price £7.95
Micro *Spectrum 48K*
Supplier *Computeristic Software*
 205 Wells Road
 Knowle
 Bristol BS42DF

Games for Children by Softshop International.

Four games are used to teach four different things; addition, subtraction, spelling numbers



Commodore 64



and the alphabet. All of the games are illustrated — I particularly liked the way the 'minus' figure was expressed in terms of a number of girls and boys zapped from a playground.

Versions of the program are

available in several foreign languages, and for other machines including the Atmos and Spectrum.

Program *Games for Children*
Price £9.95
Micro *Commodore 64*
Supplier *Soft Shop International*
 Unit 301
 16 Brune Street
 London E1 7NJ

certainly looks like one of the better products of this type.

Program *Alphabet*
Price £9.95
Micro *BBC B*
Supplier *Opal Soft*
 112 Arterial Road
 Eastwood
 Leigh on Sea
 Essex SS9 4DG

SPECIAL PRICE

3D Maze of Doom by James Paton for the ZX81 is not perhaps that special — standard *Wumpus/Transylvanian Tower* stuff. More special is the price — 85p including postage. No glossy packaging, of course and I'm not too sure about the quality of the cassette. But for that price you can hardly go wrong.

Program *3D Maze of Doom*
Price 85p
Micro *ZX81 (16K)*
Supplier *James Paton*
 2 The Avenue
 Fallings Park
 Wolverhampton

BBC LESSON

There's no doubt about it, if you have a BBC computer someone somewhere is determined to educate you.

Alphabet is a program aimed at very young children. Its simple objective is to teach the alphabet via association of pictures and capital letters. The child is presented with an object on screen and must move a cursor point at the correct initial letter.

The program comes neatly packaged with a colourful booklet and a sturdy case. It

MERCENARY

Toppler is a version of the arcade game which mimics an arcade shooting gallery — you blast away at a steady stream of ducks using a limited supply of bullets.

The game is in machine code and includes (aside from the unfortunate ducks) various other targets which can earn bonus points — the twist being you must avoid hitting them. There is bonus screen in which you blitz Tommy the Tank by blowing off his three wheels — perhaps he's a duck mercenary? Cruel but addictive, like so much in life.

Program *Toppler*
Price £5.95
Micro *Dragon 32*
Supplier *Orion Video Productions*
 38 Trentham Road
 Coventry CV1 5BD

Pick of the week

Codename Mat is the latest release from Micromega who, with *Lunar Crabs* and *Deathchase*, have built a reputation for 3D games.

Codename Mat is one of the best Spectrum games I've seen this year. Describing it is far from easy. Imagine a cross between *Timegate*, *Star Raiders* and *Star Trek*, but with dozens of extra features and 3D sprite graphics.

The solar system is being invaded on all sides by alien hordes. Using your fleet of spaceships, you must destroy them.



Derek Brewster, author of *Velnor's Lair* and *Codename Mat* for 48K Spectrum

This involves more than just chase attack sequences, although these are very well

FROM THE OUTER LIMITS

done. It also requires tactical judgment on deciding when and where to go, ie, what segment needs your support most.

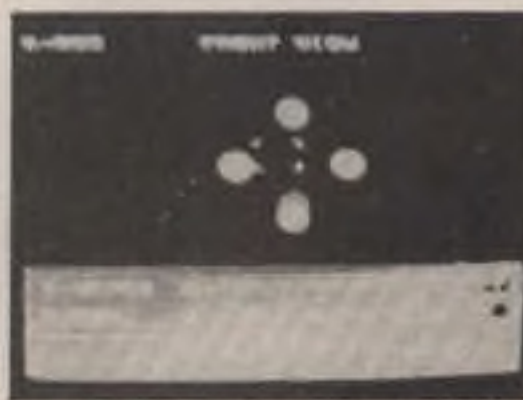
One of the most impressive features are the 3D planets — reasonable facsimiles of the real things which grow from a speck to fill the screen. You need to dock with the planets to refuel and repair after engaging in battle.

Other features of the game include warp drive and 3D 'logic', ie, everything moves on the scanners according to true spacial logic. There are also other fleets you can command via typed instructions, eg, *R2DE2* meaning fleet in segment *R2* go and defend segment *E2*.

The whole thing is in real time, so you can't just sit around waiting for inspiration — other parts of the galaxy will be under attack.

The only problem with this game is its complexity — some people may be attracted by the amazing graphics, without realising that the game primari-

ly demands thought and strategy. At the highest levels, it could last for hours. A final point — it only costs £6.95. In terms of current pricing policies for Spectrum programs, it's worth twice that.



Derek Brewster, who wrote the program, is a 25 year old programmer who is probably best known for *Velnor's Lair* — a highly regarded adventure game issued by Quicksilver. He also wrote *Haunted Hedges* and *Star Crash* for MicroMega.

Program *Codename Mat*
Price £6.95
Micro *Spectrum 48K*
Supplier *Micromega*
 230-236 Lavender Hill
 London SW11

CHILD'S PLAY

As yet there are few educational games and programs for the Commodore 64 — too tempting as a games machine perhaps. One of the first is

TRUE 3D

For some companies, 3D means having little dots representing stars which move out from the middle of the screen to the edge — this is supposed to give you the impression of hurtling through the universe.

The truer 3D can be found on *Triad* from Live Wire — in it, spaceships move towards you with a true perspective, ie, getting slowly bigger and bigger. The game involves blasting away at a fleet of the advancing aliens, most dangerous of all being the Triad — ships which break away from the rest and come straight for you.

You can hardly call the basic concept original, but the excellence of the graphics make it well above the average.

Program *Triad*
Price £8.95
Micro *Commodore 64*
Supplier *Sumlock*
Royal London House
198 Deansgate
Manchester
M3 3NE



POT SHOTS

The only software house consistently taking pot shots at Ultimate's crown as producers of best Spectrum software is Ocean who has just issued *Eskimo Eddie*.

The game features, amongst other creatures, a penguin and a polar bear. What these animals have in common is a cold white habitat. Unfortunately, (from the point of view of geographical consistency) they



live at opposite ends of the world, ie, North and South Poles.

You are *Eddie* and in the first part of the game you find yourself playing *Frogger* with a couple of icebergs and some charming polar bears who lollop lugubriously across your path. Why risk being crushed by these solemn and indifferent creatures — to rescue a penguin, of course, who for some reason can't look after himself.

If you rescue the penguin three times you move on to stage two, which involves you in some judicious iceberg shoving to kill various bugs. The graphics are superb, particularly the way the bears move, although otherwise the game is not the most original in the world.

Program *Eskimo Eddie*
Price £5.95
Micro *Spectrum 48K*
Supplier *Ocean Software*
Ralli Building
Stanley Street
Manchester M3 5FD

OPEN MIND

Paradox looks, from a quick play and the complex maps I've been sent explaining it, like one of the most complicated adventures ever designed.

The big problem with playing *paradox* is that nothing is what it seems, much is of your own imagination — the stuff of dreams and nightmares. The manufacturers suggest that you will need an open, intuitive mind to see the inner logic behind the puzzles.

There are four divisions to this mysterious world, the tunnel, the gamesboard the crystal

crystal palace and the Magician's room. Each area has its own specialised kinds of problem, some threaten your life, some your sanity. With well over a hundred rooms addiction is probably ensured.

Program *Paradox*
Price £7.50
Micro *Spectrum 48K*
Supplier *Runesoft*
Charnwood House
67 Lower Parliament
Street
Nottingham
NG1 3BB

ITALIAN CAT

Someone in the Gruneberg Corporations has been doing a magnificent PR job. This foreign language system is now being made available by various software houses for more or less every micro you could name.

The system basically involves mental associations, eg, in Italian the word for cat is 'gatto' so you imagine a cat eating a large gateau, etc.

Apparently this system works in teaching people a large vocabulary very quickly. Tansoft have just launched an Italian tutor using the system for the Oric and Atmos.

You are told by the computer what associations to imagine and are subsequently tested on them. A basic grammar of about 400 words is contained within the program.

Program *Italian*
Price £12.95
Micro *Oric/Atmos*
Supplier *Tansoft*
Units 1 & 2
Cambridge
Techno-Park
Newmarket Road
Cambridge

COCONUTS

More Dragon educational software. This time the subject is Physics and revision of the O level and CSE syllabus.

NWBC's *Physics 1* divides its chosen field up into 100 multiple choice questions and sets them in the form of a simple game in which you have to make your way across a desert to some coconuts — you move by getting an answer right.

Aside from the game there

are options for general revision, and for a timed examination.

Program *Physics 1*
Price £6.90
Micro *Dragon 32*
Supplier *N.W.B.C.*
204 High Street West
Sunderland
Tyne & Wear
SRI 1UA

DISARMING

Trafalgar is an unusual strategy game for the BBC B. As you might expect, it simulates the famous sea battle. The computer acts for the French.

A plan shows the arrangement of the two forces lined up and ready to obliterate one another. You select which ships you wish to engage in battle and the screen changes to depict the confrontation.

You shoot it out, well, more thud it out really. Cannon balls lurch back and forth making holes in the sails and, if you are lucky, igniting the magazine and sinking the enemy ship. Other factors include a gusting wind that will swerve your shots and a fireboat that you must blast from the water before it sets your fleet aflame.

Program *Trafalgar*
Price £8.00
Micro *BBC B*
Supplier *Squirrel Software*
4 Binloss Avenue
Eccles
Manchester M30 0DV



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, 12-13 Little Newport Street, WC2R 3LD.

Spectrum*

1 (1)	Chequered	(Psion)
2 (2)	Flag	(Ultimate)
3 (6)	Atic Atac	(Quicksilva)
4 (7)	3D Ant Attack	(Durrell)
5 (-)	Scuba Dive	(Ocean)
6 (4)	Hunchback	(Ultimate)
7 (-)	Lunar Jetman	(Imagine)
8 (5)	Alchemist	(Intelligent)
9 (-)	Cyrus IS Chess	(Melbourne House)
10 (-)	The Hobbit	(Richard Shepherd)

* All require 48K.
(Figures compiled by W. H. Smith & Son, London)

ZX81*

1 (1)	Flight Simulation	(Psion)
2 (-)	1K Chess	(Artic)†
3 (5)	Football Manager	(Addictive Games)
4 (3)	Invaders	(Quicksilva)
5 (2)	Defender	(Quicksilva)
6 (-)	Fantasy Games	(Psion)
7 (-)	Chess	(Psion)
8 (4)	Krazy Kong	(PSS)
9 (6)	Hopper	(PSS)
10 (-)	ZX Disassembler/Debug	(Bug-Byte)

† 1K only
* All 16K except where shown
(Figures compiled by Boots/Websters)

Vic 20

1 (1)	Computer War	(Thorn EMI)
2 (3)	Wizard and the Princess	(Melbourne House)
3 (-)	Krazy Kong	(Interceptor)
4 (-)	Bewitched	(Imagine)
5 (5)	Paratrooper	(Rabbit)
6 (8)	Gridrunner	(Llamasoft)
7 (2)	Megagalactic Camels battle at the edge of time	(Llamasoft)
8 (6)	Arcadia	(Imagine)
9 (9)	Wacky Waiters	(Imagine)
10 (10)	Jetpac	(Ultimate)

(Figures compiled by Boots/Websters)

Books

1 (-)	BBC Micro Disk Companion, Latham	(Prentice-Hall)
2 (4)	Advanced Programming Techniques on the Commodore 64, Lawrence	(Sunshine)
3 (2)	Mastering Machine-code on Your ZX Spectrum, Baker	(Interface)
4 (-)	Computing for All the Family with Your BBC Micro, Noble	(Sigma)
5 (-)	Spectrum Microdrive Book, Logan	(Melbourne House)
6 (7)	Advanced Graphics with the BBC Microcomputer, Angel and Jones	(Macmillan)
7 (9)	Commodore 64, Getting the Most From It, Onosko	(Prentice-Hall)
8 (-)	Language of the Dragon, James	(Sigma)
9 (6)	Forth for Micros, Oakley	(Newnes)
10 (8)	68000 Assembly Language Programming, Kane and Leventhal	(Osborne)

(Figures compiled by Watford Technical Books, Watford 0923 23324 Prestel 28844)
(Last week's position in brackets)

Dragon 32

1 (1)	Hungry Horace	(Melbourne House)
2 (4)	Ugh!	(Softtek)
3 (-)	SAS	(Peaksoft)
4 (10)	Skramble	(Microdeal)
5 (-)	Space Shuttle	(Microdeal)
6 (6)	Up Periscope	(Beyond)
7 (7)	Devil Assault	(Microdeal)
8 (2)	Eightball	(Microdeal)
9 (-)	The King	(Microdeal)
10 (-)	Transylvanian Tower	(Richard Shepherd)

(Figures compiled by Boots/Websters)

Commodore 64

1 (2)	Manic Miner	(Software Projects)
2 (3)	Boogaboo	(Quicksilva)
3 (1)	Chinese Juggler	(Ocean)
4 (5)	Mr Wimpy	(Ocean)
5 (6)	Megawar	(Paramount)
6 (-)	The Hobbit	(Melbourne House)
7 (10)	Hungry Horace	(Melbourne House)
8 (8)	Falcon Patrol	(Virgin)
9 (-)	Hover Bovver	(Llamasoft)
10 (-)	Hunchback	(Ocean)

(Figures compiled by Boots/Websters)

Atari

1 (1)	Rally Speedway	(Adventure International)*
2 (-)	Popeye	(Parker Brothers)*
3 (4)	Zaxxon	(Datasoft)
4 (8)	Warlock	(Callisto)‡
5 (9)	Saga 4 Voodoo Castle	(Adventure International)
6 (3)	Saga 5 The Count	(Adventure International)
7 (-)	Golden Baton	(Channel 8)
8 (2)	Slinky	(Cosmi)
9 (5)	Circus	(Channel 8)
10 (-)	Planet Fall	(Infocom)†

* Cartridge † 32K disc ‡ 32K cassette
(Figures compiled by Callisto Computers, Birmingham 021-632 6458)

BIZARRE

Introducing IBM PCjr has winged its way across the Atlantic to be the first book on the subject.

Surprisingly it isn't an introduction to Basic programming nor is it a 'one hundred best games'. Rather it's an overview of the main features and the main software packages and peripherals for the machine.

More bizarre still, there is a fairly lengthy section comparing the PCjr to several other micros — quite who this is meant for I cannot guess. There is also a nasty American family called the Roberts who illustrate how the PCjr can be used by everyone.

In fact the book is so full of homilies about how much everybody's life will be improved by this wonderful new machine it's hard to believe it's actually produced by an independent company — at least I don't think IBM own them.

Book	<i>Introducing IBM PCjr</i>
Price	\$9.95
Micro	Que Corperation 7999 Knue Road Suite 202 Indianapolis IN 46250

FADDISH

Sometimes computer languages seem as faddish as pop records — do I detect a waning in interest in Forth perhaps destined to become next year's Abba?

Extending this metaphor, Culture Club is definitely *Micro Prolog* — the language behind Japan's projects for fourth generation, artificially intelligent, computers.

Micro Prolog is a new book on the subject by the authors of the implementation of the language on the Spectrum. It explains in some detail the logic involved in the language — which proves to closely mimic Symbolic Logic which in turn is supposed to be the way humans actually reason.

It's a fascinating book, but not easy going; it might help to have studied some simple logic.

Book	<i>Micro-Prolog: Programming in Logic</i>
Price	£12.95
Micro	General
Supplier	Prentice/Hall International 66 Wood Lane End Hemel Hempstead Herts HP2 4RG

This Week

Program	Type	Micro	Price	Supplier
Helping Hands Character	Ut	BBC	£7.99	Aslett Scholey
Helping Hands Color	Ut	BBC	£7.99	Aslett Scholey
Helping Hands Sound	Ut	BBC	£7.99	Aslett Scholey
Wheel of Fortune	Ad	BBC B	£9.95	Epic Software
Alien Dropout	Arc	BBC/Electron	£7.95	Superior
Centibug	Arc	BBC/Electron	£7.95	Superior
Constellation	Ed	BBC/Electron	£7.95	Superior
Disassembler	Ut	BBC/Electron	£7.95	Superior
Fruit Machine	S	BBC/Electron	£7.95	Superior
Invaders	Arc	BBC/Electron	£7.95	Superior
World Geography	Ed	BBC/Electron	£7.95	Superior
Galaxy	Arc	Commodore 64	£9.95	Anirog
Midnight Express	Arc	Commodore 64	£7.00	Camilla
Pub Quest	Ad	Commodore 64	£5.95	Dream
Space Pilot	Arc	Commodore 64	£9.95	Anirog
Sprint Basic Compiler	Ut	Dragon	£14.95	Oasis
Pascal	Ut	Dragon 32	£14.95	Oasis
The Typist	Ut	Dragon 32	£6.95	South Molton
Backgammon	S	MZ 700	£7.95	Solo
Chess	S	MZ 700	£9.95	Solo
Fighter Command	Arc	MZ 700	£6.95	Solo
Lightning Patrol	Arc	MZ 700	£3.95	Solo
Nightmare Park	Ad	MZ 700	£6.95	Solo
Shoplister	Arc	MZ 700	£3.95	Home Micro
Xanagrams	S	MZ 700	£9.95	Solo
Blockbuster	Arc	Oric 1	£5.95	Dream
Basic F	Ut	Sord	£44.95	CGL
Biorythm Diagnosis	USt	Sord	£8.95	CGL
Falc	Ut	Sord	£34.95	CGL
Three Circles	S	Sord	£8.95	CGL
C.A.D.	Ut	Spectrum	£5.95	Dream
Caesar the Cat	Arc	Spectrum	£6.95	Mirrorsoft

Dungeon Building	Ut	Spectrum	£9.95	Dream
Dustman	Arc	Spectrum	£5.90	Timescape
Glug Glug	Arc	Spectrum	£5.95	CRL
Helping Hands Character	Ut	Spectrum	£5.99	Aslett Scholey
Helping Hands Colour	Ut	Spectrum	£5.99	Aslett Scholey
Helping Hands Sound	Ut	Spectrum	£5.99	Aslett Scholey
Machine Code for Beginners	Ut	Spectrum	£7.95	Dream
Pedro	Arc	Spectrum	£5.50	Imagine
Profile 1	Ut	Spectrum	£8.65	McGraw Hill
Quest for the Holy Grail	Ad	Spectrum	£5.95	Dream
Siege	Arc	Spectrum	£5.50	Wye Valley
Specky Lecky	Ut	Spectrum	£12.95	New Dimension
Spectrum Interfacing	Ut	Spectrum	£8.65	McGraw Hill
Spectrum Safari	Ad	Spectrum	£5.95	CDS
Weatherman	Ut	Spectrum	£3.95	Eastwood
Troopatruck	Arc	Spectrum/Vic20	£5.99	Rabbit
Bongo	Arc	Vic20	£5.95	Anirog
Cloudbust	Arc	Vic20	£5.95	Audiogenic
Escape	Ad	Vic20	£5.95	Dream
Outworld	Arc	Vic20	£5.95	Audiogenic
Spiders of Mars	Arc	Vic20	£5.95	Audiogenic
Star Defender	Arc	Vic20	£5.95	Anirog
Sea Wolf	Arc	ZX81	£3.95	Stephen Hartley

Key: Ad — adventure/Arc — arcade/Ed — education/
S — strategy-simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



An awkward childhood

In this, the first of two articles, I will try to explain the current obsession with copyright law. In the second article, I will attempt to cover the changes in the law desired by the industry and the pitfalls that must be considered in making these changes.

I am not a legal expert, just a paltry marketing man — so legal experts should read no further, for they will learn nothing from this piece except that marketing men may not be totally accurate when talking about technical subjects. However, if you are not a legal expert, but just interested in the question, then at least you won't find yourself dazzled by jargon.

For such a high-tech industry, we seem to be spending more and more of our time obsessed with what is a pretty low-tech piece of legislation embodied in the 1956 Copyright Act. The reason for the growing obsession is the very low-tech nature of a law that did not foresee many of the wonders of the current electronic age, let alone the even more wondrous electro-future that awaits us. The result is that legal protection that would have been taken for granted in any other sphere of creative or intellectual endeavour may or may not exist for computer software.

The situation is made worse by the uncertainty of the question and because of the eccentricities of our legal system. The only two ways of

changing the system are either to get new legislation through Parliament, which takes a very long time, or to set a judicial precedent by taking a case through the courts, which also takes quite a long time and costs a small (or sometimes not so small!) fortune. This is why software copyright remains in a legal limbo awaiting action from the brave, the foolhardy, or the Government.

Copyright is the most basic form of protection of intellectual property. In the UK any work is automatically protected by copyright — providing, and only providing, the work meets the criterion of the Copyright Act. You don't have to do anything to be covered.

It is a good idea though to write a copyright notice on your work along with your name and the year, is '© Nick Alexander 1984', to frighten people off but it won't make it copyright if it isn't. It may also be advisable to log a copy of your work with either a bank or a solicitor to establish the date it was completed.

Trade marks or patents, on the other hand, have to be applied for and granted, which takes time and costs money. Because of its simplicity, copyright is an ideal device for the individual and is used to protect all literary, musical and artistic works from unscrupulous thieves.

Current copyright legislation is embodied in an Act of Parliament passed in 1956. It does not mention computer software, for obvious reasons, but general legal opinion is that software is covered by the definition of the type of works that are mentioned. However, the software industry was thrown into further turmoil last month when an Australian court ruled that copyright did not apply to software.

Logically, there can be no argument that an original software program should not benefit from the same protection given to an original song, play or novel. But, the fact that a court of law, albeit an Australian one, can throw this out leaving the way clear for anyone to steal anybody else's program demonstrates that we cannot be complacent about software legal protection.

The legal position on software copyright must be clarified, and rapidly, if our still infant industry is to survive what looks set to be an awkward childhood and make it into a healthy adolescence.

Nick Alexander

A losing streak

Puzzle No. 98

Poor Tom was looking a bit down in the mouth after having had a losing streak at the races.



It appeared he lost as many pennies as he originally had pounds, and as many pounds as he originally had pennies. And, to cap it all, he had managed to drop a 50 pence piece down a drain grating as well!

Purely coincidentally, you understand, this left him with just half the amount that he had to begin with.

How much was this?

Solution to Puzzle No. 93

The program uses an array to represent the pile of cards. Each card that is 'discarded' is made non-zero. When all but one card has been rejected, the remaining value in the array that is still zero shows the location of the winning card.

```
10 DIM A (999) 20 LET C = 0 30 LET T = 1 40 LET A(T) = 1 50 LET C = C + 1 60 IF C = 998 THEN GOTO 200 70 LET T = T + 1 80 IF T = 1000 THEN LET T = 1 90 IF A(T) = 0 THEN GOTO 70 100 LET T = + 1 110 IF T = 1000 THEN LET T = 1 120 IF A(T) = 0 THEN GOTO 100 130 GOTO 40 200 FOR N = 1 TO 999 210 IF A(N) = 0 THEN PRINT N 220 NEXT N.
```

The winning card was originally in 974th place from the top of the pile.

Winner of Puzzle No. 93

The winner is: Mrs Innes, Davids Close, Alverstoke, Bristol, who receives £10.



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