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electron user NEWS

Electrons are saying it with flowers

ELECTRON technology is helping people all over the country to say it with flowers.

Interflora, the association of flower retailers, is placing comms equipped micros in all its 2,500 retail outlet shops.

The machines – labelled The Interflora Messenger – have been specially built round the Electron motherboard by British Telecom's business systems equipment division.

By November every Interflora shop in Britain will have the equipment, speeding up orders and saving on telephone calls.

The system includes an onboard modem, a disc dial and auto answer, VDU, dot matrix printer and associated software.

Installation follows a successful trial with 50 shops in various parts of the country.

"Once we got the Electron and software it was the right machine for the job", said Keith Bentley, Interflora's head of communications and computer services. "The main problems have been with the software and the dot matrix printer.

"The original printer was not good enough and kept jamming, and the software which is stored on rom proved difficult, but that has all been sorted and the system is now working perfectly".

The cost is being met by Interflora, with the retailer paying a small handling charge on each order.

That's the point Electron-based systems the average order can be sent in less than 20 seconds – instead of four minutes by telephone.

Jill Clarkes of Tracys florists in Merseyside said: "At first I was apprehensive about using computers, but the system is really easy to use.

"It's good for business because we can serve customers while orders are transmitted instead of waiting time on the end of a telephone line".

Jill Clarkes operates an Interflora Messenger

It was all go at the Show

THE London Marathon may have taken place the same weekend but the real winners were to be found at the 16th Electron and BBC Micro User Show.

A survey of exhibitors showed that visitors saved at least £500,000 by taking advantage of more than 200 special offers at the three-day event.

"We were delighted to see the way the exhibitors once again joined in the spirit of the occasion", said Derek Meakin, head of the programmers Database Exhibitions.

They offered special show prices on everything from hardware upgrades to arcade games".

But there was more to the show than just bargains. Once again it was a showcase for everything new in the Electron marketplace.

Business was brisk everywhere, but nowhere more so than on the ACP stand where the 32k Advanced Battery Backed Ram was a big seller. Plus 1 and Plus 4 stocks were exhausted, and the new 16k Advanced Control Panel rom received an enthusiastic welcome from visitors.

Sales at the Electrosonic stand were brisk where so good they turned the show into an adventure for company boss Mike Beecher.

He quickly sold all his Midi interfaces and music software stock – including his own master disc – and had to send for fresh supplies.

When he left the show he found his van had been dampened, he scraped the vehicle when driving off, and got to Southampton before discovering that he'd left the new master disc behind.

Returning to London, he found cleaners removing the last litter from the hall and tied to poke into a rubbish skip where he found the disc under about a feet of straw refuse. "Thank goodness it was underlagged" he said.

Knit one on your Electron

A BOYHOOD holiday introduced Kendall Down to knitting which has culminated in him writing a sophisticated suite of pattern design programs for the Electron.

Fascinated by his mother's busy needles as a 12-year-old youngster he asked to be-taught to knit – and acquired a skill that is serving him well as an adult.

Marriage and the eventual need for baby clothes rekindled his interest in knitting, and these days he produces most of the woollies worn by his wife Shirley and sons aged six, 11 and 14.

"I finally rebelled at the prices charged for knitting patterns and wrote a program to design and produce printed instructions for sweaters", said Kendall, who is a clergyman in North Wales.

That initial program has grown into a package of five Electron knitting pattern programs, complete with detailed instructions.

Users can produce patterns for square and drop sleeve pullovers and also design their own distinctive knitware. Details are on Page 23.

Top marks for the school tycoons

Christopher Read (left) and Colin Chappell . . . their accent is on educational programs

WHEN 13-year-old Colin Chappell devised his first computer program, he decided the ideal customer would be his school.

Teachers at Welling Secondary in Kent gave top marks to the program, French Tenses, to give Colin the incentive to carry on.

Now – four years later and still at school – Colin operates Chestnut Software (01-308 2981) from his home in Bexleyheath.

Producing games with an educational basis for the Electron, he is helped by another 17-year-old, Christopher Read, who acts as sales and marketing manager.

The enterprising duo has also won the backing of their local Bexley Borough Council who include Chestnut's programs at its educational software open days.

The latest releases for the Electron from the teenagers involve subjects that are definitely not on the normal school timetable. Enigma is a dice game for six to eight players, while Tipster analyses horse racing data to predict winners.

The Thunderstruck winners

WE had an overwhelming response to the Thunderstruck competition in the March issue, and were surprised at the number of words you found in AUDIOGENIC. However some people's imaginations got the better of them, and we came across words which we could not find in any dictionary. Here are the final results:

Stephen Lodge from Wakefield will be receiving the complete Audiogenic range – Thunderstruck 1 & 2, Bug Eyes 2, Psycastria, Last of the Free, Frankenstein 2000, Caveman Capers, and Electron Power Pack.

The second, third, fourth and fifth prize winners will each receive Thunderstruck and the Electron Power Pack compilation – Marco Muia of Lancaster, Paul Day of Colchester, Emily Clarke of Maidstone and EA Cook of Llanfrechfa.

The 45 runners-up will be sent a copy of Thunderstruck: G Laurence, Macclesfield; J Stinchcombe, Sherborne; KT Millar, Sherborne; WG Newman, Chapel-en-le-Frith; RD Charlton, New Marston; EY Whyte, The Netherlands; A Norfolk, Leeds; DG Corner, Stonehouse;R Arnfield,Southport; MJ Hopewell, Nottingham; P Robertson, Denny; H Vance, Larne; J Acton, Bath; B Orchard, Bristol; D Jackson, Portadown; G Seager, Enfield; S Bailey, St Austell; P Jones, Flint; C Yule, London; C Morris, Port Talbot; D Rich, Ripon; S Bain, Hamilton; M Malby, Hornchurch; P Noble, Bicker; A G Russell, Burnley; D Crawley, Fordingbridge; S O'Gorman, County Galway; S Fortescue, Basford; R Stuart, Watford; WA McMillan, Andover; PD Bailey, Burton on Trent; M Count, Hull; K Malone, Ramsey; R Pallett, Horndean; M Brooks, Wylam; D Knight, Lerwick; E Robertson, Troon; M Collis, Burwash; J Wright, Long Sutton; R Auty, Connahs Quay; DL Riley; Keighley; A Gilmartin, Otley; M Jones, Headington; R Nassehi, Epsom; SM Ovenell, Bexley.

Emulate Hercules

AN Electron version of Hercules has been released as a budget game by Power House.

Based on the Twelve Labours of Hercules from Greek mythology, it is a platform game with a difference.

The 50 frames lead the player through the first 11 labours at random. Only when these are completed can the 12th be attempted.

But the platforms and ropes are not always visible and even when the player has worked out where one should be it might have gone next time – or might burst into flames on impact.

Power House (01-258 3999) say they have more games on the way for the Electron, including Freedom Fighter.

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Bright ideas win prizes

SO many people entered the recent Advanced Computer Products competition in *Electron User* that it has taken several weeks just to sort through the mini-mountain of mail.

"The quality of entries was so impressive it would have been a crime to rush the job", said ACP boss John Huddleston.

"The effort put in by nearly 1,000 entrants was unbelievable – it's a pity we couldn't give them all a prize".

To win more than £500 worth of prizes, contestants had to make a practical suggestion for a new ACP product for the Electron.

Winner of the first prize, an AP5 interface plus AMX mouse package, was Kevin J Robinson of Morpeth who suggested an internal sideways rom board to fit inside the Plus 1.

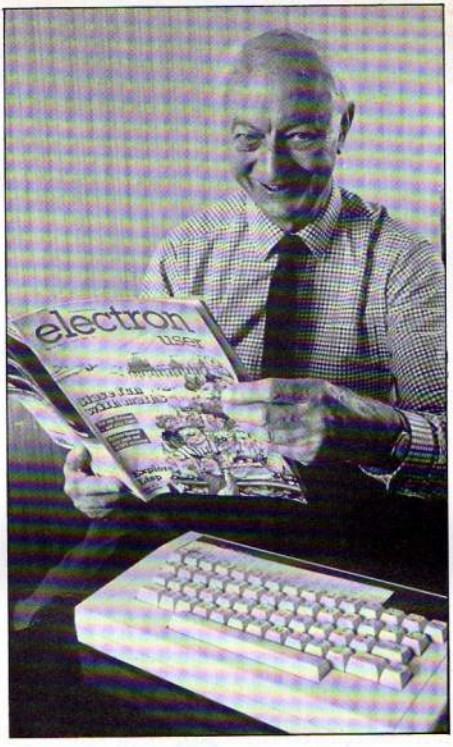
"We had to choose this practical and commonsense idea because it concurs with a product we are already working on", said John Huddleston. "Its design is simplistic and easily fitted".

Second prize of an Advanced 1770 DFS and Advanced Rom Adapter II goes to R W Dean of Wolverhampton who suggested a joystick interface and keyboard expander.

"This also coincides with something we've been looking at", said Huddleston. "If it can be done it means almost every Electron game could be joystick controlled. It's an idea we'll be considering very seriously".

Third prize of an Advanced Rom Manager and Advanced Rom Adapter I went to N R Jones of Purley who suggested an Advanced Sound System.

"It looks pretty incredible", said Huddleston. "It even includes output to a mouse. It may not make a viable product, but a lot of work went into designing it so it certainly deserves an A for effort".



Micro life begins at 73

A 73-year-old man who was made redundant when his firm brought in computers has embraced micro technology with the help of *Electron User*.

Computerised warehousing meant transport manager Ron Panting had to leave the firm where he had worked for 43 years.

Instead of stagnating at his home in Bromborough, Merseyside, he found dozens of ways to keep himself busy.

The latest is computing – a hobby inspired by his granddaughters getting an Electron as a Christmas present.

A quick trip to Dixons and a £50 outlay brought him his own machine and an activity to share with the girls when they visit him from their home near Wolverhampton.

I've had an interest in electronics since building primitive radio sets as a boy so the technology didn't scare me like it might other older people", said Ron "In any case I enjoy using my brains.

"I've spent many enjoyable hours learning the intricacies of Basic, and typing in programs from *Electron User*.

"As my reflexes – particularly fingers – are not as good as they were, commercially produced games are far too quick for me.

"Even those I type from *Electron User* for my granddaughters use are in the same category – but I can usually amend these to make them more amenable for my use.

"With the help of *Electron User* I've been able to build up a stock of games to keep my granddaughters amused as well as some more practical programs for my own enjoyment".

Super graphics on the way . . .

A FORECAST that within two years games running on Electrons will have graphics comparable with those on the inlay cards has come from a leading developer.

Dave Croft of Tynesoft (091-414 4611) believes that a technological breakthrough is just around the corner.

"Our programmers are working to improve graphics all the time", he told *Electron User*.

"We are expecting the major advance to come from a possible combination of video and computer images".

Dave Croft currently heads a team of five in-house programmers and 12 outside writers working for Tynesoft.

Their success has been so marked that the software house is considered to be a front runner in the industry.

One of its titles, Winter Olympics, has now been in the bestselling charts for more than a year while another, Commonwealth Games, has been in the Top Ten for the six months since it was launched.

Last year Tynesoft broke through the £1 million sales barrier for the first time .

Sales in the Electron and BBC Micro markets accounted for a sizeable amount of this", says Dave Croft. "They are brilliant markets for games – but they have to be good".

MOUSE AID

NEW from Wigmore House is Mousemate, an interface which allows the use of digital input devices with the Electron and Plus 1.

Together with a mouse the interface gives a degree of cursor control never before possible on the Electron, claims Wigmore (01-734 8826).

Mousemate, priced £29.90, is supplied with Wigmore's graphics and design package Mousepaint on cassette for £39.90.

CONNECTING UP YOUR USER PORT

JOE PRITCHARD shows how to make the most of ACP's Plus 5

SO far in this series we've concentrated on the Plus 1. We'll now take a short break and look at Advanced Computer Products' Plus 5, which gives the Electron a user port, Tube and 1MHz bus.

I'll concentrate on the user port as this can be used for simple hardware projects and we'll see how to make the most of it. Don't worry if you haven't got a Plus 5, everything will work equally well with Project Expansions' user port.

Your first question might be: "What is a user port and why do I need one?" Well, the user port is just another way of allowing the computer to exchange information, in the form of electrical signals, with the outside world.

Note that I said exchange – the user port allows the computer to send signals to the outside world as well as receive them.

The analogue port in the Plus 1 is a one way device, just allowing the computer to receive information.

A user port forms a two way, or bidirectional connection. There are eight separate channels, or lines and each line can carry a single electrical signal either to or from the Electron.

The big difference between a user port and the Plus 1's analogue port is the type of electrical signal carried. The analogue port accepts an input voltage between 0 and 1.8 volts and converts this into an 8 bit number.

Each input line of a user port will respond only to inputs of either 0 or 5 volts from the outside world and when used as an output from the computer will give an output of either 0 or 5 volts.

Such a system, with only two voltage levels is a digital one.

The Plus 5 user port, along with many others, is treated by the Electron as a memory location so you can use the ? indirection operator to transfer information between the Electron and the port.

Because of the eight lines, the numbers passed to the user port are in the range 0 to 255 – eight bits as shown in Figure I.

When used for output each zero in the byte that is written to the user port will cause the corresponding line to go to 0 volts and each one will cause the corresponding line to go to 5 volts.

If used for input, the byte read back from the port address will reflect the pattern of 0 and 5 volt signals on the input lines of the port.

Each line set to 5 volts is read back as one and each 0 volt input will be read back as zero.

The user port allows you to connect the Electron to a variety of other electronic circuits, switches and so on.

For instance, you could control a simple robot buggy or a model train layout, receive inputs from light or heat sensitive switches and even decode morse code from a radio. The uses are limited only by your imagination.

So let's get down to a detailed look at the Plus 5 user port.

It is based on a very sophisticated chip called the 6522 VIA (Versatile Interface Adaptor). It's the same one as used in the BBC Micro's user port and occupies 16 bytes in the Electron's memory map.

Each of these bytes represents a register inside the 6522 as shown in Figure II, and each controls some aspect of the behaviour of the chip.

It has two separate input and output ports, one of which is available to us on the Plus 5.

In addition it offers timing functions and a few other facilities which we won't be covering in this brief three part introduction. However, we may come back to the 6522 later on in the series.

In this introduction we'll be interested in two of the 6522 registers – those at &FCB0 and &FCB2. These are called IORB and DDRB respectively – abbreviations for Input Output Register B and Data Direction Register B.

The first is the actual user port and the second controls which lines of the port are used for input and which for output.

When we use a 6522 based user port, it's crucial that we tell the 6522 which lines of the port (address

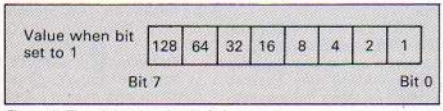


Figure I: The eight bit values of the user port

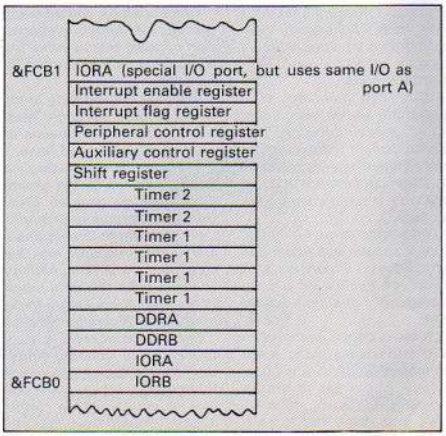


Figure II: The 6522 VIA's registers

&FCB0 in this case) are to be used for input and which for output.

Splitting the user port into a mixture of input and output lines will obviously reduce the number of each we can use; for example, if we need six output lines then we're only going to be able to have two input lines. We couldn't have eight of each.

Setting which line is to be an out and which an in is easy; for an output line simply set the corresponding bit of &FCB2 to one.

For an input line, set the bit to zero. In Figure III we've set up bits 0 to 3 of &FCB0 to be outputs and bits 4 to 7 to be inputs. The command used to write to the DDRB register would be:

```
?&FCB2=&0F
```

However, this won't work if you've got a second processor connected as the ? operator will write to the second processor's memory. Instead, we use an FX call:

```
*FX147,178,15
```

The first parameter, &B2 in this case, is the offset from &FC00 of the address to which you want to write.

The second is the value that you want to write to that address. If we wanted to set all the bits to be outputs, we'd issue:

```
?&FCB2=255
```

Similarily, for writing a value to &FCB0 we can use:

```
?&FCB0=n
```

where *n* is the value we want to write to the port.

It's quite possible to damage the user port if you try putting an electrical signal from an add-on circuit of some sort into a user port line that has been set up as an output.

Be very careful when setting up the DDRB register – if a user port line isn't going to be used as an output, set it up as an input even if you're not going to be using it.

So if we're only using line 0 as an output and we're not using any of the other lines at all, use:

```
?&FCB0=1
```

to set bit zero as an output and the others as inputs.

After that word of caution, don't panic; I've yet to damage a VIA and with a little care you should have no problems. Just follow the instructions given here and you'll soon get the hang of things. The major practical problem with using the user port is the connection to it.

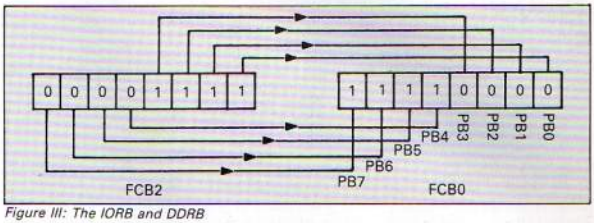


Figure III: The IORB and DDRB

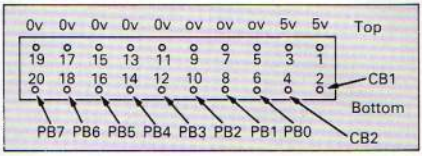


Figure IV: The Plus 5 user port pin-out

Figure IV shows the pin out of both the Plus 5 and the Project Expansions user port. It's the same as the BBC Micro's user port.

The PB lines are the In/Out lines of the user port – 5V carries 5 volts and 0V is the same as the digital ground of the analogue port. CB1 and CB2 are special purpose I/O lines which don't concern us just yet.

The connector you'll need for our projects is called a 20 way Female Insulation Displacement Connector, usually called a 20 way female IDC. Don't try soldering directly to the pins on the user port.

To use these connectors properly you'll need a special tool which allows you to squeeze the plug on to a suitable cable.

However, if you can't get hold of the IDC crimping

Turn to Page 12 ►

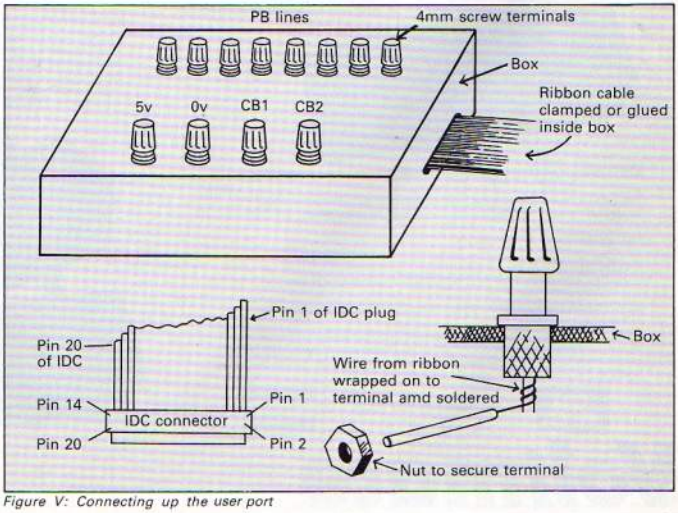


Figure V: Connecting up the user port

◀ From Page 11

tool (which comes with full instructions) it is possible to solder the connector with care.

The best sort of connector is ribbon cable, in which several separate wires are moulded in plastic to give a wide strip.

We want a length of 20 wire, or to use the technical jargon, 20 way ribbon cable. Get a piece about one metre long, so you can position whatever you connect to the user port a reasonable distance away from the Electron.

For the sort of experimental work we'll be doing, I use the box shown in Figure V. All the components are available from Rapid Electronics, Hill Farm Industrial Estate, Boxted, Colchester, Essex.

All we're doing is connecting the user port pins to the 4mm terminals so we can connect anything up to the port without having to solder and desolder connections to the IDC connector.

I've connected all of the I/O lines to terminals, including the CB1 and CB2 lines, and have bought out the 5V and 0V connections.

This uses a total of 10 terminals: 8 green ones for the PB lines, red for the CB lines 5V and black for 0V.

I used a fairly large plastic box from Tandy, but a wooden box or even a plastic sandwich box of suitable size would do.

You shouldn't have any difficulty wiring it up. The only problems are at the IDC end. If you solder, take care not to splash the neighbouring pins, especially the 5 and 0V ones.

Once you've built the box, check the connections to the IDC connector in a good light, with a magnifying glass if necessary.

```
   10 REM Program I
   20 MODE6:VDU 19,0,4;0;
   30 PROCassem
   40 REPEAT
   50 PRINTTAB(0,1)"Port re
ads:";:CALL&B00
   60 UNTIL0
   70 DEFPROCassem
   80 data=&70
   90 FOR %%=0 TO 2 STEP 2
  100 P%=&B00
  110 [OPT%%
  120 SEI
  130 LDA #0
  140 STA &FCB2  \ DATA DIR
ECTION REG.
  150 LDA &FCB0  \ PORT B I
NPUT
  160 CLI
  170 LDX #8
  180 STA data
  190 .loop
  200 ASL data
  210 LDA #0
  220 ADC #ASC"0"
  230 JSR &FFEE
  240 DEX
  250 BNE loop
  260 RTS
  270 ]
  280 NEXT
  290 ENDPROC
```

Program I

We'll check the box by getting the Electron to read from the user port. Type in Program I and run it.

The DDRB is set to make all the PB lines into inputs, then the program loops, reading IORB and printing the result returned to the screen. Use a piece of wire to connect each PB terminal in turn to 0V.

Don't connect the 5V line to 0V though, you'll crash the computer. As you connect each terminal to 0 the number displayed on the screen will change.

● *Next month we'll look at inputs and outputs from the user port in greater detail and see how we can put them to good use.*

Pinball wizard

Product: Video Pinball
Price: £1.99
Supplier: Alternative Software Limited, Unit 3-6, Baileygate Industrial Estate, Pontefract, West Yorkshire.

IT is good to see more firms getting involved in budget priced software and Alternative Software have now joined this growth industry with a pin-table simulation.

Just as on a real pin-table, the controls are simple. The spacebar is used for the plunger which pushes the ball onto the table.

The speed of the ball can be varied by adjusting the time you hold down the spacebar. Once in play, the ball bounces off the various obstacles.

These obstructions not only decide your score, but make rapid changes to the speed and direction of the ball. When it falls to the bottom of the table, you can push it back using the Z and ? keys control the left and right flippers.

With subtle use of the flippers, you can aim the ball to the bonus channel at the left of the screen. Success will cause mayhem to break out as numbers and colours flash everywhere and a bonanza of sound occurs. You should also aim to get the ball to pass through each of the channels at the top of the table so that the letters B, O, N, U and S all change colour and give your score a healthy boost.

Inevitably, the ball will either fall down one of the drains at the side – you can do nothing about this – or you'll miss a ball with your flippers. In either case you can now move on to your next ball.

Altogether you get five balls, and the game is for up to four players. Each competitor uses one ball in turn and all aim to reach the high score table.

The nature of a pin-table does not make for exciting animated graphics. Video Pinball has a tidy screen and the simplicity of the action makes for smooth but rapid movement. You can slow the game if you wish by selecting the BBC Micro option.

The choice of colour – white ball on a yellow background – is poor, both in colour and black and white. Sound effects are really rather good.

The bleeps and buzzes have an authentic flavour, but there should be an option to turn them off. No method exists within this software, although *FX210,1 before loading will kill all sound.

I have one criticism of the pin-table – it is not possible to catch a ball on the flippers to get real control over direction. That apart, Video Pinball is a good simulation and quite addictive. The style of the software is somewhat dated, but at £1.99 represents good value for money.

Rog Frost

Graphics	6
Sound	7
Playability	7
Value for Money	8
Overall	7

Mechanic's adventure

Program: Magnetic Moon
Price: £4.95 (free to Elk Adventure Club Members)
Supplier: The Elk Adventure Club, 2 The Beeches, Tilbury, Essex RM18 8ED.
Tel: 03752 4860

MANY potential text adventure authors who haven't the programming skill to write their own machine code epics can thank Gilsoft's The Quill for cutting away their shackles.

Larry Horsfield, the author of Magnetic Moon, is a case in point. Electron adventurers would not have been able to savour the delights of his imagination without an aid such as The Quill.

Although lacking the text compression – and hence the atmosphere – of the likes of Enthar Seven, Magnetic Moon is a revelation. It is a flight of science fiction fantasy with the feel of a Robico masterpiece.

You are Mike Erlin, second lieutenant of the United Planets Survey Service Spaceship, Stellar Queen. While searching for your sister ship, Stellar Princess, you discover an Earth-like planet with three moons.

Suddenly, a powerful tractor beam forces you to crashland on the moon where you are held in a dynamic magnetic force field. As a maverick hero, you have to free your ship, and gripping stuff it is too.

The game loads in three parts and each must be completed to go on to the next phase.

Part one is called Search for Source of Power and you will spend a lot of time and energy collecting much needed artifacts to continue the quest. You need to escape from the Stellar Queen without the captain or crew noticing, then examine the wreckage of the cabin.

My advice is to LOOK UP and LOOK DOWN continually. Throughout the adventure, careful examination and manipulation of potentially useful objects is essential to success.

The start is one of the trickiest I have come across and the problems don't get easier as the game progresses. It's a bit of a mechanic's game with all the mending and manipulating involved.

All in all a most enjoyable mental exercise which I recommend to the experienced adventurer. However, the novice should not be daunted as the Elk Adventure Club offers an excellent help service.

Pendragon

Presentation	4
Atmosphere	7
Frustration Factor	9
Value for Money	10
Overall	8

SPY V. SPY

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Cassette £9.95 BBC Disk and Master Compact versions also available

OXBRIDGE

AT LAST IT'S HERE - A FULLY ILLUSTRATED ADVENTURE FOR THE BBC/ELECTRON - 300 GRAPHIC LOCATIONS ON BBC, 200 GRAPHIC LOCATIONS ON ELECTRON

Oxbridge is an Adventure which takes a light-hearted look at the world of higher education. The cursor keys move you about a beautifully illustrated landscape to meet various brain-teaser type problems. If you like puzzle books, you'll love this game. It is no marathon science-fiction epic taking hours to get into. You make progress within minutes and as you play you absorb the atmosphere and folklore of the world's most famous university.
The author is an Oxford-based mathematician and puzzle composer who has used his skills to pack an incredible 300* pictures into the BBC's memory.
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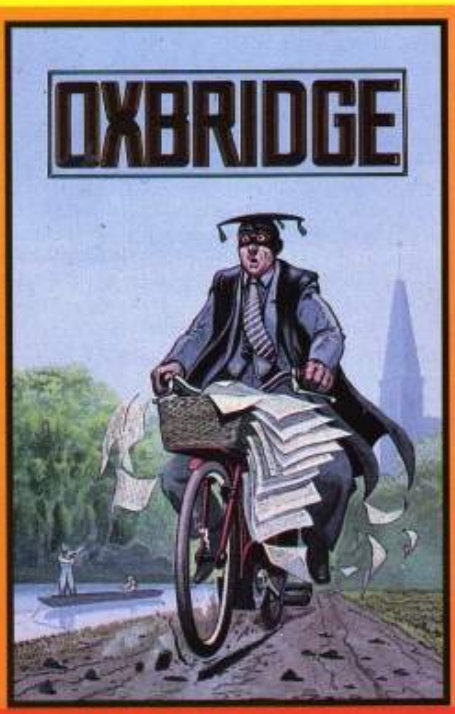

PHANTOM

Something strange has been happening, something unnatural. At first no one took much notice, those who'd experienced it were considered crackpots by those who hadn't. But now people are noticing, the so called 'crackpots' now outnumber the disbelievers.
And so the scene is set. As a Professor of Astro-Physics with more than a passing interest in Psychic Phenomena you are well prepared for the situation. Equipped with your experimental nuclear accelerator you prepare for what could be the world's final conflict, one dimension against the other, life versus death. And so the war begins.....
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**Tynesoft Computer Software, Unit 3,
Addison Industrial Estate, Blaydon,
Tyne & Wear NE21 4TE. Tel: (091) 414 4611**

TYNESOFT
COMPUTER SOFTWARE

Cheap, but not cheerful

Program: The Hacker
Price: £1.99
Supplier: Firebird Software, 64/76 New Oxford Street, London WC1A 1PS
Tel:01-379 6755

QUITE a lot of budget software has been released recently, some of which compares favourably with games costing up to three times as much.

Unfortunately, some only serves to give other budget software titles a bad name and in my opinion this game falls into this category.

It is of the platform and ladders genre, having 12 separate screens. A new one appears only when the previous one has been completed, though there is a practice mode which lets you access any screen.

Controls and movement are limited to left, right and jump. Progress is timed, but there is a pause facility enabling you to stop and plan your route. Unfortunately, I found that the movements of The Hacker were rather jerky and key response wasn't all I would wish.

The theme is that The Hacker has to pass through a terminal and modem into the telephone network. Then it's on into a central computer mainframe through a second modem (this is probably why screens B and F are identical and both titled "Do it the Modem Way").

Any similarity to a real hacker breaking into a real mainframe exists only in the screen titles, with names like On the Data Buses which at least gave me a chuckle, and Terminally Yours, which just about reflected how I felt when playing the game.

The sprites are well drawn, being fairly good representations of rom chips, discs, cassettes and the like, but the remainder of the graphics are rather basic and the backgrounds plain.

Sound was virtually non-existent being limited to one monotonous tone as the character walks. There are different tones as he falls or dies on landing.

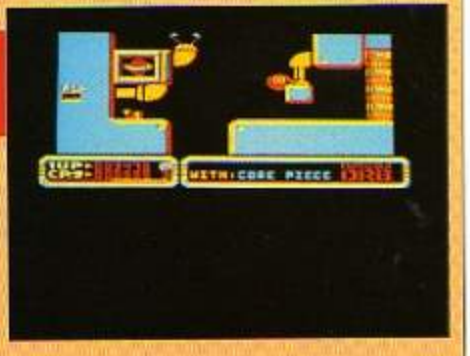
The screens are difficult to complete, but I wouldn't describe them as challenging as there doesn't seem to be any incentive to keep trying.

The Hacker originally appeared about three years ago when software was difficult to find and arcade addicts a bit less demanding. Software houses would do well to remember that standards have improved and games of this quality can be found as simple magazine listings. My overall verdict: Dull and uninspiring.

Beejay

Sound	1
Graphics	3
Playability	2
Value	2
Overall	2

Challenging adventure



Product: Omega Orb
Price: £7.95
Supplier: Audiogenic, 12 Chiltern Enterprise Centre, Theale, Berks, RG7 4AA.
Tel: 0734 303663.

THE latest arcade adventure from the prolific Peter Scott, author of Thunderstruck II and the recently re-released Hunkidory, is Omega Orb.

Peter's games always have a distinctive appearance and feel and this one is certainly from the same stable, although featuring a number of refinements on previous offerings.

You control the Omega Orb, a beautifully animated bouncing ball which is the cutest creature I've seen in a long time. I particularly liked the delightful squashy effect produced when the Orb hits the ground.

The object of the game seems similar to that of its predecessor, Thunderstruck II: Move the Orb through a variety of multi-coloured locations collecting core pieces – presumably to rebuild the core, although I have yet to find it. A number of other objects litter the landscape and it's up to you to work out what to do with them.

Omega Orb is however, considerably more hectic than Thunderstruck II because each new location produces a number of evil-looking creatures with intentions to match.

Contact with any of them reduces it to a cloud of dust, but severely drains your energy.

Furthermore, the game has a nasty habit of leaving the dead creature's dust behind, which again reduces your energy to death level in seconds. Luckily you can rely on your trusty laser gun.

You can only carry one object at a time and collecting or dropping is automatic – you simply jump on it. If you haven't got an object you take it, but if you are already carrying one it will be exchanged for the new one.

If you pause more than about a second the new acquisition will be dropped again.

It is therefore very easy, and annoying, to bounce off with the wrong object, or even empty-handed.

I haven't managed to get very far into the game yet. However, the screens I have seen have been superb with large animated sprites, used for moving creatures and for many landscape features, allowing you to walk behind the scenery. The plot is a challenge to both mental and physical reflexes.

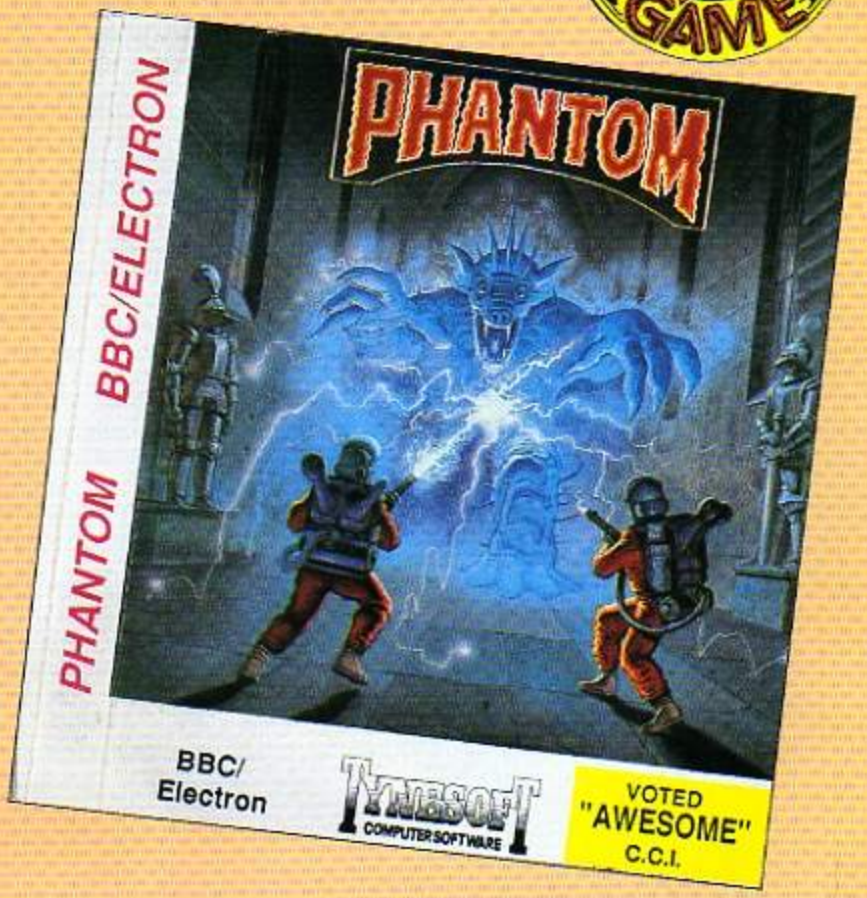
I found Omega Orb a little too similar to Thunderstruck II, but nevertheless it is a game well worth looking out for.

Martin Read

Sound	8
Graphics	10
Playability	9
Value	9
Overall	9

Ghost Buster?

Program: Phantom
Price: £7.95
Supplier: Tynesoft, Addison industrial estate, Blaydon on Tyne, Tyne and Wear, NE21 4TE.
Tel: 091 414 4611



WHEN I heard that Tynesoft had released Phantom, described as one of "the new breed of arcade games", I expected an Electron version of the classic arcade game Gauntlet. As usual I was wrong.

The cassette inlay shows two players blasting a rather unpleasant looking, multi-limbed astral misfit and looks quite smart.

The scenario is the present with the player taking the role of an absent minded professor of astrophysics with more than a passing interest in psychic phenomena.

He has long expected the impending catastrophe that is about to befall us – why else would he just happen to have a nuclear powered particle accelerator lying in his back yard?

The game loads and presents you with a start screen reminiscent of Future Shock and just as beautifully designed. Score, reactor level, heart rate in beats per minute (BPM) and electro-cardiograph (ECG) displays are in a window at the bottom of the screen.

In Phantom, as in life, you only get one chance. Each time you bump into one of the ghouls and spectres of the game they give you a terrible fright which increases your heart rate.

Being a bit of an old codger with one foot in the grave already, 100 BPM is a little too much for his old ticker and it'll give up the ghost.

Press S to start and after nerve shattering music enter Ye Olde Inn viewed from above, as in Gauntlet. It all seems very quiet and peaceful, until you discover that the ale must have been like liquid dynamite as deceased customers are very fond of the old place. Needless to say, they're not too keen on strangers and as soon as you put your head round the door they descend like rampant bluebottles.

No problem: Just whip out your new ion cannon and start blasting. Zap! The spooks vanish in little clouds of ectoplasm. Neat little gadget this, since the beam can knock out several of them in one shot.

There is a snag though, and if you like a good old shoot-'em-up then you'd better think again. The backpack has a limited amount of power and once that's gone you'll have to wait until you find another isotope pack – it's the one with the coloured top: No other pack looks or lasts quite like it. A few are scattered throughout the game, but remember they don't last long.

To make matters worse your heart rate doesn't settle down from one level to the next. It does add to the fun and doesn't let you relax.

After battling through the four levels of the inn and cleaning up the ghouls you find yourself transported into the dungeon where a completely new set of nasties appear.

Luckily the journey between each new set of screens, which involves some loading from tape, gives your heart time to get back to normal. In all there are 64 rooms between the four houses, the ultimate being the castle, with the difficulty of maze and puzzle quality increasing throughout.

The graphics are superb: The characters are clear and well drawn and the four colours of the Mode 5 display have been used to excellent effect. The animation is smooth and fast, and gets even faster as more spooks appear.

Soundwise the game is nothing to write home about, but this is a limitation of the Electron that has yet to be overcome.

Unlike most other games of this type, Phantom has another surprise up its sleeve. Whereas in Gauntlet your objective was to hack through dozens of screens, in Phantom you have to figure how best to survive to the next level. Evasion seems to be the best tactic, shooting only when you have to. This adds greatly to the game's addictive quality.

There are only two very minor faults. First, the spooks can sometimes strike without you being able to shoot back, though this is not as bad as it sounds, and second the game is a bit slow to restart after you've been killed. This is annoying in such an addictive game.

Those minor criticisms apart, Phantom is without doubt one of the finest games I have ever played on the Electron and anyone, Tynesoft included, would be doing very well to better it.

Mark Smiddy

Sound	7
Graphics	10
Playability	10
Value for money	9
Overall	10

Nine Men's Morris

ARTHUR LINDON resurrects a 3000-year-old board game

WE used to think that Nine Men's Morris was a strange dance, performed in country villages to help the crops grow. Now Arthur Lindon with the help of a little history has put us right.

Nine Men's Morris is a game first played more than 3,000 years ago. A stone slab, engraved with the playing board, found in a tomb dating from about 1400 BC, substantiates this.

Like the original, the computer game is for two players, each with nine counters. The first player to move is selected at random by the computer and play begins with opponents placing counters on the vacant points.

The object of the game is to form one or more mills. A mill is a row of three counters of the same colour in a straight line. When this is achieved a player can remove one of the opponent's counters. But the counter removed must not be part of a mill.

In Figure I it is red to go and if he places a counter at B a mill will be formed through A-B-C. He can then remove a blue counter – Q or W is best – preventing blue from gaining a mill through Q-T-W on his next turn.

If a player is reduced to two counters or unable to move he loses the game. Play continues when all the counters have been laid out by sliding a counter along a line to an adjacent point, provided that it is vacant. Again the aim is to form a mill.

If a counter in a mill is moved, as may be necessary in normal play, all counters in that mill, unless forming part of another mill, become liable to capture.

It may be necessary to waive the right of removal and to do this press Z. It is the only time a turn may be missed. To yield to your opponent at any time press Y.

For ease of use, the positions of the counters are referred to on the board by letters, but the computer sees them as numbers one to 24. Three permanent arrays are set up *X(n)*, *Y(n)* and *Z(n)*, each array being 25 elements long.

The arrays *X(n)* and *Y(n)* hold the actual character positions of the counters in the horizontal and vertical directions, *Z(n)* holds the numbers of the positions reading the grid from left to right and top to bottom.

For example, the first three numbers in *Z(n)* are 1, 10 and 22 which correspond to the grid positions A, J and V.

The two other arrays *C(n)* and *M(n)* are constantly changing during the game. The *C(n)* array is set to the colour of the counter occupying position *n* or zero if vacant and *M(n)* is set to one if the counter at position *n* is part of a mill or zero otherwise.

In the early stages counters are played one at a time by each player on vacant points using PROCplace.

When the two stocks are exhausted, selected counters are moved along the lines to the next point, provided it is vacant, using PROCmove.

After each turn, PROCcheck checks whether a mill has been formed. If it has PROCcapture deals with the removal of the opponent's counter.

It may sometimes be necessary for strategic reasons, to move a counter out of a mill during a game (a counter moved out of a mill and back again reforms the mill). PROCreset scans the grid each move to check for the formation of a new mill.

Full listing starts on Page 19

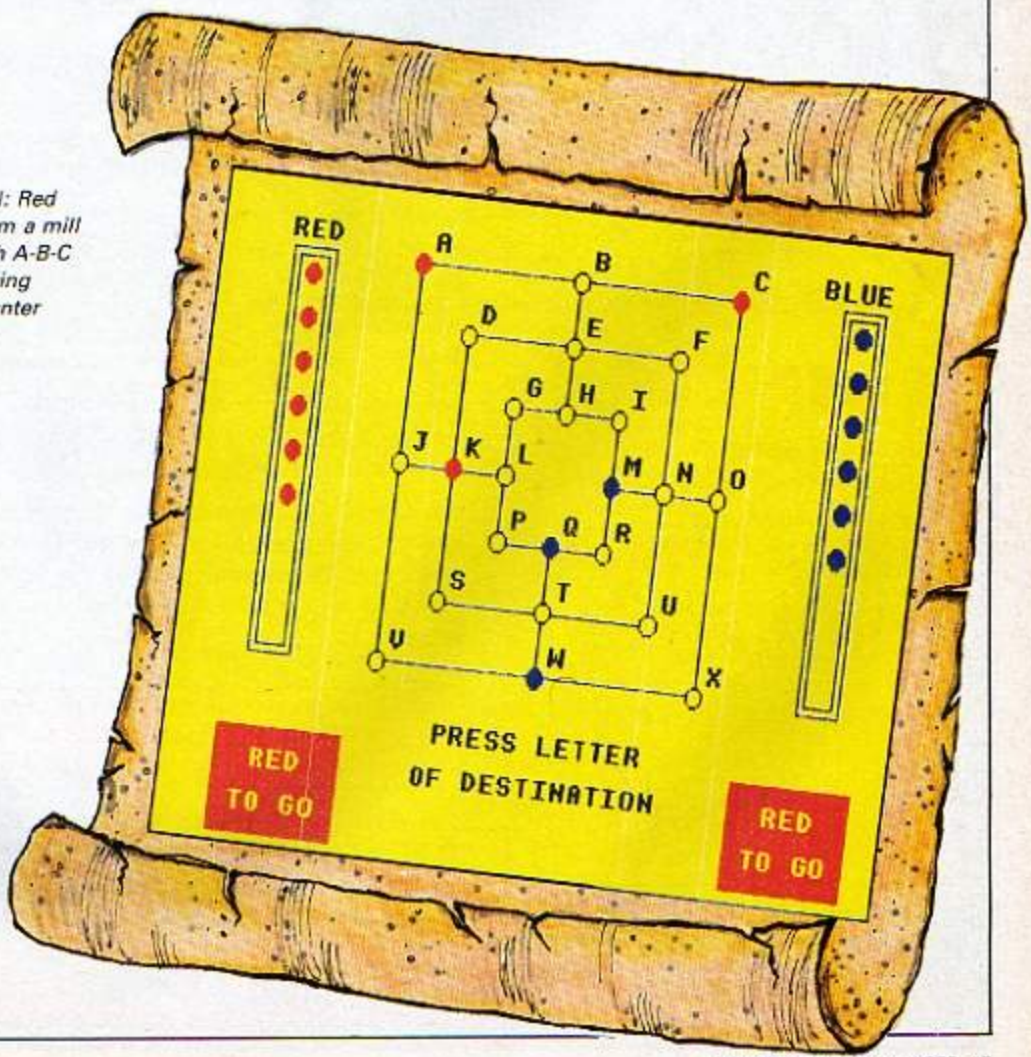


Figure I: Red can form a mill through A-B-C by placing his counter at B

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You're on your own in Occupied France — facing the toughest test that a British pilot has ever had to experience!

The year is 1943. As an RAF officer stranded in Occupied France you have one aim — to get back to Britain.

The only way to do this is to try to pass as a Frenchman, but if your French isn't good enough you risk capture and interrogation by the police or even the Gestapo.

Even the simplest tasks — from buying food to taking buses — place you at risk. And to add to your problems you've got limited funds: "Should I hitch a lift or take the train?", "Do I sell my belongings or get a job?"

Whatever you decide to do, time is short. And there are always people willing to denounce you . . .

French on the Run is that rare combination: A truly educational program that's also a thoroughly enjoyable game. This text adventure not only tests your grammar and vocabulary, but your knowledge of France and the French way of life.

And as your French improves the language problems get harder and the situations become progressively more dangerous. There are four routes to complete in sequence — you need the password from the last before attempting the next. The standard of French required is about O level, though on the last route it rises to just below A level.

And there's a chance for you to try out the French you'll learn in practice: We are offering a FREE WEEKEND IN PARIS as a prize to the first person to get back to England alive, having broken a code near the end of the final route.

For teachers: *French on the Run uses multi-choice questions with randomised distractors, all carefully chosen to illustrate linguistic points or points concerning things French. The program is meant for individual assessment, but can be used just as effectively for classroom work. A sealed envelope contains details of how the secret passwords are created.*

DATABASE SOFTWARE

TO ORDER TURN TO THE FORM ON PAGE 53

Touch of luxury

MARK SMIDDY reviews ACP's Advanced Control Panel

MANY years ago TV and monitor screens were not used to display output from the early computers. Instead, they relied upon a panel of indicator lights.

Similar to those seen in many science fiction films from the fifties, they were known as front-end control panels, and became extinct with the advent of the monitor.

Now ACP has revived the control panel idea, giving Electron users a friendly front-end panel.

Replacing the bulky electronic display, it is supplied as software on rom. To use it you will need a Plus 1 with a suitable rom cartridge or Rombox.

The panel appears instantly on power-up, taking control of the machine instead of Basic. At this point the only major problem many Electron users are likely to encounter becomes apparent – the display is unalterably in Mode 0.

This is necessary for the software but is a nuisance if your screen can't display 80 column text clearly – and this means the majority of televisions.

The control panel provides you with a very convenient interface between you and the micro's more complex functions .

The intitial control panel display has four window headers – Language, Mos, File and Panel.

Highlighting Language, using the cursor keys, brings up a language window.

Under this heading are listed all roms present in the machine that announce themselves as languages. Normally this will be just Advanced Control Panel itself, Basic and the Plus 1 rom.

It is important to note that language roms are not necessarily programming languages, just that their designers included a language entry point in the software. The Plus 1 rom can't be selected even though it appears on the list.

If you have the language cartridges View, Viewsheet, Lisp and so on, these will appear on the menu. Entering a rom from the panel is a simple matter of highlighting the one you wish to use and pressing Return.

Under the heading Mos lie the operating system functions. Some functions listed under this menu and further sub-menus do not directly concern the Electron – the rom can be used on the BBC Micro and Master as well.

Figure II: The Mos menu

Clock, for instance, accesses the real time clock in the Master. Trying to access one of these extra functions on the Electron results in the error message: "Not supported".

This should not be a problem, and if you ever upgrade to the heady heights of the BBC Master, you'll have one less rom to replace.

Available under the same heading is a pop-up-calculator that allows conversion between decimal, binary and hexadecimal and simple arithmetic to be performed.

It's a lot easier to use this than to perform the same feats from Basic.

Another useful function under the same heading is the rom list which lists the 16 rom locations allowed by the operating system and their contents, if any.

In this window it is possible to switch off (in effect unplug) any of the roms. This can be useful for stopping one rom accepting a star command intended for another.

Under the File menu are various functions concerned with filing systems, information on files, changing drive with disc systems and so on.

Finally, most powerful of all, is the Panel menu itself. This enables you to tailor the panel or design a completely new one.

It is possible, for instance, to create a panel which only contains those functions directly relevant to the Electron. Although this is not strictly necessary, it shows what can be achieved.

User defined panels can be saved to the current filing system, ADFS disc for example, and then the panel can be re-entered at a later date with *ACP followed by the filename.

Advanced Control Panel is supplied with a comprehensive 29 page manual that contains everything to get you started from fitting the rom right up to the more advanced features of the software.

It is a reasonably user-friendly piece of software, and although a luxury item I can recommend it to anyone who wants easy access to the Electron's functions.

One word of warning before you rush out and buy it – make certain that you can easily read 80 column text on your television or monitor. ■

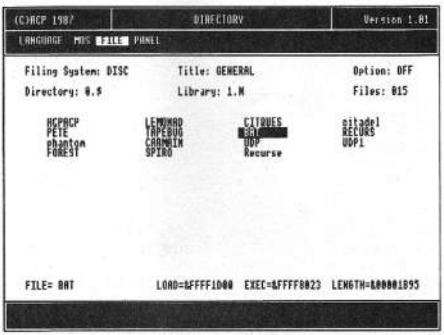
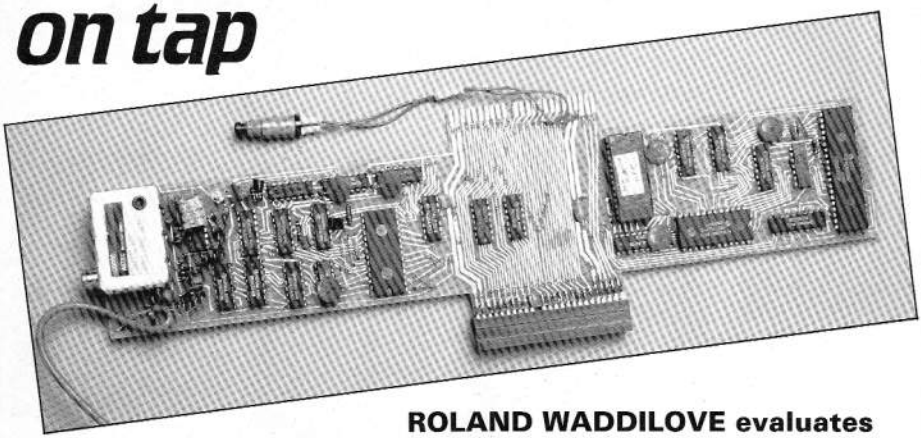


Figure I: The disc catalogue under ACP control

Product: Advanced Control Panel
Price: £34.50
Supplier: Advanced Computer Products, 6 Ava House, Chobham, Surrey GU24 8LZ
Tel: 0276 76545

Hardware Review

Teletext on tap



ROLAND WADDILOVE evaluates a Mode 7 adapter for the Electron

Product: Mode 7 Adapter
Price: £89.00
Supplier: Jafa Systems, 9 Lon-y-Garwa, Caerphilly, Mid-Glamorgan
Tel: 0222 887203

IT has taken nearly four years, but now here at last is a true Mode 7 adapter for the Electron. And very impressive it is too.

It's a hardware add-on which plugs directly into the back of the Electron and is about the same size as a Plus 1.

The pre-production prototype version I tried was not cased, so I can't say what it will look like when finished. Hopefully, it will match the colour and style of the Electron.

Plus 1, 3 and Rombox owners needn't worry, as the edge connector is continued at the rear of the board and our Rombox Plus and Cumana disc interface worked perfectly throughout the review.

There is a short monitor lead on the left side of the board which is not, as I first thought, for plugging into a monitor, but into the monitor socket on the Electron's side.

The TV output is taken from the Mode 7 adapter itself, not the Electron. There isn't a monitor output, and I hope this slight deficiency is rectified on production models.

There's really very little to it. You simply plug in, switch on, type *MODE7ON and tap the Break key. You now have Mode 7 in addition to the normal modes 0 to 6.

HIMEM is set at &7C00 so 5k extra ram is available for your programs.

The Electron has a habit of clearing this on pressing Break (it still thinks this is the screen memory) so there's a special reset button which acts like a soft Break. However, the content of the extra ram stays intact.

You can print all teletext characters, colours and graphics on the Mode 7 screen and you can even poke it directly if you wish.

As a test I borrowed half a dozen BBC discs from the *Micro User* team and booted them up on the Electron. They all worked.

In fact, no matter how they were written – legally or illegally – they produced a perfect display every time.

One of the toughest tests was Invasion from the February 1984 issue of *The Micro User*. This is a Mode 7 version of space invaders.

After adding two lines to stop the introductory music from playing it ran first time. It was every bit as good on the Electron as it is on the BBC Micro.

As a bonus, the adapter also works with Slogger's Turbo (but not 64k shadow ram mode), so now you can have the speed of the BBC Micro and Mode 7 as well.

With this combination quite a high proportion of (unprotected) BBC Micro software will run on the Electron.

But you won't be able to run commercial software such as Acornsoft's Revs.

There are many reasons why this won't work. One is simply that the software checks which micro it is running on while loading and will stop if it's an Electron.

You can turn the adapter off at any time so the micro behaves as a normal Electron.

Several new commands have been added to the Electron's operating system. The Mode 7 display can be brought down the screen with *TV255 and the BBC Micro's red function keys are emulated on the Electron's keyboard.

On the BBC Micro you can press Shift, Control or Shift+Control and a function key to obtain special effects.

This doesn't work on the Electron, but after *EFN and Break the bottom three rows of the keyboard emulate these keys when used with Caps Lk/Func.

At £79 the adapter costs as much as an Electron itself and must be considered a luxury rather than a necessity.

Remember, no matter what you add to an Electron, it will never be exactly the same as a BBC Micro, and you could end up paying out more.

However it does carry the Electron a long way down the road towards that great micro, and if money is no object then I can recommend it. ■

HALL OF FAME

The Time Machine** (continued) – **Chris Lowe

You should now have INSERTED the prisms and thus have an operational time machine. Six different locations can now be visited via the machine. They are: The Cellar, The Prehistoric Age, The Sphinx, The Mary Celeste, The Grassy Plain and The Vortex.

Ignore the other time machine in The Vortex as it is of no use.

On The Grassy Plain lever the metal plate with the crowbar. Enter the shaft and put a hammer in the works of the generator.

You should now find that the robot won't stop you from entering the archway. This is where you will find Doctor Potter – take him/her to finish the adventure.

Rick Hanson – Robert Hales

From the starting location go W then IN to the telephone box. GET THE RECORDER and PRESS PLAY to receive your instructions. Before the recorder self-destructs THROW it.

Leave the telephone box, go W then N and get the PORK PIE, then go S and W to Platform 1.

Cross the bridge, go N then E and GET THE SPANNER from the workman's tent. Go back across the bridge and return to the location where you started. Go N and GET THE POLISH. A man in dark glasses will start to follow you. Return to the bridge and WAIT.

Keep waiting until you hear a train approaching. When the carriage containing the loose stone chippings passes beneath you JUMP. Go D and KILL GUARD WITH SPANNER. Go OUT.

From the sidings go D to the staircase, then SE, S, SW, W, NW, N to the outskirts of the village. Go W, W, W and GET THE IMPI.

Then go E, S, W, W, W and GET THE RAZOR. Then go E, N, E, N to reach the village square. Go IN to the church. In the church, go S, S, W and EXAM FRAME.

Make a note of the hymn numbers before going E, S, E into the vestry. Climb the steps to the bell tower and CUT ROPE WITH RAZOR then GET ROPE. Leave the church, go E then IN to the butcher's shop. GET THE HOOK.

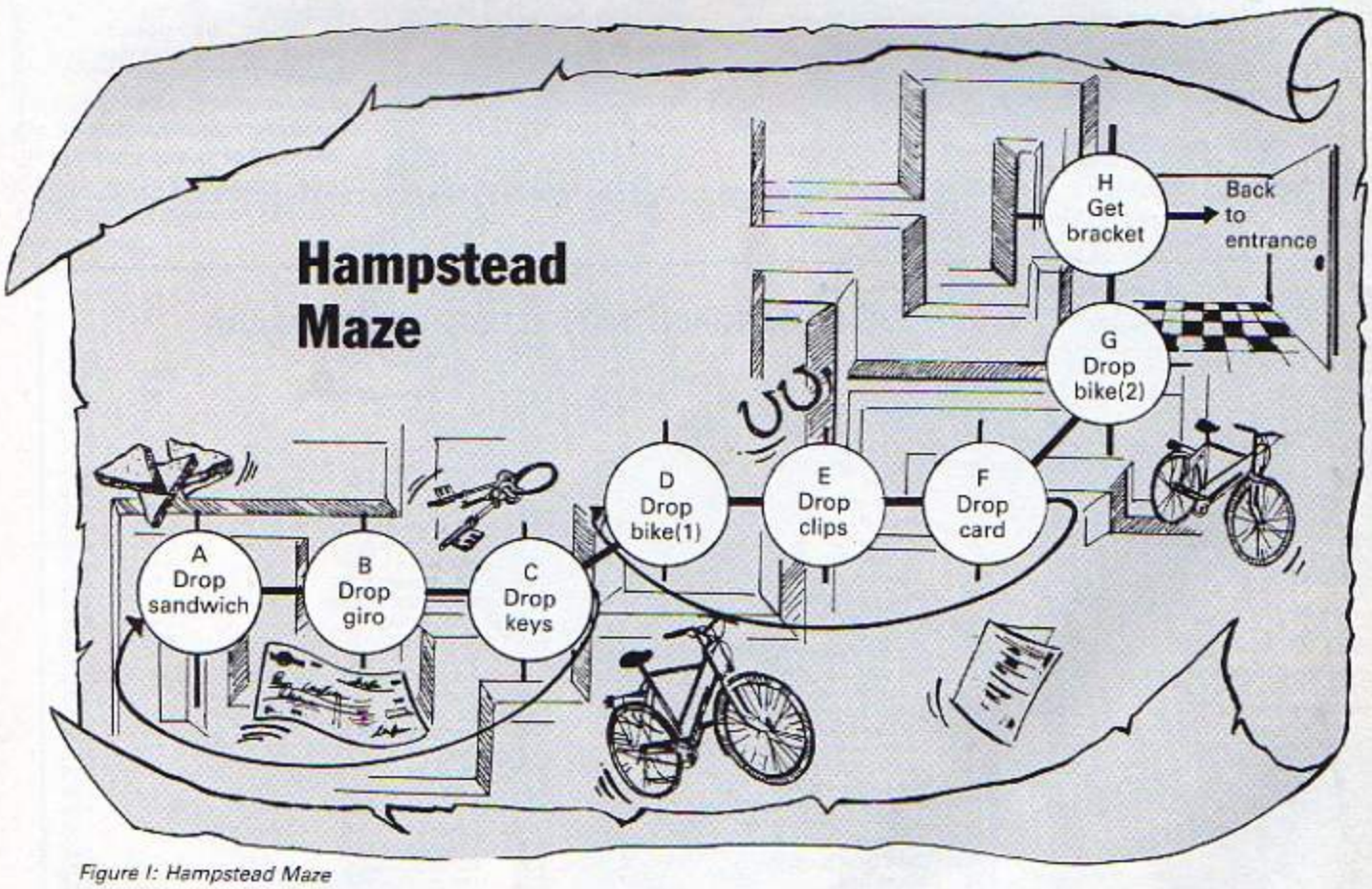


Figure I: Hampstead Maze

OVERTURE AND BEGINNERS

There can be nothing so off-putting for the beginner than a complex maze in his first or second sortie into adventureland. As an experienced adventurer, I am often flummoxed by a maze which, on first inspection, seems unmappable.

But here's some good news – every maze I have met in text adventurers on my Electron and BBC Micros, can be mapped using one of the following techniques.

Perhaps the most common type of maze is where each location description appears identical and all the exits seem the same.

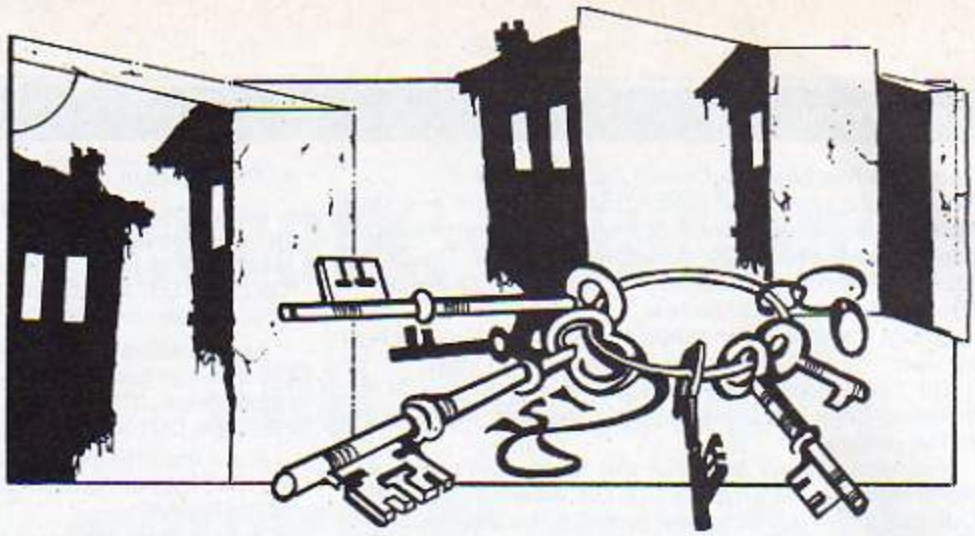
This maze can be mapped fairly successfully by the "dropping method".

Providing you are carrying enough artefacts you can drop a different one at each maze location and so alter the descriptions from each other.

The Industrial Estate in Hampstead is a prime example of this type of maze. Before beginning a maze exploration it is vital that you SAVE your position to tape so that if you become lost you can start again at the entrance.

Turn to Page 22 ▶

◀ *From Page 21*



In Hampstead, on entering the maze at A shown in Figure I, I dropped the cod and banana sandwich and then went NORTH. When a sandwich appeared at my seemingly new location I realised that I hadn't moved. I then tried each exit until I discovered one which didn't lead to the same sandwich.

At the next location which I called B on my map, I dropped my Giro cheque. I then repeated the same procedure until I discovered a new location, C.

At C I had a surprise which proved that the maze wasn't totally logical. Moving EAST I found myself back at the sandwich at A! Retracing my steps I dropped the keys at C before discovering a new location NORTH EAST at D, which was mapped as before.

The next location, E provided a second surprise as travelling NORTH took me back to the entrance. My first thought was that surely the maze cannot be so simple and anyway what is the point of it? I went back to the bicycle clips which I had dropped at E and soon discovered another exit to the EAST.

After this location I had run out of objects to drop and was tempted to use my tracksuit. Just in time I remembered that I had been arrested for indecent exposure earlier in the game and decided on a new course of action.

A quick sortie back allowed me to pick up the bike at a location I had already mapped and I then dropped this for the second time at G.

Thankfully, soon afterwards I discovered a valuable treasure NORTH of G – a lathe retaining bracket!

Then began the task of retracing my steps and collecting the objects I had dropped whilst re-checking my map of the maze.

I have used this particular technique in many adventures. The mazes in Sphinx and Classic spring instantly to mind as occassions where this method was successful.

● *Next month I will look at mapping more devious and less logical mazes.*

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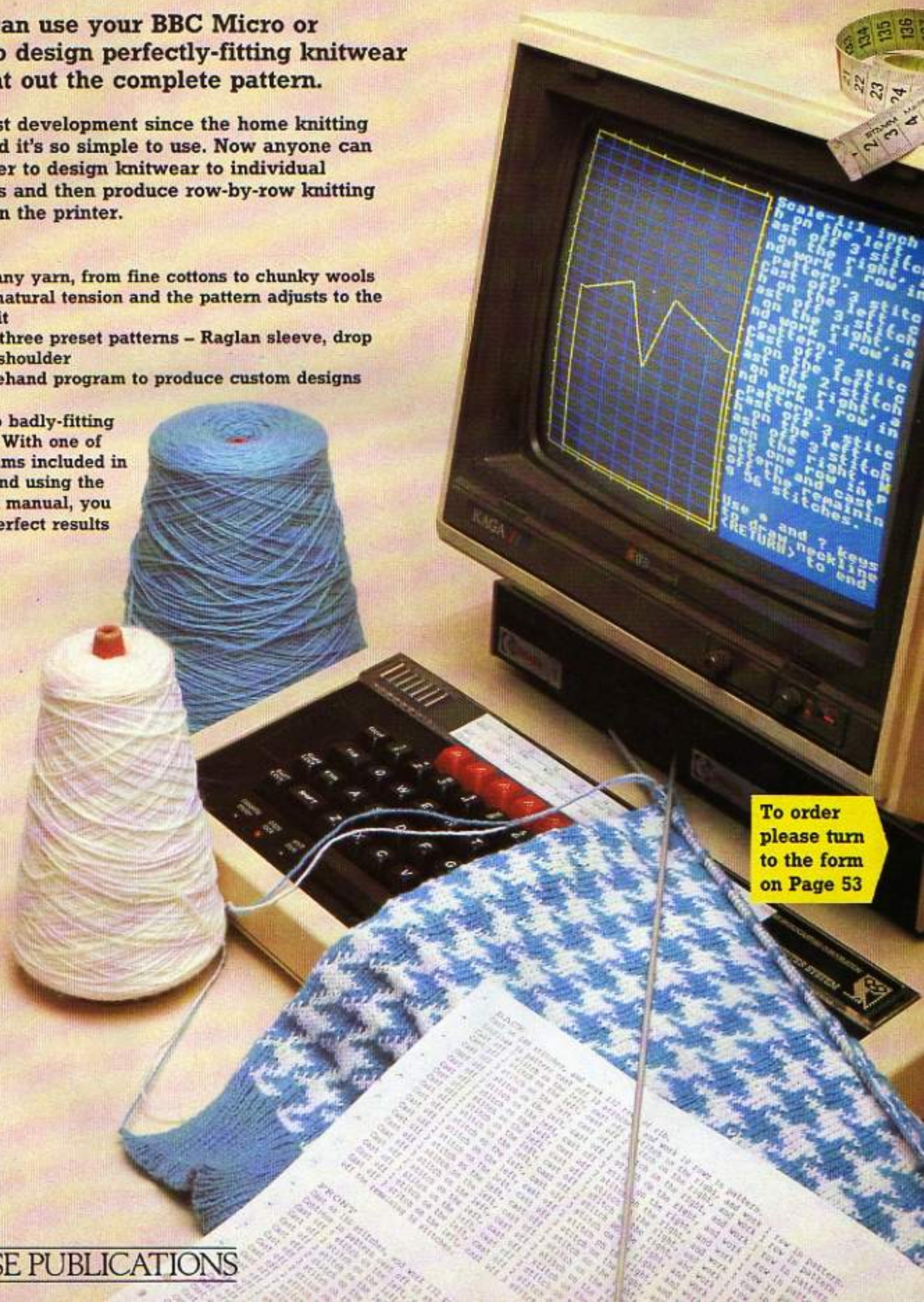

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The big squeeze

Mark Smiddy shows how to cram up to 200 Mode 2 screens on one disc

FROM the very start of computing to just a few years ago most adventure games available for computers were of the text only variety.

This was because most of the early computers were incapable of graphics of any kind. These days anything worth calling itself a computer, whether micro or mainframe, has to have graphic capabilites.

No matter which computer you refer to, graphics eat large amounts of memory. The better the graphics the larger the amount of memory they require.

Never has this been truer than in the case of our very own and much beloved, if sometimes misunderstood Acorn Electron. Its higher resolution graphics modes gobble up 20k of the available memory, leaving only 8k or so free for Basic.

While this might be fine for a machine code programmer composing his ultimate arcade masterpiece, to the writer of adventure games this is very limiting. Adventure games, by their very nature, need as much memory as possible.

The obvious alternative is to resort to pure text, leaving the Electron programmer approximately 20k free in Mode 6. The best text adventures are reckoned to need no graphics, as the mind conjures images with which no affordable computer could ever compete. At least that's what the writers tell us.

It is here that we encounter the catch 22 situation. If we use graphics we won't have any memory. If we use text we'll have to write like Shakespeare.

The solution is to store drawings for your masterpiece in a very compact form, preferably on disc, but how?

```
10 REM Program I
20 MODE 2
30 *SPOOL Picture
40 FOR N=1 TO 10
50 GCOL 3,RND(15)
60 PLOT 85,RND(1280),RND
(1024)
70 NEXT
80 *SPOOL
```

Program I

Program I illustrates an interesting feature of the Electron of which not many people are aware, in the form of the *SPOOL command.

In the manual we are told that *SPOOL sends copies of all characters sent to the screen to the currently selected filing system. Disc in this case, although tape will work just as well.

*SPOOL is generally used to create Ascii files for merging with other programs or loading into word processors such as View. Because it sends all vdu codes to the disc, including PLOTs, DRAWs and so on, by *EXECing the file back in we can redraw any picture.

This method is fast and extremely compact and very complex pictures can be stored in only a few hundred bytes.

When Program I is run it changes to Mode 2, opens file called Picture and draws some random triangles. The total length of the demonstration file created is a mere 90 bytes. To recreate the picture on the screen type.

```
MODE 2
*EXEC Picture
```

The Electron then redraws the original picture. Now insert the following:

```
65 TIME=0:REPEAT UNTIL
TIME>=200
```

and re-run Program I. The delay loop at line 65 simulates calculation; of some complex 3D image perhaps. Once the file has been created all that has to be done is to redraw it on the screen. Type:

```
*EXEC Picture
```

and press Return. This takes very little time at all, since all of the slow calculations have already been done.

There are however, other ways of executing this since it is just an Ascii file. Programs II and III illustrate this, although we are still fixed to a limit of 31 filenames, which means a limit of 31 pictures on a disc filing system disc.

```
10 REM Program II
20 X=OPENUP "Picture"
30 REPEAT
40 VDU BGET#X
50 UNTIL EOF#X
60 CLOSE #X
```

Program II

```
10 REM Program III
20 MODE 2
30 *LOAD Picture 2C00
40 FOR N%=0 TO 91
50 VDU N%?&2C00
60 NEXT
```

Program III

So where do you go from here? The obvious solution is to store all the pictures under one filename. This is very efficient and it stops

You are inside a wooden cabin.
South you can see a road.
There is an empty stone jug here.
There is a brass key here.
There is an unlit oil lamp here.

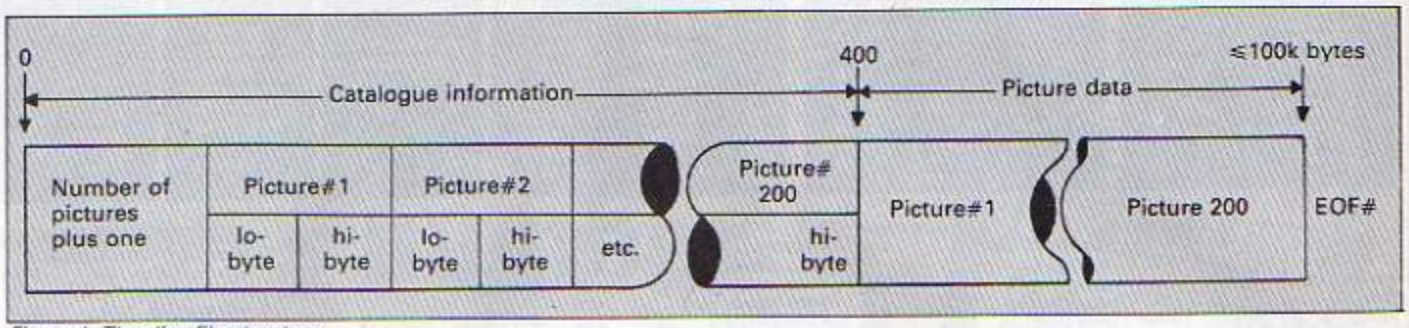


Figure I: The disc file structure

everyone peeking at your pictures. The technique is not as difficult as it might first seem.

All you have to do is create a file large enough to hold all the information.

Essentially this involves writing a very crude disc filing system in Basic. Programs IV and V do this. While most of this does not directly apply to the advanced disc filing system, it can be used since the system will work equally well on either.

```
  10 REM Program IV
  20 INPUT "Name of master
file?"master$
  30 INPUT "Length of file
in bytes?"L%
  40 X=OPENOUT master$
  50 BPUT #X,0:BPUT #X,145
:BPUT #X,1
  60 FOR N%=3 TO 400
  70 BPUT #X,0
  80 NEXT
  90 FOR N%=0 TO L% STEP 4
 100 PRINT#X,0
 110 NEXT
 120 CLOSE #X
```

Program IV

```
  10 REM Program V
  20 DIM S% 5000
  30 INPUT "Name of master
file?"master$
  40 REPEAT
  50 INPUT "Name of pictur
e to store?"filename$
  60 X=OPENUP filename$
  70 count%=EXT#X-1
  80 FOR N=0 TO count%
  90 S%?N=BGET#X
 100 NEXT
 110 CLOSE #X
 120 Y=OPENUP master$
 130 total%=BGET#X
 140 total%=total%+1
 150 PTR#X=0
 160 BPUT#X,total%
 170 PTR#X=(total%-1)*2+1
 180 PTR#X=(BGET#X+BGET#X*
256)
 190 FOR N%=0 TO count%
 200 BPUT#X,S%?N%
 210 NEXT
 220 B%=PTR#X
 230 PTR#X=total%*2+1
 240 BPUT#X,B% MOD 256
 250 BPUT#X,B% DIV 256
 260 CLOSE#0
 270 PRINT "Again?(Y/N)"
 280 UNTIL INSTR("Nn",GET$
)
```

Program V

Program IV saves space on the disc for a master file. This will be used to store graphic screens. You are first asked for the name of your master file. I suggest that you call it Pics, or something similar to keep things easy. You will then be asked how long the file is going to be in bytes – 70k should be enough for most applications.

The program creates its own separate catalogue 401 bytes long and a blank space on the disc to the size you have input.

Figure I illustrates the structure of this master file. The first byte of the file is the number of pictures stored on the disc plus one. There is space in the catalogue for 200, enough for most applications.

Following that are 400 bytes organised as 200, 2 byte pairs, low byte first, each one pointing to the start position within the file of each successive picture.

The last non zero pair always point to the end of the last concatenated file. From position 401 onwards is the data for the pictures themselves. If all that is starting to make your brain itch, don't worry, you don't have to understand how the system works to use it.

Program V, does most of the hard work. Initially you will be prompted for the name of your master file, this is the name of the file that was created by Program IV.

You will then be asked for the filename of a picture to store – the name of a picture that you have *SPOOLed to disc. Use the one you created in Program I. This will be copied and stored in the master file and you can delete the original.

```
  10 REM Program VI
  20 MODE 6
  30 INPUT "Name of master
file?"master$
  40 X=OPENUP master$
  50 REPEAT MODE 2
  60 INPUT "Picture number
?"P%
  70 total%=BGET#X
  80 IF P%>total%-1 PRINT
"Out of Range!":CLOSE#0:END
  90 PTR#X=P%*2+1
 100 start%=(BGET#X+BGET#X
*256)
 110 end%=(BGET#X+BGET#X*2
56)
 120 PTR#X=start%
 130 FOR N=start% TO end%-
1
 140 A%=BGET#X:CALL&FFE3
 150 NEXT
 160 PRINT "Again?(Y/N)";
 170 UNTIL INSTR("Nn",GET$
)
 180 CLOSE #X
```

Program VI

After putting all of your masterpieces into one file you can then use Program VI to look at them.

The surprising thing about this technique is that it works equally well for text SPOOLed from a word processor such as View or Starword. This means that you could create a separate file containing the descriptions of all of your locations and simply pluck each one from disc as it is required.

While this is inevitably slower than straightforward printing, it removes the bother of having to write an on screen formatter or pad out your text with extra spaces.

Program VII is just one example of how it is possible to create a single file containing up to 200 room descriptions from a word processor file. The program recognises the start and end of each description by the presence of the hash '#' character, therefore this must be present at the start and end of the file itself.

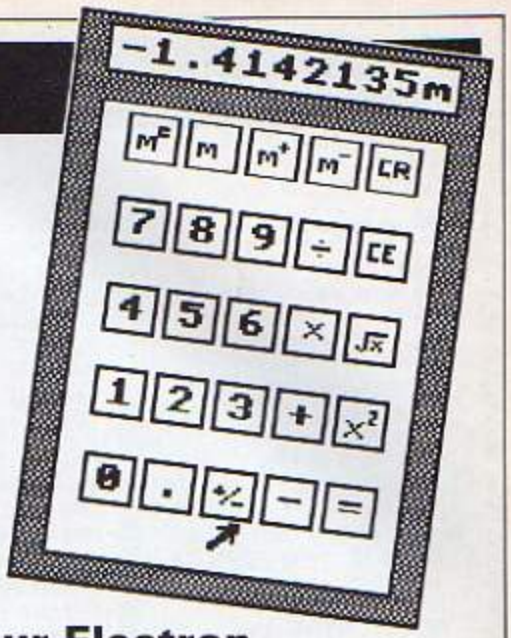
```
  10 REM Program VII
  20 DIM pointer%(200)
  21 P%=0
  30 INPUT "Name of master
file"master$
  40 INPUT "Name of descri
ption file?"filename$
  50 X=OPENUP filename$
  60 Y=OPENUP master$
  70 count%=EXT#X-1
  71 PTR#Y=401
  80 FOR N%=0 TO count%
  90 B%=BGET#X
 100 IF B%=ASC"#" pointer%
(P%)=PTR#Y:P%=P%+1 ELSE BPU
T#Y,B%
 110 IF P%>201 PRINT"Too m
any!":CLOSE#0:END
 120 NEXT
 130 CLOSE#X
 131 PTR#Y=0
 132 BPUT#Y,P%-1
 140 FOR N%=0 TO P%
 150 BPUT#Y,pointer%(N%) M
OD 256
 160 BPUT#Y,pointer%(N%) D
IV 256
 170 NEXT
 180 CLOSE#0
 190 PRINT P%-2;" descript
ions found."
```

Program VII

The advantage of both of these systems is that they use very little memory, apart from a simple load from disc to screen routine.

The rest of the program can be dedicated to the control of the game. This in the end will be the deciding factor as to whether or not the game is any good ■

It's the number cruncher!



CARL DUNKLEY turns your Electron into a pocket calculator

WHEN the crunch finally comes a micro is little more than a very smart adding machine.

It is however, so sophisticated that simple pocket calculator arithmetic can become quite difficult. That's why the following calculator program was devised.

To operate it move the pointer, using the cursor keys to the button that you want and press Return to push it.

Following in the tradition of the early portables, the display can only hold numbers in the range 1E-7<X<99999999 before an error message is generated.

Although this range is more than adequate for most normal calls, that is non-scientific calculation.

The calculator has a total of seven functions and a memory. The four main operands *, /, + and – work as normal and in correct sequence, that is 2+3*4 produces 14 and not 20.

Similarly the square and square root functions act on the number on the display not on the whole calculation.

To enter a number into the calculator's memory press the M+ button once. The letter 'm' appears at the right of the display to remind you that the memory is in use.

Each time the M+ button is pressed the number in the display will be added to the number in the memory.

The M- button works in the same way only it subtracts the number in the display from the number in the memory. The memory is cleared by pressing the Mc button and recalled by pressing M.

If you make a mistake while entering a calculation the last input can be cleared with the CE (clear entry) button.

If you press the wrong operator, for instance, plus instead of minus press the correct operator before entering anything else.

In the event of an error, for example a range error or division by zero, the screen displays the message ERROR. This can only be cleared by pressing the CR (clear all) button.

Incidentally, owners of the Plus 1 interface don't have to use the keyboard at all, since the program is fully compatible with joysticks.

VARIABLES

X%	X Position of pointer.
Y%	Y Position of pointer.
button%	True when Return pressed.

PROCEDURES

clear	Clears the display.
equal	Completes all pending operations
maths	Handles the */+-.
memory	Controls all memory fuctions.
pointer	Draws the pointer.
screen	Draws the screen.

CONTROLS

Cursor up	= Move pointer up.
Cursor down	= Move pointer down.
Cursor left	= Move pointer left.
Cursor right	= Move pointer right.
Return	= Press button.

```
  10 REM CALCULATOR
  20 REM By C.Dunkley
  30 REM (c) Electron User
  40 MODE4:PROCcharacters
  50 PROCscreen:PROCinitialis
e
  60 REPEAT:PROCmove
  70 IFbutton% PROCcontrol
  80 PROCprt
  90 UNTIL0
 100 END
 110 DEFPROCmove
 120 C=X%:D=Y%
 130 L=ADVAL(1)DIV256
 140 U=ADVAL(2)DIV256
 150 IFL=0ANDU=0 L=125:U=125
 160 K=INKEY0
 170 C=C-2*(L=0 ORK=137)+2*(L
=255 ORK=136)
 180 D=D-3*(U=0 ORK=138)+3*(U
=255 ORK=139)
 190 IFK=13 ORADVAL(0)AND3 SO
UND1,-10,2,3:button%=-1 ELSE b
utton%=0
 200 REPEAT jk%=ADVAL(0)AND3:
UNTILjk%=0
 210 IFC=X% ANDD=Y% ENDPROC
 220 IFD<15 ORD>27 ENDPROC
 230 IFC<16 ORC>25 ENDPROC
 240 PROCpointer(X%,Y%)
 250 PROCpointer(C,D)
 260 X%=C:Y%=D
 270 ENDPROC
 280 DEFPROCcontrol
 290 X=X%DIV2-7:Y=10-Y%DIV3
 300 IFY=5 ANDX<5 PROCmemory:
ENDPROC
 310 IF(Y=4 ANDX<4) OR(Y=3 AN
DX<4)OR(Y=2 ANDX<4) OR(Y=1 AND
X=1) PROCnumber:ENDPROC
 320 IF(Y=5 ANDX=5) OR(Y=4 AN
DX=5) PROCclear:ENDPROC
 330 PROCfunction
 340 ENDPROC
 350 DEFPROCclear
 360 IFY=5 ANDX=5 calc$=""
 370 scrn$="":neg%=0:dot%=0
 380 last_key%=0:PROCprt
 390 ENDPROC
 400 DEFPROCnumber
 410 last_key%=0:L=LENscrn$
 420 IFdot% L=L-1
 430 IFneg% L=L-1
 440 IFL>=8 ENDPROC
 450 chr$=CHR$(X-((Y=1)*47+(Y
=2)*48+(Y=3)*51+(Y=4)*54))
 460 IFscrn$="0" ANDchr$="0"
ENDPROC
 470 IFscrn$="-0" ANDchr$="0"
 ENDPROC
 480 IFscrn$="-0"ORscrn$="0"s
crn$=""
 490 scrn$=scrn$+chr$:PROCprt
 500 ENDPROC
 510 DEFPROCmemory
 520 last_key%=0
 530 IFX=1 memory$="":memneg%
=0:memdot%=0:PROCprt:ENDPROC
 540 IFX=2 scrn$=memory$:PROC
prt:neg%=memneg%:dot%=memdot%:
ENDPROC
 550 IFX=3 dummy$=STR$(VALmem
ory$+VALscrn$)
 560 IFX=4 dummy$=STR$(VALmem
ory$-VALscrn$)
 570 PROCcheck(dummy$)
 580 IFe% PROCerror:ENDPROC
 590 memneg%=n%:memdot%=d%
 600 memory$=dummy$:PROCprt
 610 PROCcheck2
 620 ENDPROC
 630 DEFPROCfunction
 640 IFX=2 ANDY=1 PROCdot:END
PROC
 650 IFX=3 ANDY=1 PROCneg:END
PROC
 660 IFX=5 ANDY=1 PROCequal:E
```

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Calculator listing

◀ From Page 29

```
NDPROC
  670 IFX=5 ANDY=2 PROCsqr:END
PROC
  680 IFX=5 ANDY=3 PROCroot:EN
DPROC
  690 PROCmaths
  700 ENDPROC
  710 DEFPROCdot
  720 IFdot% ENDPROC
  730 dot%=-1:last_key%=0
  740 IFscrn$="scrn$="0.":PRO
Cprt:ENDPROC
  750 scrn$=scrn$+".":PROCprt
  760 ENDPROC
  770 DEFPROCneg
  780 last_key%=0
  790 IFneg% neg%=0:scrn$=RIGH
T$(scrn$,LENscrn$-1):PROCprt:E
NDPROC
  800 IFscrn$="scrn$="-0" ELS
Escrn$="-"+scrn$
  810 neg%=-1:PROCprt
  820 neg=-1:PROCcheck2:neg=0
  830 ENDPROC
  840 DEFPROCsqr
  850 last_key%=0
  860 dummy$=STR$((VALscrn$)^2
)
  870 PROCcheck(dummy$)
  880 IFe% PROCerror:ENDPROC
  890 scrn$=dummy$
  900 neg%=n%:dot%=d%
  910 PROCprt:PROCcheck2
  920 ENDPROC
  930 DEFPROCroot
  940 IFneg% PROCerror:ENDPROC
  950 last_key%=0
  960 dummy$=STR$(SQR(VALscrn$
))
  970 PROCcheck(dummy$)
  980 IFe% PROCerror:ENDPROC
  990 scrn$=dummy$
 1000 neg%=n%:dot%=d%
 1010 PROCprt:PROCcheck2
 1020 ENDPROC
 1030 DEFPROCequal
 1040 last_key%=0
 1050 IFscrn$="scrn$="0"
 1060 a$=LEFT$(calc$,1)
 1070 IFa$="+"ORa$="/"calc$="0
"+calc$
 1080 IFRIGHT$(calc$,1)="/"AND
 ABS(VALscrn$)=0 PROCerror:END
PROC
 1090 calc$=calc$+scrn$:e%=0
 1100 FORN=1TOLENcalc$
 1110 IFMID$(calc$,N,1)="/" PR
OCdivision(N+1)
 1120 NEXT
 1130 IFe% PROCerror:ENDPROC
 1140 dummy$=STR$(EVAL(calc$))
 1150 PROCcheck(dummy$)
 1160 calc$=""
 1170 IFe% PROCerror:ENDPROC
 1180 scrn$=dummy$
 1190 neg%=n%:dot%=d%
 1200 PROCprt
 1210 PROCcheck2
 1220 ENDPROC
 1230 DEFPROCdivision(count)
 1240 a$=""
 1250 IFMID$(calc$,count,1)="-
" a$="-":count=count+1
 1260 REPEAT
 1270 b$=MID$(calc$,count,1)
 1280 IFINSTR("/*+-",b$)=0 a$=
a$+b$:count=count+1
 1290 UNTILINSTR("/*+-",b$)<>0
 ORcount=LENcalc$
 1300 IFABS VALa$=0 e%=-1
 1310 ENDPROC
 1320 DEFPROCcheck2
 1330 REPEAT:PROCmove
 1340 Y=10-Y%DIV3:X=X%DIV2-7
 1350 IF(Y=5 ANDX<5) ANDbutton
% button%=0:PROCmemory
 1360 IFY=1 ANDX=3 ANDbutton%
button%=0:PROCneg
 1370 UNTILbutton%
 1380 IFY=1 ANDX=2 AND neg PRO
Cdot:ENDPROC
 1390 IFY=1 ANDX=2 scrn$="0.":
dot%=-1:neg%=0:last_key%=0:PRO
Cprt:ENDPROC
 1400 IFY=4 ANDX<4 ORY=3 ANDX<
4 ORY=2 ANDX<4 ORY=1 ANDX=1 sc
rn$="":dot%=0:neg%=0:last_key%
=0:PROCnumber:ENDPROC
 1410 PROCfunction
 1420 ENDPROC
 1430 DEFPROCmaths
 1440 IFlast_key% PROCtrue:END
PROC
 1450 calc$=calc$+scrn$
 1460 PROCoperation
 1470 last_key%=-1
 1480 neg%=0:dot%=0
```

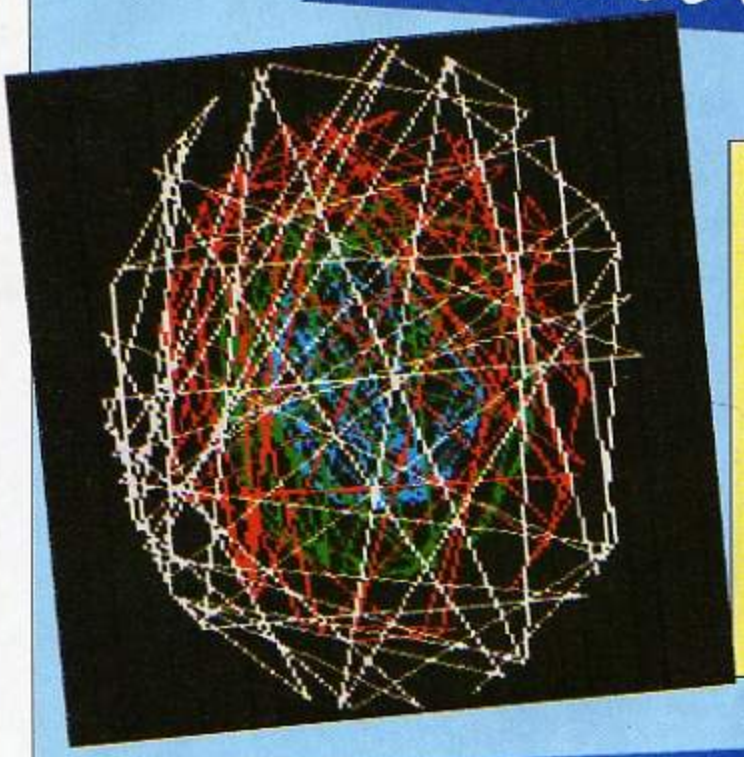


```
 1490 PROCprt:PROCcheck2
 1500 ENDPROC
 1510 DEFPROCtrue
 1520 calc$=LEFT$(calc$,LENcal
c$-1)
 1530 PROCoperation
 1540 ENDPROC
 1550 DEFPROCoperation
 1560 IFY=4 calc$=calc$+"/"
 1570 IFY=3 calc$=calc$+"*"
 1580 IFY=2 calc$=calc$+"+"
 1590 IFY=1 calc$=calc$+"-"
 1600 ENDPROC
 1610 DEFPROCcheck(D$)
 1620 n%=0:d%=0:e%=0
 1630 IFD$="0"ORD$="" ENDPROC
 1640 IFABS(VALD$)>99999999 OR
ABS(VALD$)<1E-7 e%=-1:ENDPROC
 1650 count=1:num=1:dummy$=""
 1660 REPEAT
 1670 a$=MID$(D$,count,1)
 1680 count=count+1
 1690 dummy$=dummy$+a$
 1700 IFa$<>"-"ANDa$<>"." num=
num+1
 1710 UNTILnum=9
 1720 i=INSTR(D$,"E")
 1730 IFi<>0 ANDINSTR(dummy$,"
E")=0 dummy$=dummy$+RIGHT$(D$,
i)
 1740 D$=dummy$:IFi<>0 PROCexp
 1750 IFLEFT$(D$,1)="-"n%=-1
 1760 IFINSTR(D$,".")<>0d%=-1
 1770 count=1:num=0:dummy$=""
 1780 REPEAT
 1790 a$=MID$(D$,count,1)
 1800 count=count+1
 1810 IFa$<>"-"ANDa$<>"."ANDa$
<>"" num=num+1
 1820 dummy$=dummy$+a$
 1830 UNTILnum=8 ORa$=""
 1840 count=LENdummy$
 1850 IFNOTd% ENDPROC
 1860 REPEAT
 1870 a$=MID$(D$,count,1)
 1880 IFa$="0"count=count-1
 1890 UNTILa$<>"0"
 1900 dummy$=LEFT$(dummy$,coun
t)
 1910 ENDPROC
 1920 DEFPROCexp
 1930 n$=""
 1940 zero=VAL MID$(D$,LEND$,1
)
 1950 IFLEFT$(D$,1)="-" n$="-"
:D$=RIGHT$(D$,LEND$-1)
 1960 D$=LEFT$(D$,LEND$-3)
 1970 D$=RIGHT$("0000000",zero
)+D$
 1980 d=INSTR(D$,".")
 1990 IFd=0D$=D$+".":d=LEND$
 2000 D$=LEFT$(D$,d-1)+MID$(D$
,d+1,LEND$)
 2010 d=d-zero-1
 2020 D$=n$+LEFT$(D$,d)+"."+MI
D$(D$,d+1,LEND$)
 2030 ENDPROC
 2040 DEFPROCerror
 2050 PRINTTAB(15,10);SPC(5);"
ERROR"
 2060 REPEAT:REPEAT:PROCmove
 2070 UNTILbutton%
 2080 X=X%DIV2-7:Y=10-Y%DIV3
 2090 UNTILX=5ANDY=5
 2100 dot%=0:scrn$="":calc$=""
:neg%=0:last_key%=0
 2110 ENDPROC
 2120 DEFPROCprt
 2130 IFABSVALmemory$=0 memory
$=""
 2140 IFmemory$<>"PRINTTAB(25
,10);"m" ELSEPRINTTAB(25,10);"
 2150 PRINTTAB(15,10);
 2160 IFscrn$=""PRINTSPC(9)"0"
:ENDPROC
 2170 PRINTSPC(10-LENscrn$)scr
n$
 2180 ENDPROC
 2190 DEFPROCpointer(A,B)
 2200 GCOL3,1
 2210 MOVEA+32,(32-B)*32+12
 2220 VDU5,236,4
 2230 ENDPROC
 2240 DEFPROCinitialise
 2250 X%=16:Y%=27
 2260 PROCpointer(X%,Y%)
 2270 memory$="":scrn$="":calc
$="":neg%=0:last_key%=0:dot%=0
:memneg%=0:memdot%=0:neg=0
 2280 ENDPROC
 2290 DEFPROCcharacters
 2300 *fx4 1
 2310 *fx11
 2320 VDU23;8202;0;0;0;
 2330 VDU23,224,0,&22,&14,8,&1
4,&22,0;
 2340 VDU23,225,0;16,0,&7C,0,1
6,0
 2350 VDU23,226,0;&42,&E4,&48,
16,&27,0
 2360 VDU23,227,0;&3F,&20,&2A,
&24,&AA,&40
 2370 VDU23,228,3,1,2,&8B,&50,
&20,&50,&88
 2380 VDU23,229,0,&EE,&88,&8C,
&88,&EE,0;
 2390 VDU23,230,0,&EE,&89,&8F,
&8A,&E9,0;
 2400 VDU23,231,7,4,7,&D8,&A8,
&A8,&88,0
 2410 VDU23,232,0,0;&D8,&A8,&A
8,&88,0
 2420 VDU23,233,0,7,0,&D8,&A8,
&A8,&88,0
 2430 VDU23,234,2,7,2,&D8,&A8,
&A8,&88,0
 2440 VDU23,235,0,255,0,0,255,
0,0,255
 2450 VDU23,236,7,63,15,30,58,
114,224,192
 2460 ENDPROC
 2470 DEFPROCscreen
 2480 ?&358=85:CLS:?&358=0
 2490 COLOUR129:COLOUR0
 2500 VDU24,28;28;1252;1000;
 2510 CLG:MOVE32,998:DRAW1246,
998:VDU28,1,30,38,1:CLS
 2520 PRINT;STRING$(9,CHR$235)
;"Electron  Calculator";STRING
$(9,CHR$235);
 2530 VDU26:GCOL0,0:GCOL0,129
 2540 FORY%=1TO5:FORX%=1TO5
 2550 READchr
 2560 A%=13+X%*2:B%=10+Y%*3
 2570 PROCwindow(A%,B%,1)
 2580 PRINTTAB(A%+1,B%)CHR$chr
 2590 NEXT:NEXT
 2600 PROCwindow(14,10,11)
 2610 PROCsquare(13,28,13,20)
 2620 PROCsquare(14,27,11,16)
 2630 PROCfill(452,500,170,-1)
 2640 PROCfill(852,574,170,-1)
 2650 PROCfill(852,470,170,-1)
 2660 PROCfill(852,684,170,-1)
 2670 ENDPROC
 2680 DEFPROCwindow(A,B,L)
 2690 A=A*32+32:B=(31-B)*32
 2700 MOVEA-10,B-10:DRAWA+L*32
+10,B-10:DRAWA+L*32+10,B+42:DR
AWA-10,B+42:DRAWA-10,B-10
 2710 DRAWA+L*32+10,B-10
 2720 DRAWA+L*32+10,B+42
 2730 DRAWA-10,B+42
 2740 DRAWA-10,B-10
 2750 ENDPROC
 2760 DEFPROCsquare(A,B,L,D)
 2770 A=A*32+32:B=(31-B)*32
 2780 MOVEA-10,B-10
 2790 DRAWA+L*32+4,B-10
 2800 DRAWA+L*32+4,B-10+D*32
 2810 DRAWA-10,B-10+D*32
 2820 DRAWA-10,B-10
 2830 ENDPROC
 2840 DEFPROCfill(A,B,G,E)
 2850 FORL%=-4TO4STEP8
 2860 B%=B:?&359=G:REPEAT
 2870 PLOT77,A,B%:B%=B%+L%
 2880 IFE ?&359=?&359 EOR255
 2890 UNTILPOINT(A,B%)=0
 2900 NEXT:?&359=0
 2910 ENDPROC
 2920 DATA231,232,234,233,230
 2930 DATA55,56,57,225,229
 2940 DATA52,53,54,224,227
 2950 DATA49,50,51,43,228
 2960 DATA48,46,226,45,61
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

10 LINERS

Woolball

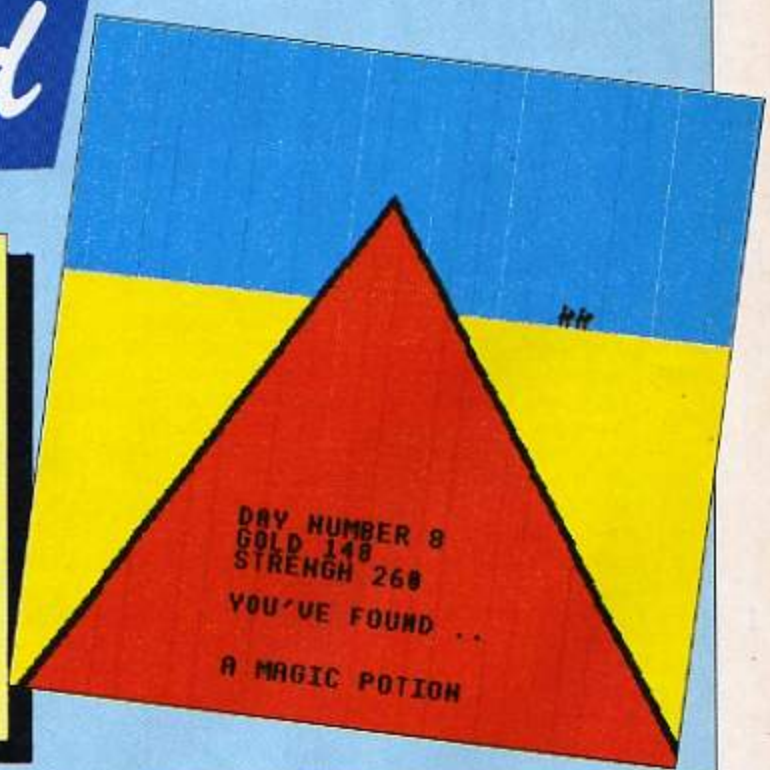


THIS month's 10 liner, written by 10-year-old Joe Hardwicke, is a tie-in to our knitting software offer. This unusual but clever little graphics routine plots lines randomly between the points of a circle and ends up with a criss cross pattern that's not dissimilar to a ball of wool.

Three balls are drawn, each on top of the last, ending with a pattern like a ball of wool after the cat has finished playing with it. To make the balls more or less dense alter the FOR variable in line 6.

```
  1 MODE 2
  2 FORR=200TO500 STEP100
  3 GCOL0,RND(7)
  4 A=50
  5 MOVE 640+R*SIN(A),512
+R*COS(A)
  6 FORJ=1TO50
  7 A=A+RND(50)
  8 DRAW 640+R*SIN(A),512
+R*COS(A)
  9 SOUND1,-15,J*5,1
  10 NEXT:NEXT:INPUTA$:GOT
01
```

Pyramid



IT isn't often that *Electron User* publishes adventure games, but this 10 liner by Gary White is so addictive that we felt we had to. The object is to survive as long as possible in the uncharted wilderness of desert around the pyramid.

On your travels you may find gold, magic potions or meet with one of the many guards that patrol the pyramid.

Potions increase your strength and gold increases your wealth. To pick up objects or carry on just press the space bar.

On meeting a guard you are automatically challenged to fight or bribe him. Press F to fight or B to bribe. If you intend to bribe a guard you must have enough gold to do so. If not the guard replies NOT ENOUGH and you will have to fight him. Fighting reduces your strength, but provided you are strong enough you'll win in the end.

The longest we have lasted is 33 days. Can you do better?

```
  1 MODE1:VDU19,3,6;0;:C
OLOUR131:CLS:COLOUR0:VDU23,
225,48,36,39,126,252,72,72,
72:PRINTTAB(29,11);CHR$225;
CHR$225
  2 VDU28,0,31,39,12:COL
OUR130:CLS:GCOL0,0:MOVE0,0:
MOVE1279,0:PLOT85,600,800:G
COL0,1:MOVE20,0:MOVE1259,0:
PLOT85,600,780:VDU28,12,30,
26,22:COLOUR0:COLOUR129:S=5
00:T=0:TU=1
  3 PRINT"DAY NUMBER ";T
U:PRINT"GOLD ";T:PRINT"STRE
NGH ";S:IF S<=0 THEN GOTO 1
0 ELSE PRINT"YOU'VE FOUND
..":X=INT(RND(75)):H=RND(3)
  4 GOSUB H+5
  5 S=S-10:CLS:TU=TU+1:G
OTO 3
  6 INPUT"A GUARD F or B
";I$:IF I$<>"F" AND I$<>"B"
 OR I$="B" AND T<X THEN PRI
NT"NOT ENOUGH":GOTO 6 ELSE
IF I$="F" THEN S=S-X:CLS:RE
TURN ELSE IF I$="B" THEN T=
T-X:CLS:RETURN
  7 PRINT"A MAGIC POTIO
N":S=S+X:GOSUB 9:RETURN
  8 PRINT":X;" oz. OF GO
LD":T=T+X:GOSUB 9:RETURN
  9 REPEAT UNTIL GET$="
":RETURN
  10 CLS:PRINT"YOU'RE DEA
D BUT YOU LASTED ";TU;" DAY
S AND FOUND ";T;" OUNCES OF
 GOLD":END
```

DEMONIC DATABASES

Part I of a new series by Bill Trevelyan showing how to write text adventures

PROGRAMMING is a means to an end, but if you like puzzle solving it becomes an absorbing pastime.

When I first thought of writing an adventure for my grandson, I decided to test my Basic and machine code programming skills, rather than rely on a commercial adventure writer, good as they may be.

How often have you sat facing a screen on which appears something like the following:

```
You are in a dank,
mouldering cellar lit by
a guttering candle. On the
peeling plaster of one wall
an uncertain hand has
traced the words, 'Susie
5873'. The door is half
open, but across the gap
lies a cheetah, asleep. It
looks suspiciously well
fed.
```

This immortal piece of prose is a location or room description. In a text only adventure game there may be a hundred or more words forming what is essentially the landscape.

Pictures are not necessary and some would say that the best adventures have vivid text descriptions that send shivers down your spine.

An adventure game is essentially just a very smart database. Location descriptions and other responses are plucked from the computer's memory and displayed in response to a command entered at the keyboard by the player, and in accordance with a selection of rules devised by the programmer.

This part of the program is analogous to a language such as Basic, and may be called the interpreter, command parser or operating system.

The player causes a location description to be replaced by another by entering a command such as NORTH or DOWN, which he interprets as moving from one place to another.

When he arrives at the final scene he is told he has saved civilisation, or scored 500 points, or whatever.

The fascination of the game depends largely on how well the descriptions are written.

There are also other pieces of text usually much shorter which we shall simply call messages. For instance:

```
You can't do that!

The sword shatters in your
hand leaving you grasping
the hilt.

The book is closed with a
gilt lock.
```

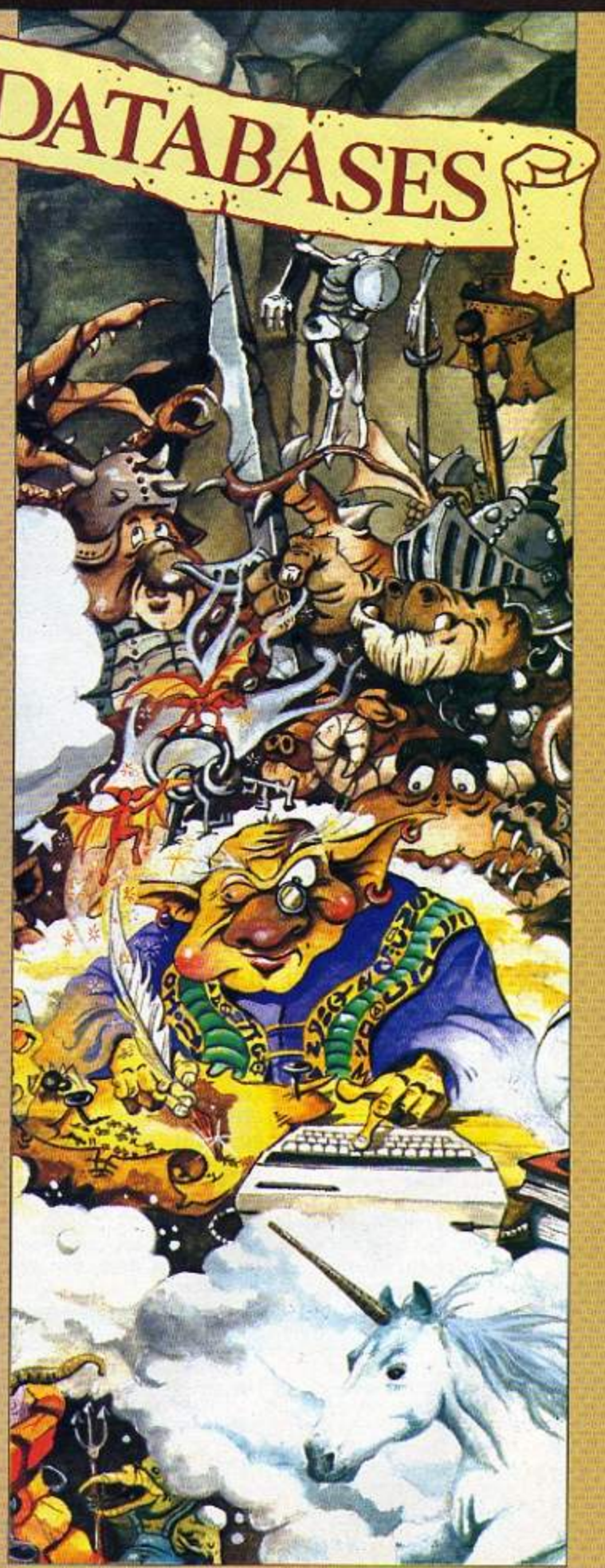
When you are composing a game, how do you store all this text, and how do you call forth the appropriate piece to be displayed on the screen?

I'm not going to try to tell you what to write and assume you are programming in Basic. Even if you settle later for machine code, it's easier if you have sorted out the problems in Basic first.

The simplest way is to write the location descriptions and messages in the form of data statements.

It is better to make them into two separate lists, since the serial number identifying a piece of text can be kept below 255.

That's the largest number which can be stored in a single byte, a convenience appreciated in machine



code programming.

Conversely, if the line numbers of the data statements can be calculated from the number of the location description or message, a simple procedure for printing the required piece of text is sufficient. This technique is shown in Program I:

```
  10 REM Program I
  20 INPUT""Enter locatio
n number: "number%
  30 IF number%<1 OR number
%>5 THEN VDU7:GOTO 20
  40 TIME=0
  50 PROCloc(number%)
  60 PRINT""Time taken wa
s ";TIME;" csec"
  70 END
  80 DEFPROCloc(n%)
  90 RESTORE (5000+n%)
 100 READ loc$
 110 PRINT loc$
 120 ENDPROC
 130 END
5000 REM Location Descripti
ons
5001 DATA "You are in an oc
tagonal room bathed in  a sh
adow-free radiance by concea
led     lighting. Masterpiec
es of modern art    line the
 walls. Archways lead off to
 E  and W. N is a close-fitt
ing door. An    ornate chair
 is nearby."
5002 DATA "You are walking
along a white, dusty    road
 which runs north to south"
5003 DATA "The road bends e
ast here. West is a     gate
 leading to a tangled wood."
5004 DATA "The road widens
and the marks of        trac
ked vehicles can be seen on
the     verges."
5005 DATA "You push through
 some entangling holly  bush
es to find a large clearing
in      which stands a low b
uilding."
```

Program I

Note that in the final version anything going into the interpreter would be shortened by eliminating non-essential spaces and replacing long variable names with single letters.

Look at the text of location one in line 5001. You will see that extra spaces have been inserted to improve the screen display so that words are not sliced in half.

The description contains 223 characters and the whole data statement consumes 241 bytes. You can't expand the text to more than about 235 characters without hearing the bleep which tells you the keyboard buffer is full.

This text is conveyed to the screen in a mere 0.2 sec.

In a tape-based (as opposed to disc-based) game which is loaded in its entirety into the computer before it is run, there is not much more than 20k available for a Basic program.

The memory available for text can be expanded by defining a text window in Mode 4 or 6 which restricts the size of the screen, and borrowing the released memory.

This device is used in Rick Hanson, though it makes for a rather unattractive display.

This means that no more than about 10k is available to hold location descriptions, equivalent to say 40 of full length.

So what of games which boast of more than 200 locations?

Machine code, even with text compression techniques, can't work miracles and the explanation is simply repetition, the same description being used for several different locations.

Again Rick Hanson is an example.

In order to print the description in Program I, the text has to be read into a string variable, *loc$*, occupying 241 bytes, though the same space is used for all the other locations.

This means there is a waste of about five bytes per location over the whole game. The memory needed to store the printout procedure musn't be forgotten, either.

One way of avoiding this duplication, paradoxically, is to read the data statements into a subscripted array.

This is saved as a data file, as shown in Program II. The entire database can be treated in this way.

When the game is run, the interpreter is first CHAINed, and immediately loads in the data file as in Program III:

```
  10 REM Program II
  20 LOC=5
  30 DIM loc$(LOC)
  40 RESTORE 5001
  50 FOR I%=1 TO LOC:READ
loc$(I%):NEXT
  60 CLS:INPUT""SAVE fil
e (Y/N)?"ans$
  70 IF ans$<>"Y" AND ans$
<>"y" THEN END
  80 PRINT""Recording Da
ta""
  90 X=OPENOUT "DATA"
 100 FOR I%=1 TO LOC:PRINT
#X, loc$(I%):NEXT
 110 CLOSE #X
 120 END
 130 REM Location Descript
ions
 180 DATA "You push throug
h some entangling holly  bu
shes to find a large cleari
ng in      which stands a l
ow building."
5001 DATA "You are in an o
ctagonal room bathed in  a
shadow-free radiance by con
cealed     lighting. Master
pieces of modern art    lin
e the walls. Archways lead
off to E  and W. N is a clo
se-fitting door. An    orna
te chair is nearby."
5002 DATA "You are walking
 along a white, dusty    ro
ad which runs north to sout
h"
5003 DATA "The road bends
east here. West is a     ga
te leading to a tangled woo
d."
5004 DATA "The road widens
 and the marks of        tr
acked vehicles can be seen
on the     verges."
5005 DATA "You push throug
h some entangling holly  bu
shes to find a large cleari
ng in      which stands a l
ow building."
```

Program II

```
  10 REM Program III
  20 LOC=5
  30 DIM loc$(LOC)
  40 PRINT""Loading Data
..."
  50 X= "DATA"
  60 FOR I%=1 TO LOC:INPUT
#X, loc$(I%):NEXT
  70 CLOSE #X
  80 INPUT""Enter locati
on number: "number%
  90 IF number%<1 OR numbe
r%>5 THEN VDU7:GOTO 80
 100 TIME=0
 110 CLS:PROCloc(number%)
 120 PRINT""Time taken w
as ";TIME;" csec"
 130 GOTO 80
 140 DEFPROCloc(n%)
 150 PRINT TAB(0,10);loc$(
n%)
 160 ENDPROC
```

Program III

The database is then in a form which makes it easy to manipulate. To print out location description one, for instance needs only:

```
PRINT loc$(1)
```

This is still extravagant in its use of memory. The five strings in Program II total 559 characters and the data statements require 606 bytes of memory.

The array loaded from the file takes up 651 bytes, as shown by the increase in the value of the quantity !&2 AND &FFFF, which gives the address of the first vacant byte above a Basic program.

The method is also exasperating while a game is being developed, since any editing of the program means that the data file has to be re-loaded, a time- consuming business with tape.

Probably the best method overall is to abandon Basic and store text directly in memory at addresses determined by the programmer.

This is a step towards machine code programming which can be made from within a Basic program using indirection operators.

```
$&2000="dog"
```

will place the string "dog" at addresses &2000 to &2002 with a terminating carriage return byte &0D at location &2003 after the string. The address of the next free location is given by:

```
address=start+length+1
```

(But be warned: Indiscriminate poking – use of indirection operators – can seriously damage your Basic programs.)

This makes it relatively easy to store a series of strings compactly at any desired part of the memory free for use by the programmer, not currently in use by Basic or the screen.

Any string is printed on the screen by the command:

```
PRINT $address
```

where *address* is the loca-

Turn to Page 34 ►

```
  10 REM Program IV
  20 :
  30 CLS
  40 INPUT"List  to start
 from: &"list$
  50 list%=EVAL("&"+list$)
  60 FOR I%=0 TO &FF:I%?li
st%=0:NEXT
  70 INPUT"Text  to start
 from: &"text$
  80 text%=EVAL("&"+text$)
  90 INPUT"Number of last
 item:  "count%
 100 RESTORE 5000
 110 REPEAT:READ number%,s
tring$
 120 pointer%=list%+2*numb
er%
 130 ?pointer%=text% MOD 2
56
 140 ?(pointer%+1)=text% D
IV 256
 150 PROCcaption
 160 $text%=string$
 170 PROCprint
 180 text%=text%+LEN($text
%)+1
 190 PRINT"Press SPACE to
 continue"
 200 REPEAT:G%=GET:UNTIL G
%=32
 210 UNTIL number%=count%
 220 PRINT"Next item is a
t address &";~text%
 230 PRINT"*** Any REPEA
TS (Y/N)?"
 240 IF INSTR("Yy",GET$) T
HEN PROCrepeat
 250 END
 260 :
 270 DEFPROCcaption
 280 L%=LEN(STR$(number%))
 290 CLS
 300 PRINT"Item no.";num
ber%;" starts at &";~text%
 310 PRINT STRING$(24+L%,"
=")"
 320 ENDPROC
 330 :
 340 DEFPROCprint
 350 PRINT"STRING$(38,"_"
)
 360 PRINT
 370 FOR I%=1 TO LEN($text
%)
 380 char$=MID$($text%,I%,
1)
 390 IF char$="=" PRINT EL
SE PRINT char$;
 400 NEXT I%
 410 PRINT"STRING$(38,"_"
)
 420 PRINT
 430 ENDPROC
 440 :
 450 DEF PROCrepeat
 460 CLS
 470 INPUT""Index number
 of item to be copied: "mas
ter%
 480 PRINT"STRING$(38,"_")
 490 PRINT"*** Enter 0 to
 end"
 500 REPEAT
 510 PRINT
 520 INPUT"Index number of
 copy: "copy%
 530 IF copy%=0 THEN 560
 540 I%=list%+2*copy%:J%=l
ist%+2*master%
 550 ?I%=?J%:?(I%+1)=?(J%+
1)
 560 UNTIL copy%=0
 570 PRINT"STRING$(38,"_")
 580 ENDPROC
 590 :
 600 REM Text
5000 DATA 0,Text 0
5010 DATA 1,Text 1
5020 DATA 8,Text 8
```

Program IV

```
  10 REM Program V
  20 :
  30 CLS
  40 INPUT"List  to start
 from: &"list$
  50 list%=EVAL("&"+list$)
  60 FOR I%=0 TO &FF:I%?li
st%=0:NEXT
  70 INPUT"Text  to start
 from: &"text$
  80 text%=EVAL("&"+text$)
  90 REPEAT:CLS:INPUT""E
nter Index Number (500 to Q
UIT): "number%
  95 IF number%=500 THEN 2
10
 100 PRINT""Enter text:-
"
 110 INPUT LINE string$
 120 pointer%=list%+2*numb
er%
 130 ?pointer%=text% MOD 2
56
 140 ?(pointer%+1)=text% D
IV 256
 150 PROCcaption
 160 $text%=string$
 170 PROCprint
 180 text%=text%+LEN($text
%)+1
 190 PRINT"Press SPACE to
 continue"
 200 REPEAT:G%=GET:UNTIL G
%=32
 210 UNTIL number%=500
 220 PRINT"Next item is a
t address &";~text%
 230 PRINT"*** Any REPEA
TS (Y/N)?"
 240 IF INSTR("Yy",GET$) T
HEN PROCrepeat
 250 END
 260 :
 270 DEFPROCcaption
 280 L%=LEN(STR$(number%))
 290 CLS
 300 PRINT"Item no.";num
ber%;" starts at &";~text%
 310 PRINT STRING$(24+L%,"
=")"
 320 ENDPROC
 330 :
 340 DEFPROCprint
 350 PRINT"STRING$(38,"_"
)
 360 PRINT
 370 FOR I%=1 TO LEN($text
%)
 380 char$=MID$($text%,I%,
1)
 390 IF char$="=" PRINT EL
SE PRINT char$;
 400 NEXT I%
 410 PRINT"STRING$(38,"_"
)
 420 PRINT
 430 ENDPROC
 440 :
 450 DEF PROCrepeat
 460 CLS
 470 INPUT""Index number
 of item to be copied: "mas
ter%
 480 PRINT"STRING$(38,"_")
 490 PRINT"*** Enter 0 to
 end"
 500 REPEAT
 510 PRINT
 520 INPUT"Index number of
 copy: "copy%
 530 IF copy%=0 THEN 560
 540 I%=list%+2*copy%:J%=l
ist%+2*master%
 550 ?I%=?J%:?(I%+1)=?(J%+
1)
 560 UNTIL copy%=0
 570 PRINT"STRING$(38,"_")
 580 ENDPROC
```

Program V

◀ *From Page 33*

tion at which the string starts. Printing stops when the terminator &0D is reached.

In order to print the required string the addresses of the start byte of all the strings in the sequence must be stored in a table or list.

The location of the addresses is found by calculation from an index number allotted to each string.

Program IV allows location descriptions or messages to be entered as DATA statements and then transferred to storage in the region of the memory assigned to the database.

The data statements serve as a record which can easily be edited in the future.

Alternatively, as shown in Program V, the text can be entered at the keyboard, in which case the address list and text sequence should be recorded on tape or disc with:

```
*SAVE <filename> AAAA ZZZZ
```

where *AAAA* is the start address in hex and *ZZZZ* is the address of the first free byte after the code.

The database might run, for example, from &2800 to &6000 in Mode 6, with messages at &3000-&3FFF, location descriptions at &4000-&6000, and address lists at &2900-&2AFF and at &2B00-&2BFF.

Another good feature is that duplication of location descriptions is particularly simple.

All that is required is to insert the same address at the required number of places in the address list. You can see this in Programs IV and V.

For each text string, one byte is wasted as the terminator carriage return and another two for the entry in the address list, a small overhead compared with Basic's string handling.

The procedure to print out the text stored in the database is short, though it is simplest to have two such procedures, one for short messages and one for location descriptions (which have separate address lists).

Program VI contains a procedure for printing location descriptions. A few bytes are saved by printing "You are" from the procedure rather than having it at the beginning of each string.

```
  10 REM Program VI
  30 INPUT "Enter index nu
mber: "number%
  40 PROCloc(number%)
  50 END
  60 :
  70 DEFPROCloc(n%)
  80 list%=&3100 :REM or a
ny other convenient address
  90 address=!(list%+2*n%)
 AND &FFFF
 100 TIME=0
 110 PRINT"You are ";$add
ress
 120 PRINT""Time taken w
as ";TIME;" csec"
 130 ENDPROC
```

Program VI

A full length description is printed in 0.2 sec which is quite fast enough.

● *Next month we will see that some improvements can be made to this method of storing text, at the cost of more elaborate procedures for storing and recalling it from the database.*

COMPUTING IN ACTION

Check up on the taxman

BARRY WOOD's program takes the guesswork out of tax returns

TAX Calculator is a short utility enabling you to check your tax liability.

The program asks you to input certain information before the calculation.

It needs to know what your tax code is, which tax period your next pay day will be in, how much you've earned, how much tax you've paid on those earnings and how much you expect your next pay to be before any deductions.

Your tax code, issued by the local tax office, is in the form 233L. The actual number can be almost anything but 233 is normal for single people or married women and 369 for married men or others who are claiming a married man's allowance (for instance a single parent).

The letter following the number is usually L, H or T. None of these letters affects the way in which tax is calculated. Certain other letters, however, may affect the calculation and are outside the scope of this program.

National Insurance calculations in the program are based on a person who pays NI contributions under weekly Table A.

This will cover all working men and single women who are not classed as self-employed, any working married women who are not entitled to be on B rate and is not self-employed, and in all cases, not contracted out of the state pension scheme and under the current legal retirement age.

The way that this program calculates your income tax is to start with your tax code. A code of 233 means that you may earn up,to £2335 a year before you need to pay any tax. This is just under £45 a week. A married man with a tax code of 369 can earn £3695 a year or just under £72 a week, without incurring tax liability.

The amount of tax-free pay which you are entitled to for week *X* is calculated and this figure is deducted from from the total wages earned for the current tax year, up to and including the week in which you will receive the amount entered in the input routine.

If your total taxable earning in any one tax year is less than £17,100, you will be taxed at the rate of 27 per cent.

If you exceed that figure, you will have to pay tax at 40 per cent on all taxable pay earned between £17,100 and £20,100. The rate then increases to 45 per cent for the next £3,000 spread. There are other bands up to 65 per cent and the program caters for these.

National Insurance is calculated differently. In this case there is a base line and a ceiling. Any earnings below the line, currently at £39, attract no contributions up to the maximum amount payable of £25.80 a week irrespective of the amount earned.

For all points in between, the amount due depends on the gross pay for that week. From the base line to £70 the figure is 5 per cent and from £70.01 to the ceiling is paid at 9 per cent.

Unlike income tax calculations, amounts earned during the year have no effect. If you earn £20 one week and £100 the next, you will pay no NI contribution for the first week and £9 for the second.

Once the tax and NI has been calculated your nett pay is found by subtracting these two amounts from your gross pay.

The bar chart shown in Figure I is drawn in Mode 1 and the figures – Tax, NI due, and Nett are shown both as money and as a percentage of your total earning that week.

If you have entered the information incorrectly or you are due a rebate the bars may exceed the limit of the screen. This should not be a problem and will leave you secure in the knowledge that you are due a nice fat tax rebate.

Full listing starts on Page 36

VARIABLES

@%	Set to &20205 to format for monetary output.
nett	The money you are left with after deductions.
ni-due	How much NI you have to pay.
pay	Your total earnings to date.
pay-due	What you expect to be paid that week.
taxcode	Your tax code.
tax-to-date	Total amount of tax you have paid that year.
week	Number of the current tax week.

PROCEDURES

enter	Get information from user.
calc-tax-rate	Calculates the rate of tax payable.
calc-ni-frac	Calculate the amount of NI to pay.
calc-graph	Work out lengths of bars on the graph.
draw-graph	Draws the bar graph.

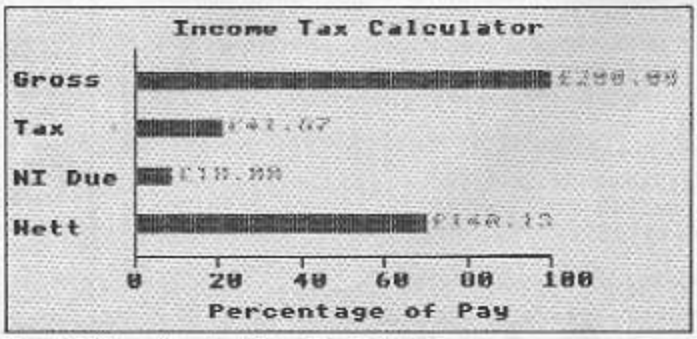


Figure I: Sample output from Tax Calculator

Tax calculator listing

◀ From Page 35

```
   10 REM Tax Calculator
   20 REM By Barry Wood
   30 REM (c) Electron User
   40 MODE1:DIM bar(3),money(3
)
   50 PRINTSPC10"Income Tax Ca
lculator"
   60 PROCenter:VDU23;8202;0;0
;0;
   70 PROCcalc_tax_rate
   80 PROCcalc_ni_frac
   90 PROCcalc_graph
  100 PROCdraw_graph
  110 G=GET:VDU4
  120 END
  130 DEFPROCenter
  140 INPUT"Enter tax code (n
umbers only) "taxcode
  150 INPUT"Enter pay earned
to date "pay
  160 INPUT"Enter tax paid to
 date "tax_to_date
  170 INPUT"Enter tax week "w
eek
  180 INPUT"Finally enter pay
 due this week "pay_due
  190 CLS:ENDPROC
  200 DEFPROCcalc_tax_rate
  210 tax_rate=0.27
  220 IF pay+pay_due>17200 tax
_rate=0.4
  230 IF pay+pay_due>20200 tax
_rate=0.45
  240 IF pay+pay_due>25400 tax
_rate=0.5
  250 IF pay+pay_due>33300 tax
_rate=0.55
  260 IF pay+pay_due>41200 tax
_rate=0.6
  270 taxfree=(taxcode*10)+5
  280 paytot=pay+pay_due
  290 tax_due=(paytot-((taxfre
e/52)*week))*tax_rate
  300 tax_to_pay=(INT((tax_due
-tax_to_date)*100))/100
  310 ENDPROC
  320 DEFPROCcalc_ni_frac
  330 IF pay_due<39 ni_frac=0
  340 IF pay_due>=39 ni_frac=0
.05
  350 IF pay_due>=65 ni_frac=0
.07
  360 IF pay_due>=100 ni_frac=
0.09
  370 IF pay_due>=295 ni_due=2
5.65:ENDPROC
  380 ni_due=pay_due*ni_frac:E
NDPROC
  390 DEFPROCcalc_graph
  400 taxpl=(tax_to_pay/pay_du
e)*100
  410 nipl=(ni_due/pay_due)*10
0
  420 nett=pay_due-tax_to_pay-
ni_due
  430 bar(3)=750:money(3)=pay_
due
  440 taxbar=INT((tax_to_pay/p
ay_due)*750):bar(2)=taxbar:mon
ey(2)=tax_to_pay
  450 nibar=INT((ni_due/pay_du
e)*750):bar(1)=nibar:money(1)=
ni_due
  460 nettbar=INT((nett/pay_du
e)*750):bar(0)=nettbar:money(0
)=nett
  470 ENDPROC
  480 DEFPROCdraw_graph
  490 VDU29,220;312;19,2,2;0;:
GCOL0,0
  500 MOVE 0,0:DRAW 0,400:MOVE
 0,0:DRAW 750,0
  510 FOR X%=0 TO 750 STEP 150
  520 MOVE X%,0:DRAW X%,-20:VD
U5:MOVE X%-16,-30:PRINTX%/7.5:
NEXT:VDU4
  530 PRINTTAB(0,11)"Gross "TA
B(0,14)"Tax"TAB(0,17)"NI Due"T
AB(0,20)"Nett"TAB(11,25)"Perce
ntage of Pay"TAB(9,8)"Income T
ax Calculator"
  540 Y%=50:FOR N%=0 TO 3:X%=b
ar(N%):PROCbars:Y%=Y%+92:NEXT:
ENDPROC
  550 DEFPROCbars:GCOL0,2
  560 MOVE X%,Y%:MOVE X%,Y%+30
:GCOL0,2:PLOT 85,0,Y%:PLOT85,0
,Y%+30:GCOL 0,1
  570 MOVE X%+10,Y%+30:VDU5:PR
INT"£";money(N%)
  580 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

Lost without Super Trace

ROLAND WADDILOVE provides a useful program to track down those elusive bugs

BBC Basic is one of the most powerful and flexible versions of Basic available. However, while it does possess some quite advanced features to aid program development such as procedures and local variables, one or two commands aren't that useful and could be improved.

TRACE, when implemented correctly, is a powerful debugging command that enables you to chart the path of a program. You can follow Basic's route through a listing as it executes your procedures, GOSUB, GOTO and other commands.

Bugs or typing errors in programs are difficult to spot at the best of times, and the micro occasionally reports an error at the wrong line. By stepping through a program line by line you can often spot where it is going wrong.

This is where the TRACE command comes in. Inserting TRACE ON at the start of a program instructs Basic to print the line number of the line it is executing.

However, the line numbers are printed at the current print position and more often than not they totally corrupt the screen display. This isn't very helpful.

Super Trace is a short machine code utility which modifies the TRACE command making it much more useful.

Enter and save the program then run it to store the code. Now you can load or enter your program. Insert a TRACE ON command near the start of the program and a TRACE OFF at the end. Now run it.

The line number of the line that Basic is executing is printed in the top left corner of the screen and the new Super Trace command waits for you to press a key. Tap the spacebar and Basic moves on to the next line.

Figure I shows a simple program and the output generated by the normal TRACE command, while Figure II shows the new Super Trace in action.

The modified command does not corrupt the screen display – the line number is always printed in the top left corner in square brackets yet the current print position is unaffected.

After tapping a key the program will continue exactly where it left off, even if it was in the middle of printing a row of characters.

The routine works by intercepting oswrch – the main vdu vector. Basic sends all output to the screen through this so it's an easy matter to check for an open square bracket.

When one is found the routine assumes that Basic is about to print the TRACE line number and redirects the output to the top left corner of the screen.

When a close square bracket character is detected the original print position is restored and Basic continues as normal.

This utility will prove an invaluble aid when tracking down those elusive bugs and typing slips. Keep it handy on a disc or tape and run it before typing in a program. Now you can step through a listing and watch Basic processing each line.

Full listing starts on Page 38

```
>L.
   10REM Normal TRACE Command
   20TRACE ON
   30FOR i=ASC"a" TO ASC"z"
   40PRINT CHR$(i);
   50NEXT
   60*SAVE SCREEN 5800 8000
   70TRACE OFF
>
>RUN
[30] [40] a[50] b[50] c[50] d[50] e[50]
f[50] g[50] h[50] i[50] j[50] k[50] l[50
] m[50] n[50] o[50] p[50] q[50] r[50] s[
50] t[50] u[50] v[50] w[50] x[50] y[50]
z[50] [60]
```

Figure I: The normal TRACE command

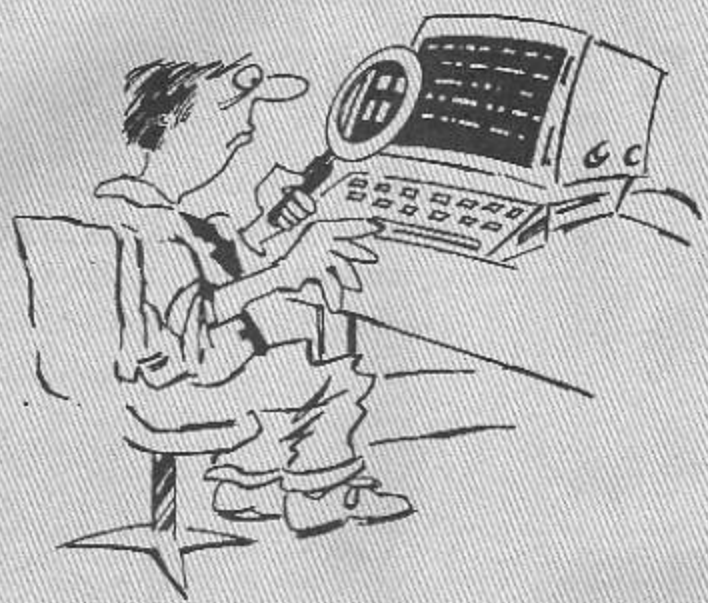
```
[60]

>L.
   10REM Super Trace Demonstration
   20TRACE ON
   30FOR i=ASC"a" TO ASC"z"
   40PRINT CHR$(i);
   50NEXT
   60*SAVE SCREEN 5800 8000
   70TRACE OFF
>
>RUN
abcdefghijklmnopqrstuvwxyz
```

Figure II: The new Super Trace command

Super Trace listing

◀ From Page 37

```
  10 REM Super Trace
  20 REM By R.A.Waddilove
  30 REM (c) Electron User
  40 MODE 6
  50 PRINT"Where shall I put
 the code?
  60 INPUT"(Hit RETURN if un
sure):"&a$
  70 IF a$="" a$="B00"
  80 trace=&20
  90 vector=&20E
 100 osbyte=!&20A AND &FFFF
 110 osrdch=!&210 AND &FFFF
 120 x=&50:y=&51
 130 space=&52
 140 xreg=&53:yreg=&54
 150 FOR pass=0 TO 2 STEP 2
 160 P%=EVAL("&"+a$)
 170 [OPT pass
 180 .intercept
 190 LDA vector+1:BPL done
 200 SEI
 210 LDA vector:STA oswrch+1:
LDA vector+1:STA oswrch+2
 220 LDA #code MOD256:STA vec
tor:LDA #code DIV256:STA vecto
r+1
 230 LDA #0:STA space
 240 CLI
 250 .done
 260 RTS
 270
 280 .code
 290 PHP:PHA
 300 LDA trace:BEQ exit \TRA
CE ON?
 310 LDA &26A:BNE exit \midd
le of VDU queue?
 320 LDA space:BEQ Lbracket \
 finished I]?
 330
 340 LDA #0:STA space
 350 LDA #32:JSR oswrch
 360 LDA x:JSR oswrch:LDA x
:JSR oswrch:LDA y:JSR oswrch \
old cursor position
 370 JSR osrdch \wait
 380 PLA:PLP
 390 RTS
 400
 410 .Lbracket
 420 PLA:PHA:CMP #ASC"[":BNE
Rbracket
 430 STX xreg:STY yreg
 440 LDA #&86:JSR osbyte:STX
x:STY y \store cursor position
 450 LDX xreg:LDY yreg
 460 LDA #30:JSR oswrch \top
left corner
 470 .exit
 480 PLA:PLP
 490 .oswrch
 500 JMP &8023
 510
 520 .Rbracket
 530 CMP #ASC"]":BNE exit
 540 INC space:BNE exit
 550 ]
 560 NEXT
 570 CALL intercept
 580 PRINT"Super Trace insta
lled..."
```



This listing is included in this month's cassette tape offer. See order form on Page 53.

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Derrick
Fred's Words
Hilo
Maths Test
Mouser
Number Signs
Seawall
Super Spell

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BALANCE
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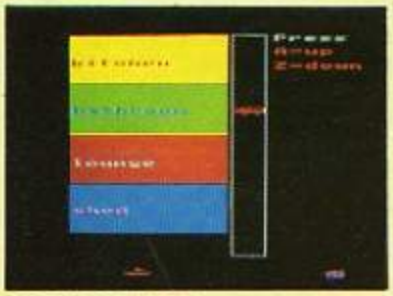
Codebreaker
Dog Duck Corn
Guessing
Hangman
Maths Hike
Nim
Odd Man Out
Pelmanism
Towers of Hanoi

HANGMAN
Improve your child's spelling with this fun version of the popular game



ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 53

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Spelldroid: Learn to spell with our friendly robot

Tortal: *Teach and test the rules of single addition*

PLUS:
Database: *A comprehensive database for the young learner.*
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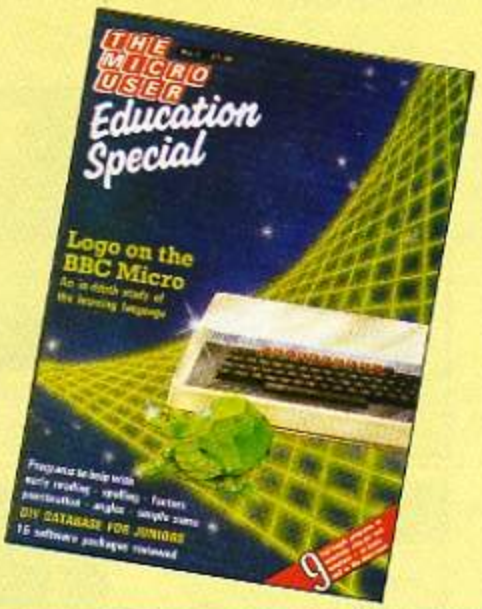
Fun Factors: *Arcade style factor learning.*
Discovery: *A strategy based phrase identification game.*
Punctuation: *Test and teach the rules of punctuation.*

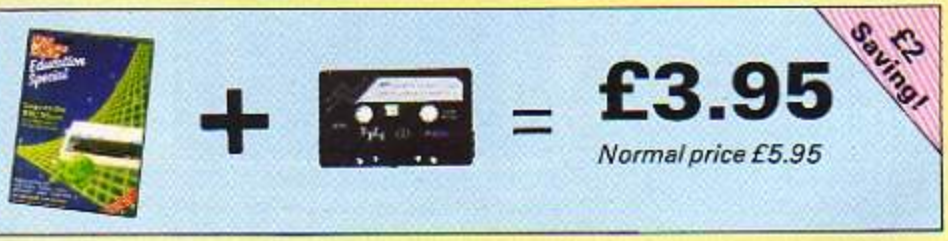
Educational Computing on the Electron

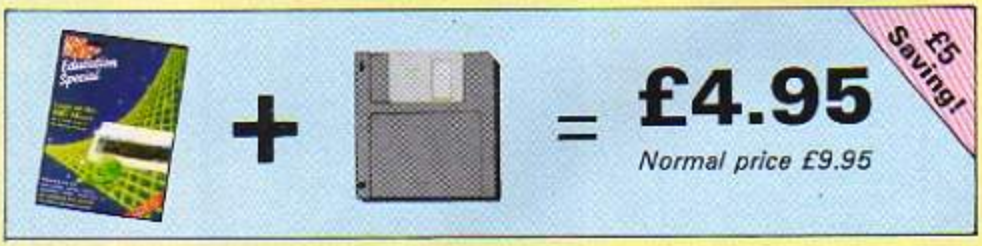
Volume 2 of *The Micro User* Education Special contains nine full length programs written to the highest standards and each picked to combine educational worth with sheer enjoyment. The nine programs cover topics from early reading and simple sums to the rules of punctuation and angle estimation – and there's an excellent introductory database.

The programs on the tape and disc have been adapted for the Electron and the magazine contains all the original listings together with advice on how they can be adapted to cater for individual needs.

Covers all age ranges from infants to secondary.



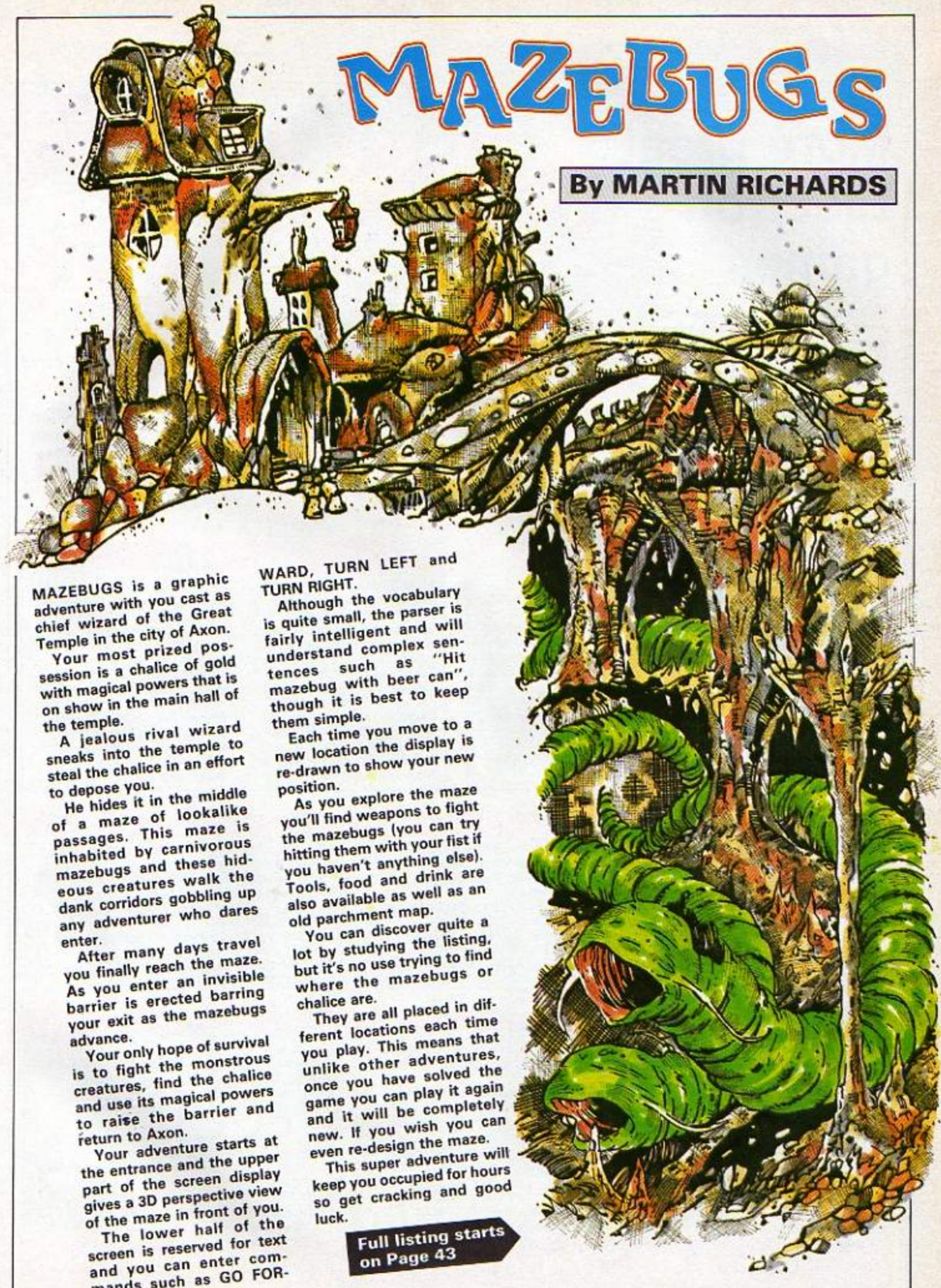




To order turn to the form on Page 53

MAZEBUGS

By MARTIN RICHARDS



MAZEBUGS is a graphic adventure with you cast as chief wizard of the Great Temple in the city of Axon.

Your most prized possession is a chalice of gold with magical powers that is on show in the main hall of the temple.

A jealous rival wizard sneaks into the temple to steal the chalice in an effort to depose you.

He hides it in the middle of a maze of lookalike passages. This maze is inhabited by carnivorous mazebugs and these hideous creatures walk the dank corridors gobbling up any adventurer who dares enter.

After many days travel you finally reach the maze. As you enter an invisible barrier is erected barring your exit as the mazebugs advance.

Your only hope of survival is to fight the monstrous creatures, find the chalice and use its magical powers to raise the barrier and return to Axon.

Your adventure starts at the entrance and the upper part of the screen display gives a 3D perspective view of the maze in front of you.

The lower half of the screen is reserved for text and you can enter commands such as GO FORWARD, TURN LEFT and TURN RIGHT.

Although the vocabulary is quite small, the parser is fairly intelligent and will understand complex sentences such as "Hit mazebug with beer can", though it is best to keep them simple.

Each time you move to a new location the display is re-drawn to show your new position.

As you explore the maze you'll find weapons to fight the mazebugs (you can try hitting them with your fist if you haven't anything else). Tools, food and drink are also available as well as an old parchment map.

You can discover quite a lot by studying the listing, but it's no use trying to find where the mazebugs or chalice are.

They are all placed in different locations each time you play. This means that unlike other adventures, once you have solved the game you can play it again and it will be completely new. If you wish you can even re-design the maze.

This super adventure will keep you occupied for hours so get cracking and good luck.

Full listing starts on Page 43

More great Electron games

This month we introduce a new volume in our Ten of the Best series – 10 more games to give you many hours of fun and entertainment.

These four packages are crammed with the best games from the last two years of Electron User. As an added bonus a previously unpublished game has been added to each one – stunning machine code masterpieces from our technical wizard, Roland Waddilove.

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Jam Butty: *Machine code simulation of high drama on a building site.*
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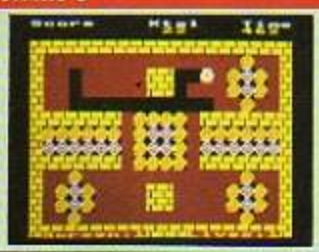
Haunted House: *Fight against all the odds to get out alive.*
Space Hike: *Another classic, Help the spaceman avoid marauding monsters.*
Parky's Peril: *Help Parky through an invisible maze, racing against time.*
Rally Driver: *All the thrills of high-speed driving with none of the risks.*
Alphaswap: *Your letters are in a twist. Can you put them in order.*
Knockout: *Fast and furious action as you batter down a brick wall.*
Money Maze: *Avoid ghosts and collect coins in an all-action arcade classic.*
Lunar Lander: *The traditional computer game specially written for the Electron.*

Volume 2

Atom Smash: *Machine code thrills as you help to save the world from destruction.*
Bunny Blitz: *Go egg collecting, but keep away from proliferating rabbits.*
Castles of Sand: *Build castles – but beware the rising tide and hungry sandworms.*
Reaction Timer: *Test your reactions with this traffic lights simulation.*
Solitaire: *The Electron version of the age-old game of logic and patience.*
Jumper: *Jump for your life in this exciting arcade action game.*
Break free: *Test your wits and reflexes in this popular classic ball game.*
Code breaker: *Crack the code in a colourful if frustrating brainteaser.*
Parachute: *Save the plunging sky divers from a watery end.*
Star fighter: *Attack the bandit ships in this fast-moving 3D punch up.*

Volume 3



Rockfall: *Come diamond mining in this fun packed game with its own screen designer.*
Karate Warrior: *Win your black belt in this gruelling test of karate skill.*
Grand Prix: *Battle your way into the lead in this tricky racing simulation.*
Invasion Force: *Can you survive wave after wave of relentlessly advancing aliens.*
Grebit: *Guide the frog across the busy road then across the fast-flowing river!*
Fruit Worm: *Steer the worm towards the fruit while avoiding rocks and its ever-growing tail.*
Manic Mole: *Watch out for melting platforms and conveyor belts in your quest for jewels.*
Skramble: *Fly your fighter fast and low over the landscape to penetrate enemy territory.*
Mr. Freeze: *You'll need speed and strategy to reach the ice blocks before they melt away.*
Paint Roller: *Steer a speeding roller, run over paint pots but keep clear of the rocks.*

Volume 4

NEW

Lunar Invasion: *Defend the moon from wave after wave of marauding aliens in this superb multi-screen arcade game.*
Howzat: *Try not to get caught out in this vivid recreation of a day's test cricket.*
Snapdragon: *Enjoy this two-player micro version of the familiar card game.*
Day at the Races: *Fancy a flutter? You can bet your shirt in safety in this two-player horse racing game.*
Reversi: *Combine cunning and chance as you try to out-think your Electron at this classic board game.*
Fishing: *Relax and enjoy a quiet afternoon by a shady brook. You'll regret if you let this one get away.*
Cavern Capers: *Escape from the depths of the planet by blasting oil drums and dodging deadly fireballs.*
Craal: *Escape from the maxe and win the beautiful princess in this superb text adventure.*
Oxo: *High strategy meets low cunning in a logic game to strain your brain.*
Missile Attack *Defend your city from a missile invasion and save it from certain doom.*

TO ORDER TURN TO THE FORM ON PAGE 53

Mazebugs listing

◀ From Page 41

```
  10 REM Mazebugs
  20 REM By Martin Richards
  30 REM (c) Electron User
  40 IF PAGE=&1900 GOTO 4570
  50 PROCassemble:CLEAR
  60 PROCinitialise
  70 MODE4:VDU23,1,0;0;0;0;
  80 PROCinstructions
  90 MODE5:VDU23,1,0;0;0;0;
 100 PROCview
 110 REPEAT
 120 PROCany_objects
 130 PROCattack
 140 PROCcommand
 150 UNTIL Y%=10 OR energy<1
 160 IF energy<1 PROCdead
 170 IF Y%=1 PROCdone_it
 180 MODE 6:*FX4
 190 END
 200
 210 DEF PROCdead
 220 PROCpause(200)
 230 RESTORE 1000
 240 FOR I%=1 TO 11
 250 READ A%,B%
 260 SOUND 1,-15,A%,B%:SOUND 1,0,0,1
 270 NEXT
 280 CLS:COLOUR2:PRINT"You're dead..."Eaten by a mazebug!":COLOUR1:PRINT"Strength=0""Mazebugs killed=";dead;
 290 PROCpause(500)
 300 ENDPROC
 310
 320 DEF PROCdone_it
 330 PROCinventory:PROCpause(400)
 340 PRINT':PROCscore
 350 SOUND 1,-15,40,5:SOUND 1,-15,28,5:SOUND 1,-15,20,20
 360 CLS:VDU 26,23,1,0;0;0;0;
 370 MOVE 100,200:GCOL 0,3:H%=3:W%=1:BIG$="CONGRATULATIONS":CALL &900,BIG$:MOVE 310,100:H%=2:GCOL 0,2:BIG$="you made it":CALL &900,BIG$
 380 PROCpause(500)
 390 ENDPROC
 400
 410 DEF PROCview
 420 VDU 19,2,6;0;
 430 GCOL 0,3
 440 MOVE 40,396
 450 DRAW 40,1023:DRAW 1240,1023
 460 DRAW 1240,396:DRAW 40,396
 470 VDU 24,48;400;1235;1019;
 480 VDU 29,640;700;
 490 PROCdraw
 500 VDU 28,0,31,19,21
 510 ENDPROC
 520
 530 DEF PROCinitialise
 540 *FX4,1
 550 VDU 23,224,255,129,129,129,129,129,129,255
 560 VDU 23,225,195,60,90,255,231,126,36,102
 570 VDU 23,226,24,60,24,126,189,60,36,102
 580 VDU 23,227,0,0,0,195,126,24,24,126
 590 VDU 23,228,85,170,85,170,85,170,85,170
 600 DIM maze$(11),hole$(10),object$(10),place(10,1),carrying(4),bug(10,1),strength(10)
 610 RESTORE 870
 620 FOR I%=0 TO 11
 630 READ maze$(I%)
 640 NEXT
 650 FOR I%=0 TO 10
 660 hole$(I%)=STRING$(15," ")
 670 strength(I%)=RND(10)
 680 REPEAT X%=RND(17):Y%=RND(7)
 690 UNTIL NOT FNwall(X%,Y%)
 700 bug(I%,0)=X%:bug(I%,1)=Y%
 710 NEXT
 720 FOR I%=0 TO 4
 730 carrying(I%)=-1
 740 NEXT
 750 FOR I%=0 TO 10
 760 READ object$(I%)
 770 REPEAT
 780 X%=RND(17):Y%=RND(8)
 790 UNTIL NOT FNwall(X%,Y%)
 800 place(I%,0)=X%:place(I%,1)=Y%
 810 NEXT
 820 X%=10:Y%=9:direction=0
 830 energy=100:drunk=FALSE
 840 dead=0:*FX16
 850 ENDPROC
 860
 870 DATA ****************
 880 DATA *..*..*...*..*..*
 890 DATA **.*.**.*...*...**
 900 DATA *....*..*.*..**..*
 910 DATA *.**...*.*.*..**.*
 920 DATA *...*.*.....*....*
 930 DATA ***.*...*.*...*.**
 940 DATA *...*.*...*..*.*..*
 950 DATA *.*.*....*...*..*.*
 960 DATA ********.********
 970 DATA .........*.*.......
 980 DATA ..................
 990 DATA The chalice,An apple,A gold coin,A map,An axe,A sword,A dagger,A club,A hammer,A beer can,A spade
1000 DATA 40,14,40,14,40,7,40,14,52,14,48,7,48,14,40,7,40,14,36,7,40,20
1010
1020 DEF PROCany_objects
1030 FOR I%=0 TO 10
1040 IF place(I%,0)=X% AND place(I%,1)=Y% PRINT object$(I%)" is here."
1050 NEXT
1060 ENDPROC
1070
1080 DEF PROCattack
1090 flag=FALSE
1100 FOR I%=0 TO 10
1110 IF bug(I%,0)=X% AND bug(I%,1)=Y% flag=TRUE
1120 NEXT
1130 IF NOT flag ENDPROC
1140 energy=energy-RND(5)
1150 PRINT"The Mazebug attacks:You are ";
1160 IF RND>0 PRINT"hit with a claw..." ELSE PRINT"bitten..."
1170 SOUND 0,-15,5,5
1180 ENDPROC
1190
1200 DEF PROCcommand
1210 ok=FALSE
1220 REPEAT
1230 PRINT:PROCinput
1240 IF command$="turn" PRINT"Which way?":PROCinput
1250 IF INSTR(command$,"left") direction=(direction+3)MOD4:PROCdraw:ok=TRUE
1260 IF INSTR(command$,"right") direction=(direction+1)MOD4:PROCdraw:ok=TRUE
1270 IF INSTR(command$,"forward") PROCmove
1280 IF LEFT$(command$,3)="inv" PROCinventory
1290 IF LEFT$(command$,3)="get" OR LEFT$(command$,3)="tak" PROCget
1300 IF LEFT$(command$,4)="drop" PROCdrop
1310 IF LEFT$(command$,4)="drin" PROCdrink
1320 IF LEFT$(command$,3)="dig" PROCdig
1330 IF LEFT$(command$,4)="look" PROClook
1340 IF LEFT$(command$,3)="eat" PROCeat
1350 IF LEFT$(command$,3)="hit" OR LEFT$(command$,4)="stab" PROChit
1360 IF command$="score" PROCscore
1370 IF NOT ok PRINT"Eh?"
1380 UNTIL ok
1390 ENDPROC
1400
1410 DEF PROCinput
1420 LOCAL x%,y%
1430 COLOUR3
1440 x%=POS:y%=VPOS
1450 VDU23,1,1;0;0;0;:*FX21
1460 REPEAT
1470 INPUT TAB(x%,y%);COMMAND$
1480 UNTIL LEN COMMAND$
1490 command$=""
1500 FOR I%=1 TO LEN COMMAND$
1510 command$=command$+CHR$(ASC MID$(COMMAND$,I%,1)OR &20)
1520 NEXT
1530 VDU23,1,0;0;0;0;
1540 COLOUR2
1550 ENDPROC
1560
1570 DEF PROCscore
1580 ok=TRUE
1590 PRINT"Strength=";energy
1600 PRINT"Mazebugs killed=";dead;
1610 ENDPROC
1620
1630 DEF PROCinventory
1640 ok=TRUE:CLS:flag=FALSE
1650 PRINT"You have:"
1660 FOR I%=0 TO 4
1670 IF carrying(I%)>-1 flag=TRUE:PRINT object$(carrying(I%))
1680 NEXT
1690 IF NOT flag PRINT"Nothing!"
1700 ENDPROC
1710
1720 DEF PROCdraw
1730 GCOL0,2:CLG
1740 MOVE 600,1019:MOVE -600,1019
1750 PLOT 85,600,0:PLOT 85,-600,0
1760 IF direction=0 PROCnorth
1770 IF direction=1 PROCeast
1780 IF direction=2 PROCsouth
1790 IF direction=3 PROCwest
1800 PROCbug
1810 ENDPROC
1820
1830 DEF PROCbug
1840 LOCAL x%,y%
1850 x%=0:y%=0:A%=X%:B%=Y%:H%=0
1860 IF direction=0 y%=-1
1870 IF direction=1 x%=1
1880 IF direction=2 y%=1
1890 IF direction=3 x%=-1
1900 REPEAT
1910 FOR I%=0 TO 10
1920 IF bug(I%,0)=A% AND bug(I%,1)=B% H%=10-2*ABS(X%-A%+Y%-B%)
1930 NEXT
1940 A%=A%+x%:B%=B%+y%
1950 UNTIL FNwall(A%,B%) OR H% OR B%>10
1960 IF H% W%=H%DIV2:BIG$=CHR$225:MOVE -H%*16,-H%+32-8:CALL &900,BIG$
1970 ENDPROC
1980
1990 DEF PROCsouth
2000 B%=Y%+6:IF B%>10 B%=10
2010 REPEAT
2020 IF FNwall(X%+1,B%) PROCleft(6-B%+Y%)
2030 IF FNwall(X%-1,B%) PROCright(6-B%+Y%)
2040 IF FNwall(X%,B%) PROCfront(6-B%+Y%)
2050 B%=B%-1
2060 UNTIL B%<Y%
2070 ENDPROC
2080
2090 DEF PROCnorth
2100 B%=Y%-6:IF B%<0 B%=0
```

Turn to Page 44 ▶

Mazebugs listing

◀ From Page 43

```
 2110 REPEAT
 2120 IF FNwall(X%+1,B%) PROCr
ight(6+B%-Y%)
 2130 IF FNwall(X%-1,B%) PROCl
eft(6+B%-Y%)
 2140 IF FNwall(X%,B%) PROCfro
nt(6+B%-Y%)
 2150 B%=B%+1
 2160 UNTIL B%>Y%
 2170 ENDPROC
 2180
 2190 DEF PROCwest
 2200 A%=X%-6:IF A%<1 A%=1
 2210 REPEAT
 2220 IF FNwall(A%,Y%+1) PROCl
eft(6+A%-X%)
 2230 IF FNwall(A%,Y%-1) PROCr
ight(6+A%-X%)
 2240 IF FNwall(A%,Y%) PROCfro
nt(6+A%-X%)
 2250 A%=A%+1
 2260 UNTIL A%>X%
 2270 ENDPROC
 2280
 2290 DEF PROCeast
 2300 A%=X%+6:IF A%>18 A%=18
 2310 REPEAT
 2320 IF FNwall(A%,Y%-1) PROCl
eft(6-A%+X%)
 2330 IF FNwall(A%,Y%+1) PROCr
ight(6-A%+X%)
 2340 IF FNwall(A%,Y%) PROCfro
nt(6-A%+X%)
 2350 A%=A%-1
 2360 UNTIL A%<X%
 2370 ENDPROC
 2380
 2390 DEF PROCfront(S%)
 2400 GCOL0,1:MOVE -100*S%,-50
*S%:MOVE 100*S%,-50*S%:PLOT 85
,-100*S%,50*S%:PLOT 85,100*S%,
50*S%
 2410 GCOL 0,3:MOVE -100*S%,-5
0*S%:DRAW 100*S%,-50*S%:DRAW 1
00*S%,50*S%:DRAW -100*S%,50*S%
:DRAW -100*S%,-50*S%
 2420 ENDPROC
 2430
 2440 DEF PROCleft(S%)
 2450 GCOL0,1:MOVE -300*S%,-50
*S%:MOVE -100*S%,-50*S%:PLOT 8
5,-300*S%,50*S%:PLOT 85,-100*S
%,50*S%:MOVE -100*(S%-1),50*(S
%-1):PLOT 85,-100*S%,-50*S%:PL
OT 85,-100*(S%-1),-50*(S%-1)
 2460 GCOL 0,3:MOVE -100*S%,-5
0*S%:DRAW -300*S%,-50*S%:DRAW
-300*S%,50*S%:DRAW -100*S%,50*
S%:DRAW -100*(S%-1),50*(S%-1):
DRAW -100*(S%-1),-50*(S%-1):DR
AW -100*S%,-50*S%:DRAW -100*S%
,50*S%
 2470 ENDPROC
 2480
 2490 DEF PROCright(S%)
 2500 GCOL 0,1:MOVE 300*S%,-50
*S%:MOVE 100*S%,-50*S%:PLOT 85
,300*S%,50*S%:PLOT 85,100*S%,5
0*S%:MOVE 100*(S%-1),50*(S%-1)
:PLOT 85,100*S%,-50*S%:PLOT 85
,100*(S%-1),-50*(S%-1)
 2510 GCOL 0,3:MOVE 100*S%,-50
*S%:DRAW 300*S%,-50*S%:DRAW 30
0*S%,50*S%:DRAW 100*S%,50*S%:D
RAW 100*(S%-1),50*(S%-1):DRAW
100*(S%-1),-50*(S%-1):DRAW 100
*S%,-50*S%:DRAW 100*S%,50*S%
 2520 ENDPROC
 2530
 2540 DEF PROCmove
 2550 LOCAL x%,y%
 2560 flag=FALSE:ok=TRUE
 2570 FOR I%=0 TO 10
 2580 IF bug(I%,0)=X% AND bug(
I%,1)=Y% flag=TRUE
 2590 NEXT
 2600 IF flag IF RND>0 PRINT"
The Mazebug blocks your path
.":ENDPROC
 2610 x%=X%:y%=Y%
 2620 IF direction=0 y%=Y%+(Y%
>0)
 2630 IF direction=2 y%=Y%+1
 2640 IF direction=1 x%=X%-(X%
<18)
 2650 IF direction=3 x%=X%+(X%
>1)
 2660 IF FNwall(x%,y%) PRINT"
Wall in the way!":ENDPROC
 2670 IF y%=10 AND FNpossess(0
)<0 PRINT"You cannot leave"
without the chalice.":SOUND 1,
-15,0,20 ELSE X%=x%:Y%=y%:PROC
move_bugs:PROCdraw:CLS:energy=
energy-1
 2680 ENDPROC
 2690
```



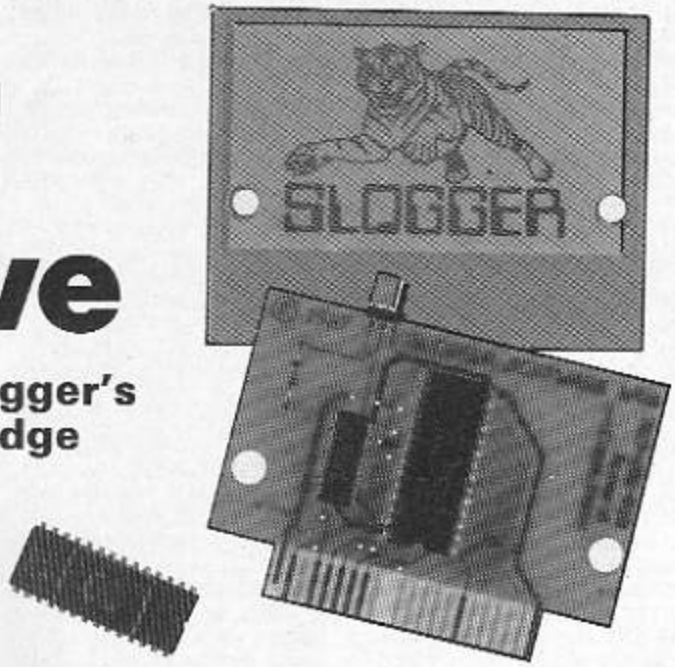
```
 2700 DEF PROCmove_bugs
 2710 LOCAL x%,y%
 2720 FOR I%=0 TO 10
 2730 x%=bug(I%,0):y%=bug(I%,1
)
 2740 IF RND>0 x%=x%+RND(3)-2
ELSE y%=y%+RND(3)-2
 2750 flag=FALSE
 2760 FOR J%=0 TO 10
 2770 IF J%<>I% AND bug(J%,0)=
x% AND bug(J%,1)=y% flag=TRUE
 2780 NEXT
 2790 IF y%<10 AND NOT (flag O
R FNwall(x%,y%)) PROCcheck_hol
e
 2800 NEXT
 2810 ENDPROC
 2820
 2830 DEF PROCcheck_hole
 2840 IF MID$(hole$(y%),x%,1)=
" " bug(I%,0)=x%:bug(I%,1)=y%:
ENDPROC
 2850 FOR J%=0 TO 200 STEP 4
 2860 SOUND 1,-15,J%,1
 2870 NEXT
 2880 SOUND 0,-15,5,10
 2890 PRINT"A bug fell down"
a hole..."
 2900 bug(I%,0)=0:bug(I%,1)=10
:dead=dead+1
 2910 ENDPROC
 2920
 2930 DEF FNwall(x%,y%)
 2940 IF MID$(maze$(y%),x%,1)=
"*" THEN =TRUE ELSE =FALSE
 2950
 2960 DEF FNpossess(it)
 2970 LOCAL flag,I%:flag=-1
 2980 FOR I%=0 TO 4
 2990 IF carrying(I%)=it flag=
I%
 3000 NEXT
 3010 =flag
 3020
 3030 DEF FNlast_word(temporar
y$)
 3040 LOCAL I%:I%=LEN temporar
y$
 3050 REPEAT I%=I%-1
 3060 UNTIL MID$(temporary$,I%
,1)=CHR$32 OR I%=0
 3070 =MID$(temporary$,I%+1)
 3080
 3090 DEF FNcarry
 3100 LOCAL flag,I%:flag=-1
 3110 FOR I%=0 TO 4
 3120 IF carrying(I%)<0 flag=I
%
 3130 NEXT
 3140 =flag
 3150
 3160 DEF FNobject_no(thing$)
 3170 LOCAL I%,flag:flag=-1
 3180 FOR I%=0 TO 10
 3190 IF INSTR(object$(I%),thi
ng$) flag=I%
 3200 NEXT
 3210 =flag
 3220
 3230 DEF PROCdig
 3240 ok=TRUE
 3250 IF FNpossess(10)<0 PRINT
"You need a spade!":ENDPROC
 3260 PRINT"Digging..."
 3270 FOR I=1 TO 5
 3280 SOUND 0,-15,4,1:SOUND 0,
0,0,9:SOUND 0,-15,5,9:SOUND 0,
0,0,9
 3290 energy=energy-1
 3300 NEXT
 3310 hole$(Y%)=LEFT$(hole$(Y%
),X%-1)+"O"+RIGHT$(hole$(Y%),7
-X%)
 3320 ENDPROC
 3330
 3340 DEF PROCdrop
 3350 ok=TRUE
 3360 IF LEN command$<6 PRINT"
Drop what?":PROCinput
 3370 command$=FNlast_word(com
mand$)
 3380 A%=FNobject_no(command$)
 3390 B%=FNpossess(A%)
 3400 IF A%<0 OR B%<0 PRINT"Eh
?":ENDPROC
 3410 carrying(B%)=-1
 3420 place(A%,0)=X%:place(A%,
1)=Y%
 3430 SOUND 1,-15,0,4
 3440 ENDPROC
 3450
 3460 DEF PROCdrink
 3470 ok=TRUE
 3480 IF FNpossess(9)<0 PRINT"
You haven't got anything to
drink.":ENDPROC
 3490 IF drunk PRINT"The can i
s empty.":ENDPROC
 3500 drunk=TRUE
 3510 PRINT"OK...";
 3520 FOR I%=100 TO 200 STEP 1
0
 3530 SOUND 1,-15,I%,1:SOUND 1
,0,0,7
 3540 NEXT
 3550 PRINT"hic!"
 3560 energy=energy+25
 3570 IF energy>100 energy=100
 3580 ENDPROC
 3590
 3600 DEF PROCget
 3610 ok=TRUE
 3620 IF LEN command$<5 PRINT"
Get what?":PROCinput
 3630 command$=FNlast_word(com
mand$)
 3640 B%=FNobject_no(command$)
 3650 IF B%<0 PRINT"Eh?":ENDPR
OC ELSE IF place(B%,0)<>X% OR
place(B%,1)<>Y% PRINT"Eh?":END
PROC
 3660 A%=FNcarry
 3670 IF A%<0 PRINT"Pockets ar
e full!":ENDPROC
 3680 PRINT"Ok":carrying(A%)=B
%:place(B%,0)=0:place(B%,1)=10
 3690 ENDPROC
 3700
 3710 DEF PROCeat
 3720 ok=TRUE:A%=FNpossess(1)
 3730 IF A%<0 PRINT"Haven't go
t any food":ENDPROC
 3740 PRINT"You feel better...
"
 3750 energy=energy+50:carryin
g(A%)=-1
 3760 IF energy>100 energy=100
 3770 ENDPROC
 3780
 3790 DEF PROClook
 3800 IF command$="look" PRINT
"Look at what?":PROCinput
 3810 command$=FNlast_word(com
mand$)
 3820 ok=TRUE
 3830 IF INSTR(command$,"bug")
 OR command$="monster" PRINT"U
gh!,it's horrible":ENDPROC
 3840 A%=FNobject_no(command$)
 3850 IF A%<0 OR FNpossess(A%)
<0 PRINT"You haven't got that"
:ENDPROC
 3860 IF A%=3 PROCmap ELSE PRI
NT"Seems ordinary."
 3870 ENDPROC
 3880
 3890 DEF PROCmap
 3900 CLS:COLOUR 129:ok=TRUE:C
OLOUR 3
 3910 FOR I%=0 TO 9
 3920 PRINT CHR$9;
 3930 FOR J%=1 TO 18
 3940 IF FNwall(J%,I%) COLOUR
129:VDU224 ELSE IF MID$(hole$(
I%),J%,1)="O" COLOUR 128:PRINT
"o"; ELSE VDU 9
 3950 NEXT
 3960 PRINT
 3970 NEXT
 3980 COLOUR 129:PRINT TAB(9,1
0);CHR$224;CHR$9;CHR$224;
 3990 COLOUR 128:COLOUR 3
 4000 FOR I%=0 TO 10
 4010 IF bug(I%,1)<10 PRINT TA
B(bug(I%,0),bug(I%,1));CHR$225
 4020 NEXT
 4030 COLOUR 2:PRINT TAB(place
(0,0),place(0,1));CHR$227;TAB(
X%,Y%);CHR$226
 4040 PROCpause(3000):CLS
 4050 ENDPROC
 4060
 4070 DEF PROChit
 4080 IF INSTR(command$,"with"
)=0 PRINT"What with?":PROCinpu
t
 4090 command$=FNlast_word(com
mand$)
 4100 A%=FNobject_no(command$)
:B%=FNpossess(A%)
 4110 ok=TRUE
 4120 IF (A%<0 OR B%<0) AND co
```

```
mmand$<>"fist" PRINT"You haven
't got that":ENDPROC
 4130 x%=X%+(direction=3)-(dir
ection=1):y%=Y%+(direction=0)-
(direction=2)
 4140 flag=-1:f%=FALSE
 4150 FOR I%=0 TO 10
 4160 IF bug(I%,0)=x% AND bug(
I%,1)=Y% flag=I%
 4170 IF bug(I%,0)=x% AND bug(
I%,1)=y% F%=TRUE
 4180 NEXT
 4190 IF flag<0 AND NOT f% PRI
NT"It's too far away.":ENDPROC
 4200 IF flag<0 AND f% PRINT"I
can't reach!":ENDPROC
 4210 PRINT"Thump...":SOUND 0,
-15,6,1
 4220 IF command$="fist" PRINT
"It bites your arm off!":ene
rgy=energy-50:ENDPROC
 4230 IF RND(10)=1 OR AX=1 OR
AX=3 PRINT"You drop the ";FN(a
st.word(object$(AX)):carrying(
BX)=-1:place(AX,0)=X%:place(A%
,1)=Y%
 4240 IF AX=1 PRINT"Apple is s
quashed!"
 4250 IF AX=3 PRINT"Map ruined
!"
 4260 IF AX=2 PRINT"Didn't hur
t him!"
 4270 IF AX=0 OR AX>3 strength
(flag)=strength(flag)-RND(5)
 4280 IF AX=1 OR AX=3 place(AX
,0)=0:place(AX,1)=10
 4290 IF strength(flag)<1 PRIN
T"Mazebug is dead.":bug(flag,
0)=0:bug(flag,1)=10:PROCdraw:d
ead=dead+1 ELSE IF strength(fl
ag)<4 PRINT"Mazebug is weak."
 4300 ENDPROC
 4310
 4320 DEF PROCpause(delay)
 4330 *FX21
 4340 K%=INKEY delay
 4350 ENDPROC
 4360
 4370 DEF PROCinstructions
 4380 PRINT STRING$(200,CHR$22
8)
 4390 MODE 230,890:H%=3:W%=3:B
IG$="MAZEBUGS":CALL &900,BIG$
 4400 PRINT TAB(0,7)"The sacre
d Golden Chalice has been take
nfrom the Great Temple by a ri
val wizard from a nearby city.
"
 4410 PRINT"He has hidden it
in a maze of twisty,  turny p
assages which are inhabited by
  carnivorous Mazebugs."
 4420 PRINT"After many days t
ravel you have reached the maz
e. You must find the Chalice a
nd return home with it. Once y
ou have entered you can't le
ave without it."
 4430 PRINT"Use GO FORWARD, T
URN LEFT/RIGHT to move.(Discov
er the other commands yourself
!)."
 4440 PRINT"Hit a key to sta
rt the adventure..."
 4450 REPEAT UNTIL GET
 4460 ENDPROC
 4470
 4480 DEF PROCassemble
 4490 char=&87:block=&85:count
er=&85:limit=&86:string=&83:le
ngth=&82:addr=&80:x=&7E:y=&7C:
byte=&7B:height=&7A:width=&79:
mode=&78:data=&77:!data=&E2000
402:data!4=&01010804:H%=&420:W
%=&45C:X%=&310:Y%=&312:os=!&20
E AND &FFFF
 4500 B%=&900:FOR pass=0 TO 2
STEP 2:P%=B%:[OPT pass:LDX &35
5:LDA data,X:STA mode:LDA &600
:BEQ error:LDA &601:STA block:
LDA &602:STA block+1:LDY #0:LD
A (block),Y:STA string:INY
 4510 LDA (block),Y:STA string
+1:INY:INY:LDA (block),Y:BEQ e
rror:STA limit:LDA #0:STA coun
ter:.loop5 LDY counter:LDA (st
ring),Y:STA char:LDA #10:LDX #
char:LDY #0:JSR &FFF1:JSR prin
t:INC counter:LDA counter:CMP
limit:BCC loop5:RTS
 4520 .error BRK:EQUB 4:EQUS
Big error!":BRK:.print LDA Y%:
STA y:LDA Y%+1:STA y+1:LDA X%:
STA x:LDA X%+1:STA x+1:LDY #7:
.loop1 LDA H%:BEQ error:STA he
ight:.loop2 LDA x:STA X%:LDA x
+1:STA X%+1:LDA char+1,Y:STA b
yte:LDA Y%:CLC:ADC #4:STA Y%
 4530 LDA Y%+1:ADC #0:STA Y%+1
:LDX #8:.here LDA W%:BEQ error
:STA width:ASL byte:PHP:BCC ne
xt:.loop3 JSR plot:.next LDA X
%:CLC:ADC mode:STA X%:LDA X%+1
:ADC #0:STA X%+1:DEC width:BEQ
 carryon:PLP:PHP:BCC next:BCS
loop3:.carryon PLP:DEX
 4540 BNE here:DEC height:BNE
loop2:DEY:BPL loop1:LDA y:STA
Y%:LDA y+1:STA Y%+1:RTS:.plot
LDA #25:JSR os:LDA #69:JSR os:
LDA X%:JSR os:LDA X%+1:JSR os:
LDA Y%:JSR os:LDA Y%+1:JMP os:
]:NEXT
 4550 ENDPROC
 4560
 4570 *KEY0 *T.|MD%=PAGE-&E00:
FOR I%=PAGE TO TOP STEP4:!(I%-0
%)=!I%:NEXT:?(TOP-0%)=255:MPAG
E=&E00:MOLD:MRUN|M
 4580 *FX138,0,128
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

Powerful alternative

MARK SMIDDY reviews Slogger's rom upgrade and ram cartridge



THE arrival of Slogger's new expansion 2.0 adds proof that the Electron has come of age.

Aided by the efforts of Slogger it has graduated into a powerful and serious home micro.

The main expansion for the Electron is via Acorn's Plus 1 or Slogger's own Rombox Plus. These do provide adequate expansion for most purposes, but there is room for improvement in the operating system. No doubt this was the idea behind Expansion 2.

Supplied on rom, the software is simply inserted in place of the old expansion rom inside the Plus 1 or Rombox Plus.

Users of older versions of the Rombox may find this a bit fiddly, but it only has to be done once. The same bugbear does not apply to the Plus 1 however.

On power up, if all is well as shown in Figure I, *HELP reveals that we have a whole new set of commands added to the expansion: BUFFER, JOYSTICK, RLOAD and RSAVE.

Users of Rombox Plus will already be familiar with the basic idea behind BUFFER and JOYSTICK although both have been upgraded from their original format.

As Figure II shows, the *HELP functions have been extended on Expansion 2 to allow more help on individual commands.

The command BUFFER is concerned with sideways or the shadow ram available to owners of the Slogger Master Ram board. Basically it configures almost 16k of sideways ram or 12k of shadow ram as an extended printer buffer.

This is particularly useful in printing long listings or working on a word processor such as View. It loads and fills the buffer and prevents the machine from hanging, and cuts out wait while the printer slowly dumps out screens full of text.

In case of a mistake, the printing can be halted and the buffer flushed by a couple of simple star commands without having to switch the Electron off and start again.

The JOYSTICK command is a way of implementing joysticks into some game software via Slogger's switched joystick interface reviewed in the May, 1987, issue of *Electron User*.

The two new commands are directly concerned with sideways ram and are used to save rom images to disc and then reload them into sideways ram at a later date.

This can be very useful, especially if you have several cartridge based roms that you want to use at once.

What if you don't have a sideways ram bank? Slogger can provide the answer in the form of its new 32k, write protectable sideways ram cartridge.

Readers of *Electron User* will no doubt remember that enthusiastic review Roland Waddilove gave to ACP's battery backed sideways ram in last month's issue and they may well wonder what the difference is.

Frankly there is not a lot to choose between them. The ACP unit is better for making a permanent copy of two of your roms since the battery backup holds the information even after power off. The Slogger unit is more suited to being a printer buffer and rom in one.

The Slogger ram cartridge also has the advantage that its software driver is an integral part of the Expansion 2 rom, and ACP's is supplied in ram with the package for you to copy to tape or disc.

The ACP cartridge has the advantage of write protection being built into the software, whereas the Slogger unit is configured through a plug and pin that protrudes from the top of the casing. Slogger tells us that a new model is currently being developed with software write protect and printer buffer protection.

This means that while your printer buffer is active you cannot accidentally overwrite it with a rom image, like this reviewer. I await its arrival with anticipation.

To sum up, Slogger's sideways ram provides an alternative sideways ram package and if bought with the Expansion 2.0, does offer a considerable saving and a very powerful piece of hardware. ■

```
*HELP

Electron Expansion 2.00
Printer,ADC,RS423

  BUFFER
  JOYSTICK
  RLOAD
  RSAVE

OS 1.00
```

Figure I: The Help Screen

```
>*HELP BUFFER
Electron Expansion 2.00

  *BUFFER
  *BUFFER ON
  *BUFFER OFF
  *BUFFER FLUSH
  *BUFFER PAUSE
  *BUFFER RESUME
  *BUFFER 64K

OS 1.00
```

Figure II: Getting extra help on BUFFER

Product: Expansion 2 Rom
Price: £11.95
Supplier: Slogger, 107 Richmond Road, Gillingham, Kent ME7 1LX.
Tel: 0634 52303

Product: 32k Sideways Ram
Price: £12.95
Supplier: Slogger, 107 Richmond Road, Gillingham, Kent ME7 1LX.
Tel: 0634 52303

Micro Messages

Making the most of sideways ram

I HAVE been an avid reader of Electron User *since you distributed it inside* The Micro User *and have found all the articles and reviews very comprehensive. I am sure these have influenced my purchases of various hardware.*

At the moment I am using View with a Plus 3, Plus 1 and Brother M1009 printer. (I was very grateful to you for the excellent Printer Driver in the August 1986 issue). I am considering further expansion and wondered if anybody could answer my queries?

I am thinking of buying ACP's sideways ram. Can I use any of this extra 16k for my text? Also if I bought the Wigmore House Mouse could I use the 16k for better pictures?

Does the sideways ram come with adequate software to make rom images to load into sideways ram or must I buy ACP's rom manager? If it does can I backup roms and load them into sideways ram or must I unplug it and plug in a cartridge? And if I bought the rom manager will it backup itself?

Once I have got sideways ram I was considering buying ACP's E00 DFS. Does this mean I will have the equivalent of a Plus 4 but with a 3.5in drive?

And one final thing, do you know how to configure a 5.25in disc drive from drive 0 to drive 1? Please let me know. – **Graham Dearing, Stockton-on-Tees, Cleveland.**

● You can't use the extra 16k of ram for text or pictures, only rom images. Software to copy and load roms is provided by ACP with the cartridge (please note that you can only copy your own roms for your own use). You can copy cartridges as well to save you plugging and unplugging them whenever you want to use them.

You don't need ACP's Advanced Rom Manager but, it is a useful toolkit to have around when you've got sideways ram. You'll find an article showing the many uses of sideways ram in the February 1986 issue of *Electron User*.

ACP's E00 DFS is the same as used in the Plus 4. If you are buying a 5.25in drive ask for it to be set as drive 1. You can set it yourself but it involves opening the case (invalidating your warranty) and either removing one of the chips or altering a DIP switch.

Shape shading

I HAVE owned an Electron for nearly three years now and ever since I started collecting Electron User *my Basic programming has improved tremendously.*

I have been trying to find a program that fills in objects of any shape, I know that PLOT 85 fills in triangles and I have a program that draws filled in circles and squares but, I cannot find a program to fill in an object of any shape. Can anyone help me with this? – **James Siddle, Merston, W.Yorks.**

● You'll find fill routines in the March 1985 and July 1986 issues of *Electron User*. Most shapes can be drawn using several triangles joined together using PLOT 85. In fact, this is how your circles and squares are drawn.

Plus 4 software

DUE to the lack of software available on disc for the Acorn Electron and ACP Plus 4, I feel I must draw all Plus 4 users' attention to the only way in which we will ever receive disc software:

We must all club together and write or phone the major software companies such as Superior Software and Tynesoft to bring to their attention that there is a profitable market in Plus 4 disc software.

I am afraid it is beyond me how the Plus 3 is considered to be a worthwhile market when it is inferior to the greater compatibility and ease of use that the Plus 4 offers.

I have already approached ACP on this issue and I hope that they will be able to give professional guidance and help to those who buy their goods.

When I phoned Superior they told me not enough people seemed to want Plus 4 disc software. If a time comes when there is sufficient demand they would consider it carefully.

Come on all Plus 4 owners, put pen to paper or mouth to phone and show the big software companies what an important part of the market we are. – **Paul Scranage, Leicester.**

Escape codes

I HAVE had my Electron for about 18 months now and in the beginning bought Electron User *at the newsagent. But since April of 1986 I have had the magazine sent direct because it is such good value for money and I like to receive it as early as possible.*

Many of the articles I have read have certainly saved me hours of pondering what to do over a problem.

However, one problem I could not find a solution to in the magazine was what was meant in my Centronic printer's manual by those print codes that started ESC. For instance, ESC E n.

I did finally manage to work out that ESC was

Turn to Page 48 ▶

Beginner's blues

NO such line at one two five,
Out of room! What is this jive?
Bad command? Too many FORs?
Type mismatch? What is the cause?
String too long! Patience getting short,
Not as easy as I first thought,
This programming lark's hurting my head,
Think I'll play a game instead.
Out with the tapes, Snapper or Hopper?
One thing's for sure, I'll come a cropper!
Goodbye Mistake, farewell Bad MODE,
Just got to wait for the game to load.
But what's this I see, oh horror, oh shock,
A Rewind tape and a Data and Block!
I throw up my arms in bitter dispair,
And give the screen an angry glare.
Enough I cry. That's it I blub,
I'm off to find a friendly pub!
– **M.Hopewell, Nottingham.**

◀ From Page 47

CHR$(27), which is mentioned in the VDU code table in the Electron hand book as reserved.

Finally, I have become a video camera buff and I am looking for a titling program for my Electron, (there are programs available for the Spectrum and the Commodore 64). Can anyone help me? – **D.G.W. Rance, Eltham, London.**

● ESC E n means the Ascii escape code 27, the Ascii code for E and a number n. To send these codes to the printer enter:

```
VDU 2,1,27,1,ASC"E",1,n,3
```

The 2 at the start switches the printer on and the 3 at the end switches it off. The printer codes in between are directed to the printer port by preceding them with a 1.

Coffee tip

I RECENTLY wrote that part three of the View tutorial would be the best. My hopes were justified. Part three is one of the best pieces of utility software and it compliments View in a very professional way.

I didn't like the suggestion of building up a dictionary as mentioned in part three and thought of using previous listings I had already typed in. The obvious one was an early program found in the March 1984 issue of Electron User *– Coffee.*

*The problem was how to use it. The Plus 3 user guide provides the answer. Take the Coffee listing and delete all but the data. This can be *SPOOLed to disc and you now have a View file that you can use to build a dictionary.* – **A.Osborne, Hadfield, Cheshire.**

Spelling Checker tips

THANK you for publishing the View Spelling Checker in the May 1987 issue of Electron User. *One problem I met was that if you have a file that you want to check on a separate disc from your dictionary you can't change disc. To overcome this just add these lines:*

```
215 INPUT"Change disc and
press RETURN":*MOUNT
475 INPUT"Change disc and
press Return":*MOUNT
```

Another problem is that you can't list the dictionary, so I wrote a lister program. When run use Control+Shift to pause. At the end you will be told how many words there are.

```
  10 REM Dictionary Lister
  20 REM By W.Buttigieg
  30 MODE 6
  40 ON ERROR REPORT:PRINT
"!":VDU13,10:PRINT"Press an
y key to restart":REPEAT UN
TIL GET:RUN
  50 PRINT"What is the nam
e of the dictionary";:INPUT
 A$
  60 T=0:OSCLI"EXEC "+A$
  70 T=T+1
  80 VDU 1:INPUT B$:IF B$<
>"*" GOTO 70
  90 PRINT""""There are "
;T-1;" words in the diction
ary.":END
```

I have been buying Electron User *for almost a year now and think it is brilliant. Well done!* – **Wayne Buttigieg, Staines, Middlesex.**

● You can also *LIST the dictionary to check and count the entries.

This command is built in to the DFS but ADFS users will find this utility on the Welcome disc. Alternatively you can simply load the dictionary into View and read at your leisure.

There were a couple of minor errors to look out for in this program. Firstly our printer had a breakdown and all the underline characters were accidentally printed as minus signs.

Luckily they are quite easy to spot and most readers managed to get the program running. Secondly, always end your View file with a blank line or two as the last byte of the file is missed.

DIP switch settings

WITH any program involving printing I have to type:

```
*FX6,0
```

If possible I include it at the beginning of a program and this I did for Wimps. However, when printing out notepad (PROCprint), the text was all jumbled up on one line with no line feed though printing out a card was alright.

After experimenting with PROCprint I altered line 960 from VDU 13 to VDU 10 and the printout was then ok. Was the VDU 13 an error or is there a better solution to my problem?

Thank you for a very compact and versatile utility. – **N. Gill, Camberley, Surrey.**

● Wimps works fine with our Epson FX-80 printer so it sounds like yours is not quite Epson compatible. You may be able to solve the problem by setting one of the DIP switches in the printer so that it accepts carriage returns. You'll have to look up the position and switch number in your manual.

***WHAT would you like to see in future issues of* Electron User?**

What tips have you picked up that could help other readers?

Here is your opportunity to share your experiences.

Remember that these are the pages that you write yourselves. So tear yourself away from your Electron keyboard and drop us a line.

The address is:

Micro Messages
Electron User
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY.

Adventure tip

MANY BBC Micro Adventures run on the Electron, particularly when using the Slogger Master Ram Board in 64k mode. The appearance of the text is however, often spoilt by Mode 7 control characters which appear in Mode 6 as unsightly random characters.

These can be removed by chaining this 'cleanup' program before loading the adventure.

```
  10 REM Cleanup
  20 WRCHV=&20E
  30 FOR opt%=0 TO 3 STEP3
  40 P%=&900
  50 [ OPT opt%
  60 .init
  70 LDA WRCHV
  80 STA ret_vec
  90 LDA WRCHV+1
 100 STA ret_vec+1
 110 LDX #intrcpt AND &FF
 120 LDY #intrcpt DIV &100
 130 SEI
 140 STX WRCHV
 150 STY WRCHV+1
 160 CLI
 170 RTS
 180 .intrcpt
 190 CMP #128
 200 BMI exit
 210 LDA #32
 220 .exit
 230 JMP (ret_vec)
 240 .ret_vec
 250 EQUW 0
 260 ]
 270 NEXT
 280 CALL init
```

I would be interested to hear from any Electron owners in the North London/Herts area. I use a Plus 1 with an AP4 disc interface and would be interested to compare notes with any Plus 3 disc users. – **D.Aulton, 5 Lynford Gdns, Edgeware, Middx, HA8 8TX**

Front page news

I WOULD like to redefine one of the keys on the Electron to make it function as a Tab key. I have tried using:

```
*KEY1 VDU 9
```

but have had no success. I want to do this so that I can use Fleet Street Editor. This program is written for the BBC Micro and uses the Tab

key as a toggle.

Apart from this it appears to work, but of course may have other problems which I have yet to discover. I hope you can help. – **Neil McLean, Edinburgh.**

● The Tab key on the BBC Micro produces Ascii code 9. This is the same as pressing Control+I on the Electron, (I is the ninth letter of the alphabet). If this doesn't work try redefining a function key:

```
*KEY9 !I
```

However, this may still not work as the program could be looking at the hardware directly using a negative inkey value. In this case nothing can be done.

Printer interfaces

I AM the owner of an Electron and want to attach a printer to it. Could you please tell me what is needed to do this, and perhaps at the same time advise me on a book that will expand my vocabulary to include computer speak. – **D. Binting, Birch Vale, Cheshire.**

● The Electron hasn't got a printer port so you'll have to buy an interface such as the Plus 1 or Rombox Plus. Make sure the printer has a Centronics interface, and you'll need a printer lead as well.

There are many books available for the novice – have any readers found a particularly good one? Trevor Roberts' excellent Basics series which started in the September 1986 issue of *Electron User* is aimed at the beginner and explains many of the terms used in programming.

Musical Micro

AFTER some pathetic attempts to make music on my Electron I wondered whether it is possible to change the rather dull bleep created by the machine into something a bit more interesting.

The user guide only mentions changing sounds using the ENVELOPE command, but this appears to make only 'police car' noises.

I have heard much more impressive sounds on the BBC Micro and would like to know if the Electron can produce anything like these. – **Henry Doyle, Leigh-on-Sea, Essex.**

● The Electron has only one sound channel compared with three on the BBC Micro so is at a disadvantage when it comes to producing music.

It is possible to create some super sound effects for games and some pleasing single channel music. Keyboard Player in the February 1987 issue of *Electron User* will help you compose, record and playback music.

Praise and passwords

WELL DONE Superior Software! I am of course referring to the brilliant new compilation Superior Hits Volume 3.

I was given a Plus 3 disc drive for Christmas and was pleased when I received news that Superior Software was thinking of converting some Electron games on to 3.5in disc and rushed my order off.

I am delighted with it. I think that Gary Partis – author of Syncron and Psycastria, is fab! I hope to see more games on disc for the Electron from Superior in the near future, including Strykers Run.

Thanks for a great magazine. I look forward to getting it every month and sit and read it for hours.

I have also completed Tynesoft's The Big KO. Here are the eight passwords: SWITCH, POSTER, GUNSTAR, LOGICAL, SPIKE, JOHNBOY, WINDOW, START. – **David Cox, Skelton, Yorks.**

Tuned in to interference

I HAVE owned an Electron for a couple of years, but I have a problem. Whenever I use it lines of about one inch flicker across the screen. I have tried the computer with two televisions, but the display is the same.

A television engineer said it was radar blips. This couldn't be the reason because I've tried my computer at a friend's house and it works perfectly.

The computer has been checked twice and no fault has been found. I also own a Spectrum and this also has the same lines on screen. Is it anything to do with the electricity?

I have heard that the Music 500 works with the Electron using one of ACP's interfaces. Is this true? When can we expect the price of the Electron to rise as I paid £200 for mine?

I know someone who has Acornsoft's GXR rom for the BBC Micro. The front cover of the user guide says "For the BBC and Acorn Electron". On page 99 of the Electron user guide the PLOT statements 96-255 are reserved for the graphics extension rom. Where can I get one? – **Stuart Sharp, Brighton, Sussex.**

● As your Electron works perfectly at your friend's house it is safe to assume that it is ok and that the fault lies elswhere. Your Spectrum also displays the same fault so it looks like either the computers or your televisions are picking up interference.

It could be the mains – there are adaptors which fit into the mains socket that suppress mains interference – but it could also be a neighbour with a powerful CB radio.

At the last Manchester Electron and BBC Micro user show Advanced Computer Products demonstrated the Music 500 working with an Electron and Plus 5. Contact ACP for details.

We hope the Electron doesn't rise in price. At just over £60 it is excellent value for money and you can't find a better micro for the price.

We tried Acornsoft's GXR rom when it was first released and unfortunately, it didn't work in an Electron. There are other roms available that will give you some of the extra commands provided by GXR for instance, Vine Micros' Addcomm and Slogger's Stargraph.

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

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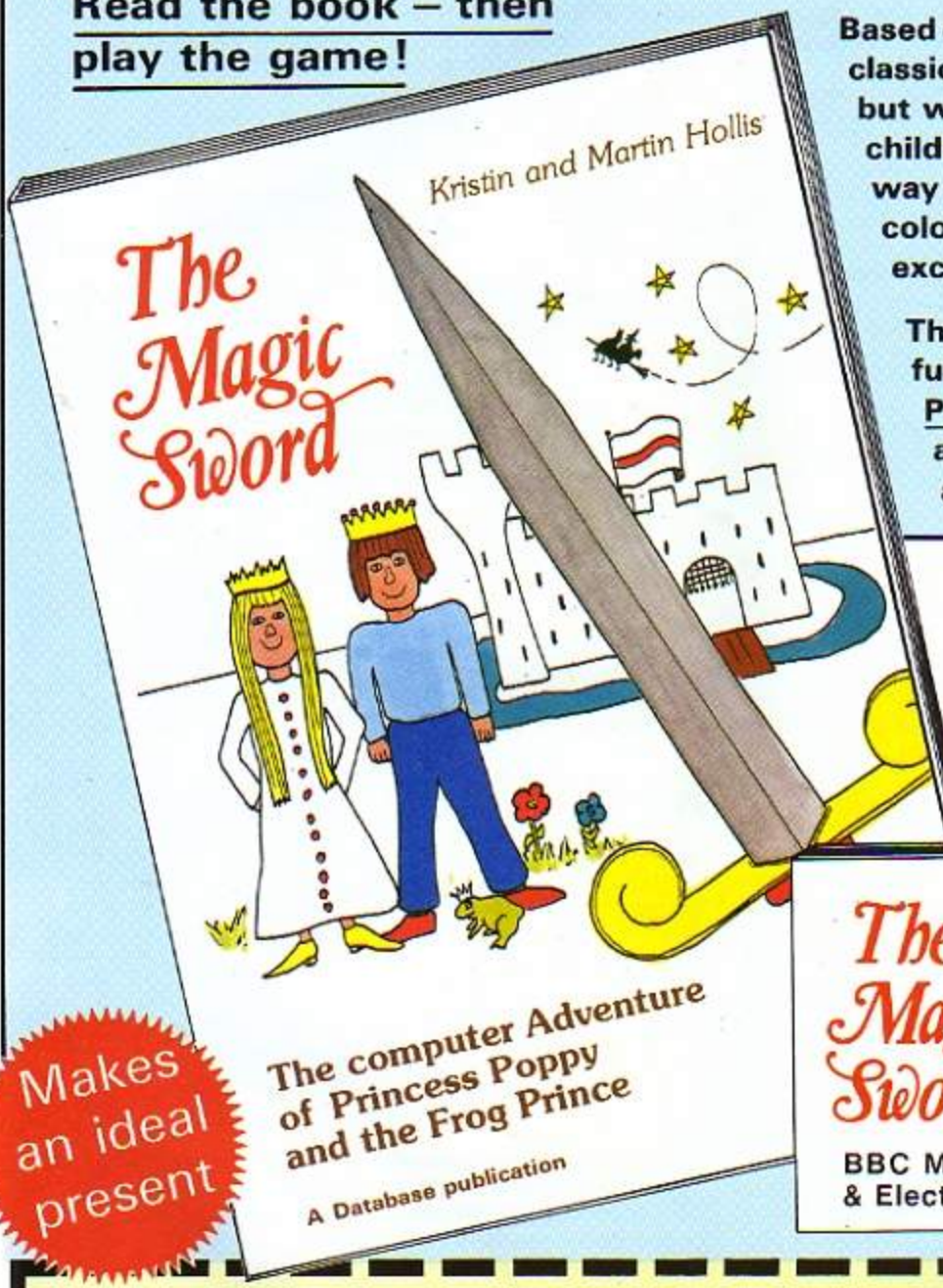

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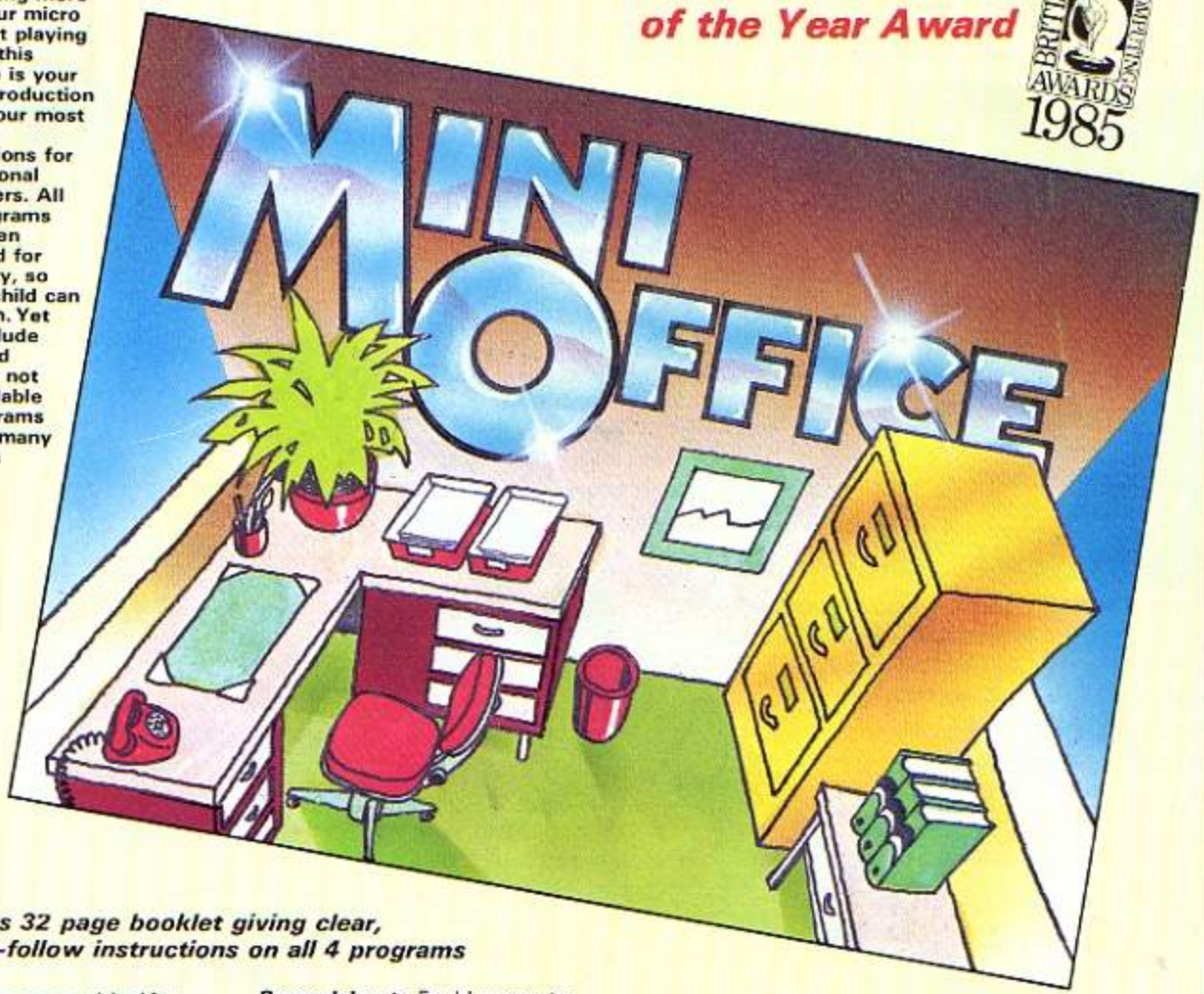

Contains 32 page booklet giving clear, easy-to-follow instructions on all 4 programs

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Spreadsheet: Enables you to use your micro for home accounts or pocket money records. It creates a display of numbers in rows and columns. Continuous updating is possible, and a changed figure can be instantly reflected throughout the rest of the spreadsheet. Your results can be saved, to be used for future updates, or can be fed into its associated program . .

Graphics: Part of the spreadsheet section, it lets you draw bar charts, pie charts and histograms to give a graphic presentation of your statistics. Helps to give life and colour to the dullest figures!

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TO ORDER TURN TO THE FORM ON PAGE 53

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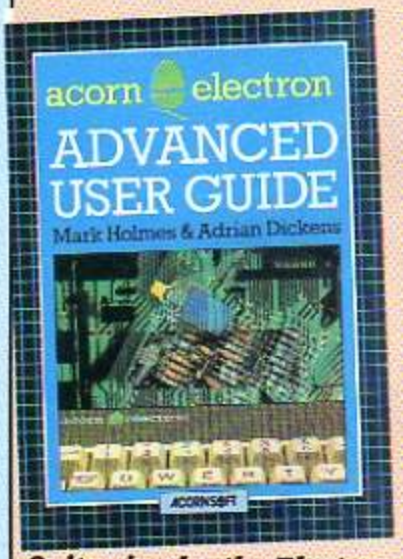

This detailed guide to the Electron's operating system is a must for every serious Electron user. In its information packed pages you'll find:

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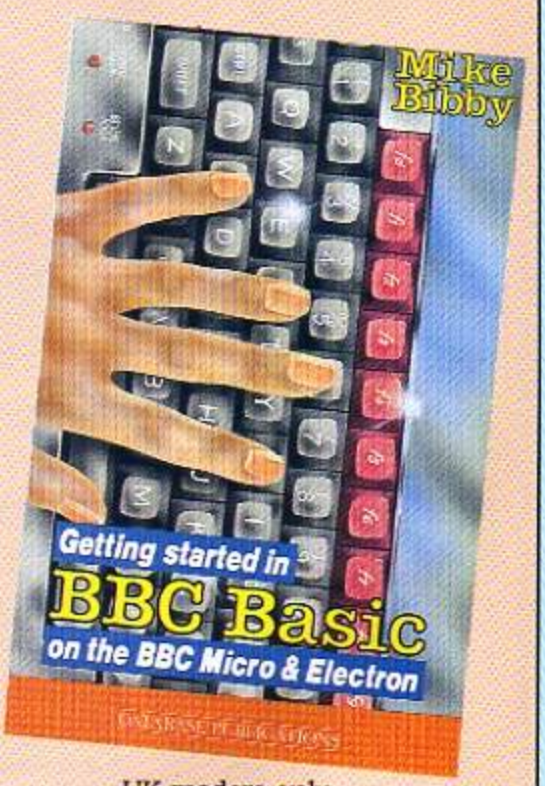

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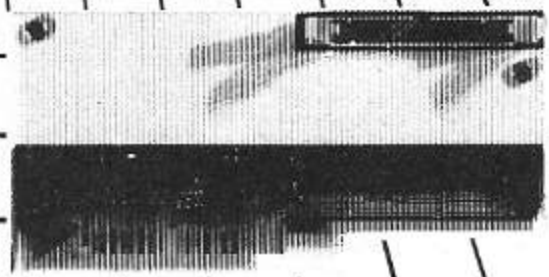

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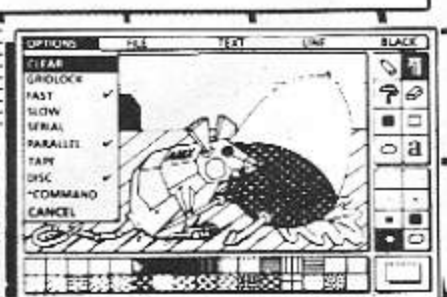

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Part II

Building up from the atoms

ROLAND WADDILOVE explains the predicate functions in Part II of his guide to Lisp programming

LAST month I introduced you to Lisp, the language of artificial intelligence. This unusual and quite old language is widely used, particularly on large mainframe computers.

We saw that Lisp is a LISt Processing language used to manipulate symbols and lists of symbols.

This makes it ideal for programs designed to deal with the complexities of language and speech. Written languages are after all, merely lists of symbols.

Let's start by looking at a group of commands called predicates. These are simply Lisp's way of asking questions and are used to discover the nature of symbols and lists.

The sort of questions we can ask are whether something is true or false. Lisp will reply T for true and NIL for false. There are many built-in commands to ask questions and you can add your own if you need more as we'll see in next month's article.

The two most fundamental concepts in Lisp are the atom and the list. As you might expect there are commands which will tell whether a particular object or item of data is an atom or list.

Plug your cartridge in or load Lisp from tape and enter:

```
(ATOM 'fred)
```

and you'll see Lisp reply T to this question. Lisp asked: "Is this item an atom?" and the T indicates that *fred* is indeed an atom. The single quote before *fred* tells Lisp to take the word literally. It simply means the characters *f r e d* and nothing more.

Similarly we can test for lists with:

```
(LISTP (fred))
```

and Lisp replies T – the answer to the question "Is this thing a list?" is True.

There are two important points to notice: A list is something enclosed by brackets and an atom is a single word (or number). LISTP ends with a P indicating that it is a predicate. But not all predicates end in P – ATOM doesn't as we've seen.

Try switching these two questions around:

```
(ATOM '(fred))
(LISTP 'fred)
```

and check that NIL is printed each time.

Now that we can distinguish between an atom and a list, let's move on to look at the contents of lists.

Two of the most common functions in Lisp S-expressions (syntactically correct expressions), are CAR and CDR. Last month we saw that CAR gave us the first item in a list and CDR gave us what is left after taking away the first-item. So:

```
(CAR '(a b c))
```

is the atom *a*. We can prove that it's an atom with:

```
(ATOM (CAR '(a b c)))
```

which asks "Is the first item of the list (*a b c*) an atom?". In this case the answer is T. However, try this:

```
(ATOM (CAR '((a)(b)(c))))
```

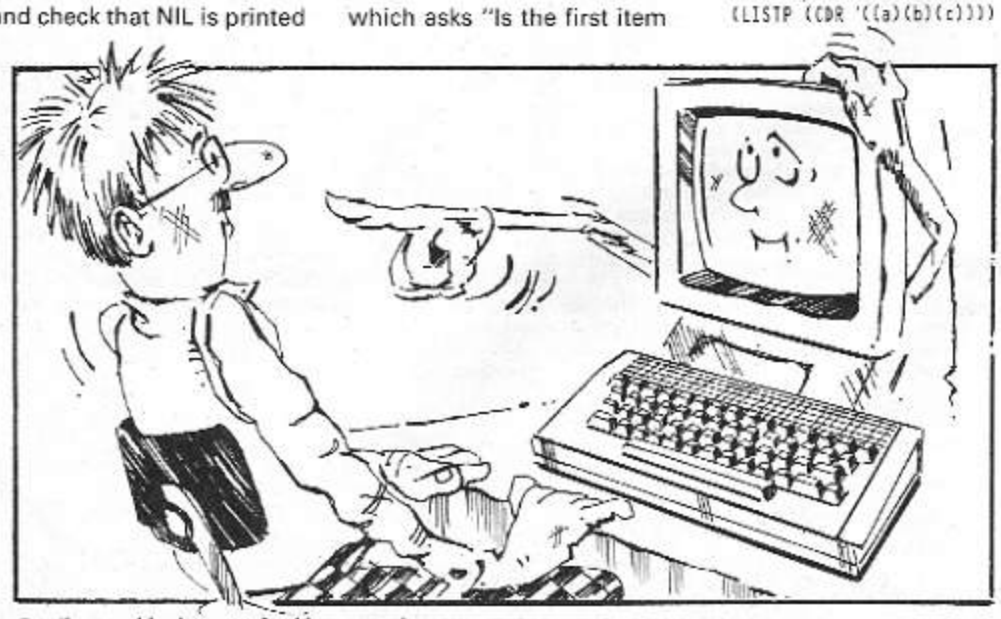
and the answer is NIL. That's because the first item is the list (*a*). Prove this with:

```
(LISTP (CAR '((a)(b)(c))))
```

and the answer Lisp prints is T.

Is the CDR of a list an atom or a list? We can use the same S-expressions as before but this time replacing CAR with CDR. Enter:

```
(ATOM (CDR '(a b c))
(LISTP (CDR '(a b c))
(ATOM (CDR '((a)(b)(c))))
(LISTP (CDR '((a)(b)(c))))
```



Predicates: Lisp's way of asking questions

```
LISP

Evaluate : (ATOM (CAR '(a b c)))
Value is : T
Evaluate : (NULL '())
Value is : T
Evaluate : (SETQ x 'Hello)
Value is : Hello
Evaluate : (SETQ y '(This is a list))
Value is : (This is a list)
Evaluate : (CAR y)
Value is : This
Evaluate : (CONS x y)
Value is : (Hello This is a list)
Evaluate :
```

Try replacing the list (*a b c*) with some of your own and confirm that CDR always results in another list. It can never give an atom.

A list need not have any items at all and () is a valid list – called a NULL list. NULL is in fact a question and can be used to ask "Is this item a NULL list?". The result is either T or NIL. You can see this with:

```
(NULL '(eggs and bacon))
(NULL '())
(NULL '(()()()))
```

Notice that the last S-expression is NIL – it is a list of NULL lists as:

```
(NULL (CAR '(()()())))
```

shows.

There are more predicates acting on lists, but for the moment we'll take another look at atoms. Remember that an atom is an item not enclosed by brackets. So *fred, jim*, 57 and -4 are all atoms.

How can we tell whether an atom is a number or a string of characters? As we've seen ATOM tells us when we have an atom and LISTP when we have a list so you can probably guess that NUMBERP tells us when we've got a number. CHARP, (not CHARACTERP) tells us when we've got a string of characters:

```
(ATOM 57)
(NUMBERP 57)
(ATOM 'fred)
(CHARP 'fred)
(CHARP 57)
(NUMBERP 'fred)
```

Notice that numbers don't need a quote in front of them. That's because we can let Lisp evaluate a number. The value of the atom 57 is 57. But *fred* hasn't got a value so the quote prevents Lisp from evaluating it.

Can you guess what MINUSP, ZEROP and ONEP do? The P indicates that they are predicates – they ask questions which have either true or false answers. MINUSP tests for negative numbers, ZEROP tests for zero and ONEP tests for one. Enter:

```
(MINUSP 256)
(MINUSP -12)
(ZEROP 5)
(ZEROP 0)
(ONEP 1000)
(ONEP 1)
```

Finally GREATERP and LESSP take two arguments and test whether the first number is larger or smaller than the second:

```
(GREATERP 5 6)
(GREATERP 574 263)
(LESSP 5 6)
(LESSP 574 263)
```

Let's pause for a moment and examine how Lisp handles variables. Unfortunately, Lisp uses variables in a totally different way to Basic. That means you must forget everything you've learnt when programming in Basic.

Lisp uses SETQ to give an identifier a value. In other words, we can give a variable name an associated value. For instance, to set *x* equal to 5 and *y* equal to six:

```
(SETQ x 5)
(SETQ y 6)
```

Prove that they do actually have these values by entering:

```
x
y
```

A point worth noting is that Lisp evaluates each S-expression when you enter it and the value is printed out. So when you enter:

```
(SETQ fred 546)
```

Lisp evaluates this and tells you that it is equal to 546. This property can be used to set one variable equal to another and is quite commonly found in Lisp programs. For instance, to set *x* and *y* equal to 10 we could use:

```
(SETQ x (SETQ y 10))
```

Lisp always evaluates the innermost bracket first so *y* is set to 10 by the inner SETQ. The value of this S-expression is 10 so *x* is set to 10 by the outer SETQ.

That takes care of numeric variables, but what about strings? These are in fact handled in exactly the same way as numeric variables and we can use SETQ with any value:

```
(SETQ x 'Hello)
(SETQ y '(This is a list))
```

Don't forget the single quote and if there is more than one word enclose the string in brackets making it a list. You can test these two assignments by entering *x* and *y* as before. Lisp will evaluate them and print the result.

Now that we can set the value of variables let's put them to good use. If you entered the last example *y* will be equal to (*This is a list*) and the CAR of this should be the atom *This*.

So much for the theory, does it actually work in practice? Enter:

```
(CAR y)
```

and you should see the result *This* printed. We don't want a quote in this example as *y* is a variable and we want Lisp to evaluate it.

Last month we looked at the command CONS which can be used to CONStruct lists. It takes two arguments, an atom and a list and adds the atom onto the head of the list.

Try it with *x* and *y* – we should be able to CONS the atom *x* on to the list *y*. Enter:

```
(CONS x y)
```

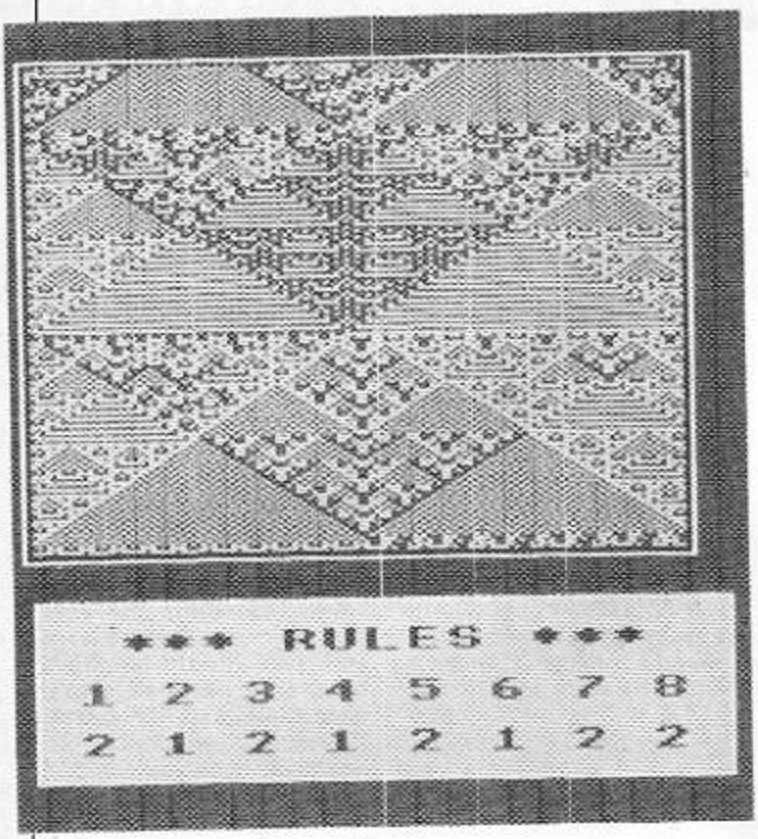
Lisp will tell you that the result of this operation is the list (*Hello This is a list*).

The more you experiment with these simple commands the easier Lisp will become. Try creating some variables of your own using the commands we've learnt so far. Here are a few examples to get you started:

```
(SETQ n1 60)
(SETQ n2 20)
(GREATERP n1 n2)
(SETQ fred '(a list))
(LISTP fred)
(CONS n1 fred)
(CONS n2 (CONS n1 fred))
(ATOM n1)
(NUMBERP fred)
```

If you can follow that lot you're well on your way to becoming a Lisp programmer.

● *That's all for now, there is plenty of material here to keep you occupied until next month when we'll see how to define our own functions.* ■



AUTOMATON

Create fascinating screen displays with ANDREW RICHARDS' scrolling wallpaper

AUTOMATON is an interesting variation on John Conway's mathematical game of Life. It is essentially a simple pattern generator, which is capable of producing some superb wallpaper-like patterns.

Like Life, the patterns are generated by applying a few simple rules to a colony of micro organisms. These single-celled creatures reproduce rapidly, with each new generation bringing out a new pattern.

Each cell is represented by a coloured pixel on the screen and by assigning each new generation of cell a new colour it is possible to create some amazing graphic displays. These represent the growth of the colony from a single cell to a multi-cellular society.

The colony is started by "seeding" it with a few cells.

This can be a set pattern or a random spread. In this Electron version the seed pattern is set, but it can easily be altered by changing the PLOT commands in lines 250 and 260.

Consider a single cell – a coloured pixel on the screen. This can have up to three neighbouring cells occupying the three positions immediately above it as shown in Figure I. Each cell can be one of three types, indicated by its colour – 1, 2 or 3 (0 indicates no cell).

To discover the future of a particular cell we add the colour numbers of the three cells immediately above it. The colours range from 0 to 3 and there are three cells which produces a result in the range 0 to 9.

Ten rules can be drawn up indicating what the outcome is to be (eight can be altered from the main screen).

For instance, if the result is zero then a cell of colour two could be born. If the result is one the cell could be colour three and two might mean that the cell dies out – colour zero and so on.

This process is repeated for each row of cells and the new generation is calculated by examining the previous one. By tinkering with the rules you can generate many different and interesting patterns.

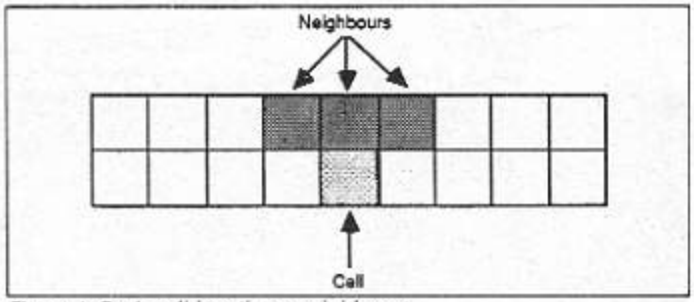


Figure I: Each cell has three neighbours

Run the program and tap the Escape key to start the colony growing. When you've seen enough, tap the Escape key again to clear the pattern. Now try changing the rules by pressing the keys 1 to 8. To see the effect on the colony again press Escape

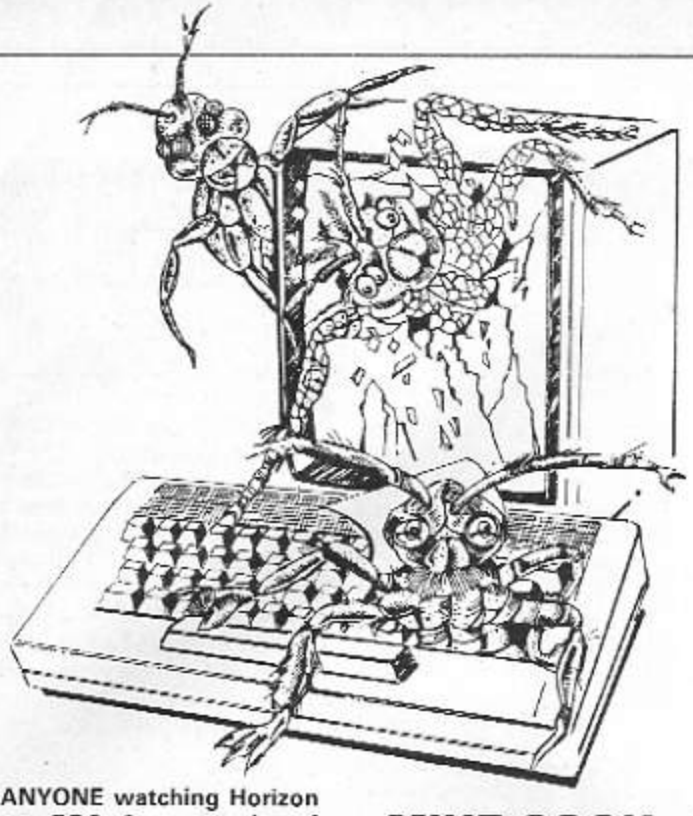
There are many different patterns to generate and it would take a long time if you were to view them all. Experiment with the rules – there are some fascinating screen displays just waiting to be discovered. ■

```
  10 REM Automaton
  20 REM By Andrew Richards
  30 REM (c) Electron User
  40 MODE 6:*FX16
  50 PROCassemble
  60 MODE 5:*FX229,1
  70 PROCinitialise
  80 REPEAT
  90 PROCrules
 100 CALL &900
 110 UNTIL FALSE
 120 END
 130
 140 DEF PROCrules
 150 PROCwindow
 160 *FX178,255
 170 COLOUR 3:PRINT TAB(4,5
)"Press 1 to 8"TAB(4,7)"to s
et rules"
 180 COLOUR 2:PRINT TAB(3,1
5)"Escape  starts"
 190 COLOUR0:COLOUR130
 200 REPEAT K%=GET
 210 IF K%>ASC"0" AND K%<AS
C"9" K%=K%-48:table?K%=(tabl
e?K%+1)MOD 4:PRINT TAB(1+K%*
2,28)CHR$(table?K%+48);CHR$7
 220 UNTIL K%=27
 230 *FX178
 240 PROCwindow
 250 GCOL 0,3:MOVE 128,956:
PLOT 1,128*8-8,0
 260 GCOL 0,2:PLOT 69,640,9
56
 270 ENDPROC
 280
 290 DEF PROCwindow
 300 COLOUR128:VDU26,28,2,2
0,17,2,12,26
 310 ENDPROC
 320
 330 DEF PROCinitialise
 340 VDU23,1,0;0;0;0;
 350 VDU23,224,170,85,170,8
5,170,85,170,85
 360 COLOUR129:CLS
 370 GCOL 0,2:DRAW 0,1023:D
RAW 1278,1023:DRAW 1278,0:DR
AW 0,0
 380 COLOUR1:COLOUR128:FOR1
%=1 TO 19:PRINTTAB(1,I%)STR1
NG$(16,CHR$224):NEXT
 390 FOR I%=22 TO 26:PRINTT
AB(1,I%)STRING$(17,CHR$224):
NEXT
 400 VDU28,2,29,18,23:COLOU
R130:CLS
 410 GCOL0,3:MOVE 128,32*9:
PLOT 1,64*17,0:PLOT 1,0,-32*
7:PLOT 1,-64*17,0:PLOT 1,0,3
2*7
 420 COLOUR0:PRINTTAB(2,1)"
*** RULES ***"
 430 COLOUR1:PRINTTAB(1,3)"
1 2 3 4 5 6 7 8"
 440 COLOUR0:PRINTTAB(1,5)"
2 1 2 1 2 1 2 1"
 450 VDU 24,120;400-60;112+
130*8;960;:CLG:VDU26
 460 GCOL0,3:MOVE 112,964:D
RAW 120+130*8,964:DRAW 120+1
30*8,400-60:DRAW 112,400-60:
DRAW 112,964
 470 ENDPROC
 480
 490 DEF PROCassemble
 500 x%=&50:y%=&52
 510 count=&54
 520 Lcount=&55
 530 byte=&56
 540 loop_counter=&57
 550 Yreg=&58
```



```
 560 color=&59:!&59=&11001
00
 570 Xreg=&60
 580 table=&90:!table=&0201
0201:table!4=&02010201:table
!8=&0101
 590 pcol=&359
 600 FOR pass=0 TO 2 STEP 2
 610 P%=&900
 620 [OPT pass
 630 SEI
 640 .start
 650 JSR scroll
 660 JSR decode
 670 JSR generation
 680 LDX &F4:LDA #8:STA &F4
:STA &FE05:LDA &9FFF:STX &F4
:STX &FE05
 690 AND #1:BEQ start
 700 CLI
 710 RTS
 720
 730 .generation
 740 LDA #(&5820+2+&140)MOD
256:STA screen+1
 750 LDA #(&5820+2+&140)DIV
256:STA screen+2
 760 LDY #0:LDX #0
 770 .loop
 780 STX Xreg
 790 LDA #0:CLC
 800 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
 810 LDA table,X:TAX:LDA co
lor,X:ASL A:STA byte
 820 INY
 830 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
 840 LDA table,X:TAX:LDA co
lor,X:ORA byte:ASL A:STA byt
e
 850 INY
 860 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
 870 LDA table,X:TAX:LDA co
lor,X:ORA byte:ASL A:STA byt
e
 880 INY
 890 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
 900 LDA table,X:TAX:LDA co
lor,X:ORA byte
 910 INY
 920 LDX Xreg
 930 .screen STA &6000,X
 940 TXA:CLC:ADC #8:TAX:BNE
loop
 950 RTS
 960
 970 .decode
 980 LDA #(&5821+2+&140)MOD
256:STA addr+1
 990 LDA #(&5821+2+&140)DIV
256:STA addr+2
1000 LDY #0:STY pixel
1010 .loop
1020 .addr LDA &6000:STA by
te
1030 LDA #4:STA Lcount
1040 .loop2
1050 INY
1060 LDA byte:LDX #0
1070 AND #&88:BEQ ink
1080 INX
1090 CMP #&08:BEQ ink
1100 INX
1110 CMP #&80:BEQ ink
1120 INX
1130 .ink
1140 TXA:STA pixel,Y
1150 ASL byte
1160 DEC Lcount:BNE loop2
1170 CLC:LDA addr+1:ADC #8:
STA addr+1:LDA addr+2:ADC #0
:STA addr+2
1180 CPY #128:BCC loop
1190 LDA #0:STA pixel+1,Y
1200 RTS
1210
1220 .scroll
1230 LDA #(&5827+2*&140)MOD
256:STA old+1:STA new+1
1240 LDA #(&5827+2*&140)DIV
256:STA old+2:STA new+2
1250 DEC old+1
1260 LDX #19*8
1270 LDY #0
1280 .loop
1290 .old LDA &5800,Y
1300 .new STA &5800,Y
1310 TYA:CLC:ADC #8:TAY
1320 BNE loop
1330 LDA old+1:AND #7:BNE n
ot_bottom
1340 SEC:LDA old+1:SBC #&39
:STA old+1:LDA old+2:SBC #&1
:STA old+2
1350 DEC new+1
1360 DEX:BNE loop:RTS
1370 .not_bottom
1380 DEC old+1
1390 LDA new+1:AND #7:BNE n
ot_bot
1400 SEC:LDA new+1:SBC #&39
:STA new+1:LDA new+2:SBC #&1
:STA new+2
1410 DEX:BNE loop:RTS
1420 .not bot
1430 DEC new+1
1440 .next
1450 DEX:BNE loop:RTS
1460
1470 .pixel EQUS STRING$(14
0,CHR$0)
1480 ]
1490 NEXT
1500 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 53.



Electronic evolution with the biomorphs

MIKE COOK, doing his best to improve on nature

ANYONE watching Horizon on BBC 2 a couple of months back about Darwinian evolution could not fail to be impressed by the simulated evolution of the little figures known as biomorphs.

I was so taken by it that I laid down my soldering iron and started to program my own version for the Electron.

The principles of the simulation are explained in chapter 3 of Richard Dawkins' book The Blind Watchmaker. He demonstrates that dramatic large scale development of organisms may be achieved by the accumulation of numerous small changes.

The appearance of any creature is determined by its genes which are passed on to its offspring to produce near identical creatures. However, every so often one of the genes mutates or changes slightly resulting in a significantly different creature.

If this creature has a slightly increased chance of survival then it will prosper and an increasing number of the population will carry the same gene pattern. Eventually the whole of the population may contain the same gene types.

In our computer simulation, to save time, each offspring acquires one mutated gene from its parents.

We can then choose the child to breed from for the next generation. This is more like selective breeding than natural selection, but if you equate the ability to please the selector with chances of survival, then it amounts to the same thing.

The small creatures in the simulation, christened biomorphs by Dawkins, are controlled by six genes. In Dawkins' original simulation there were nine, but the display and memory constraints on the Electron necessitate a little simplification.

The basic shape is a simple bifurcating tree drawn by a recursive procedure and each gene controls some aspect of the drawing – shown in Table 1.

It is not important to understand what the genes do. In fact it could be considered to be an undue influence on your selection. However, the way colour is handled does need a little explanation.

Each biomorph is basically two coloured and at each level of recursion the colour number is incremented by some fraction depending upon a gene value.

At an incremental value of one the colour changes every recursion level so if this increment is small the biomorph might not change colour at all.

Another gene controls the two colours actually displayed on screen.

When this mutates a third colour, selected at random, can be substituted in place of any one of the colours used.

Due to the limitations on the number of colours that can be displayed on a Mode 1 screen, this third mutated colour is also used for drawing the boxes and labelling the biomorphs. The two colours of the biomorph may well map to the same displayed colour, in which case the creature will be of a single colour.

When you run Biomorphs you are invited to choose the starting position for your evolution. The choices are a microbe, where all the gene values are set close to the minimum, a random point chosen close to the minimum values or some pre-set point.

Using this last option you can continue breeding from where you left off if you have made a note of the gene values.

At the centre of the screen is the parent biomorph and in the 12 surrounding boxes are the mutated offspring. Each mutation contains only one gene different from its parent.

There are twelve offspring because each of the six genes can change by a positive or negative increment. Note that they all look very similar – there will only be slight differences between them. In fact, at the smaller sizes these differences might not be discernible.

The gene values are extremely interdependent and all their effects grow with increasing complexity.

You will be invited to choose an offspring from which to breed the next generation and this can be selected by pressing any key from A to L. If any other key is pressed the value of the parent's genes will be printed and the parent will be drawn.

There is nothing in the program to stop the biomorphs growing out of their boxes but this can be prevented by the appropriate selection of offspring to breed from.

Many creatures or shapes

Gene	Function
0	Depth of recursion used.
1	Basic size of line.
2	Branching angle.
3	Branching angle incremented at each new level of recursion.
4	Colour incremented at each new level of recursion.
5	Displayed colour.

Table I: The genes

can be evolved. One simple one is shown in the screen dump in Figure I. It is fun to give your creations names – I call these Bumble Bees.

You are not restricted to biological shapes, however; you can get a very good likeness to small space invader creatures or space ships.

This is a program that can be extensively tinkered with; the gene maximum, minimum and increments are all contained in data statements and can be easily altered. You could also include a feature to record the progress (gene values of each generation parent) of your creatures on disc file or printer.

In a sense, as Dawkins points out, you are not creating the creatures but discovering them. However, as the number of possible creatures is so large that the two processes become very similar.

The program as printed is capable of generating 120,736,980 shapes which, if you could view them at the rate of one per second, would take you just over 3.8 years to see them all – so get cracking!

Figure I: Bumble Bees

Biomorphs listing

```
   10 REM Biomorphs
   20 REM By Mike Cook
   30 REM (c) Electron User
   40 MODE 1:*FX16
   50 DIM morph(5,12),parent(5
)
   60 DIM GI(5,2),PX(12),PY(12
)
   70 REM Read in increments
   71 REM & limits of genes
   80 RESTORE 130
   90 FOR A%=0 TO 2
  100 FOR B%=0 TO 5
  110 READ GI(B%,A%)
  120 NEXT:NEXT
  125 REM Gene increments
  130 DATA 1,4,0.16,0.16,0.1,0
  135 REM Gene min
  140 DATA 1,-36,-3.14,-3.14,0
,64
  145 REM gene max
  150 DATA 9,36,3.14,3.14,1,10
23
  160 PROCINTPOS
  170 PROCINTP
  180 gn%=0
  190 CLS:*FX178
  200 REPEAT
  210 gn%=gn%+1
  220 PROCmutate
  230 PROCdisplay
  240 PROCchoose
  250 UNTIL FALSE
  255
  260 DEF PROCINTP
  270 IF A$="C" ENDPROC
  280 parent(0)=1
  290 parent(1)=4
  300 parent(2)=0.785
  310 parent(3)=1
  320 parent(4)=1
  330 parent(5)=&1CA
  340 IF A$="A" ENDPROC
  350 FOR A%=0 TO 4
  360 parent(A%)=(RND(7)+1)*GI
(A%,0)
  370 NEXT
  380 parent(0)=RND(3)+1
  390 parent(5)=RND(7)*64+RND(
7)*8+RND(7)
  400 ENDPROC
  405
  410 DEF PROCmutate
  420 FOR B%=1 TO 12
  430 FOR A%=0 TO 4
  440 morph(A%,B%)=parent(A%)
  450 IF (B% MOD 2) D=-1 ELSE
D=1
  460 C=((B%-1)DIV 2)
  470 IF C<>A% THEN 500
  480 IF morph(A%,B%)+D*(GI(A%
,0))<GI(A%,1) OR morph(A%,B%)+
D*(GI(A%,0))>GI(A%,2) THEN 500
  490 morph(A%,B%)=morph(A%,B%
)+D*(GI(A%,0))
  500 NEXT
  510 NEXT
  520 parent(5)=(parent(5) AND
&3F) OR (RND(7)*64)
  530 FOR R%=1 TO 12
  540 morph(5,R%)=parent(5)
  550 NEXT
  560 ENDPROC
  565
  570 DEF PROCdisplay
  580 PROClines
  590 PROCtree(parent(0),paren
t(1),parent(2),parent(3),paren
t(4),parent(5),640,500)
  600 FOR A%=1 TO 12
  610 PROCtree(morph(0,A%),mor
ph(1,A%),morph(2,A%),morph(3,A
%),morph(4,A%),morph(5,A%),PX(
A%),PY(A%))
  620 NEXT
  630 ENDPROC
  635
  640 DEF PROCINTPOS
  650 RESTORE 920
  660 FOR A%=1 TO 12
  670 READ PX(A%),PY(A%)
  680 NEXT
  690 CLS
  710 PRINT TAB(10,2)"COLOUR B
IOMORPHS"
  720 COLOUR2:PRINT"An exerc
ise in Darwinian Evolution"
  740 PRINT"By Mike Cook"
  750 COLOUR3:PRINT"Based on
an idea by Richard Dawkins"
  760 PRINT"Author of The Bli
nd Watchmaker"
  780 COLOUR2:PRINT"Options
to start evolving from:-"
  790 COLOUR1:PRINT"A - A mic
robe."
  800 PRINT"B - Some random p
oint."
  810 PRINT"C - A defined poi
nt."
  820 COLOUR2:PRINT"Press A,
B OR C: ";
  830 A$=GET$:PRINTA$
  840 IF NOT(A$="A" OR A$="B"
OR A$="C") THEN 820
  850 IF A$<>"C" ENDPROC
  860 FOR A=0 TO 5
  870 PRINT"Gene number ";A;"
```

Turn to Page 62 ▶

Biomorphs listing

◀ From Page 61

```
";
  880 INPUT parent(A)
  890 IF parent(A)>GI(A,2) OR
parent(A)<GI(A,1)  PRINT:PRINT
"Values between ";GI(A,1);" an
d ";GI(A,2):GOTO 870
  900 NEXT
  910 ENDPROC
  920 DATA 160,860,480,860,800
,860,1120,860,160,604,1120,604
,160,348,1120,348
  930 DATA 160,92,480,92,800,9
2,1120,92
  940 DEF PROClines
  950 CLS
  960 VDU 23,1,0;0;0;0;
  970 VDU5
  980 PRINT
  990 FOR X=320 TO 960 STEP 32
0
 1000 FOR Y=256 TO 800 STEP 25
6
 1010 MOVE X,0:DRAWX,1023
 1020 MOVE 0,Y:DRAW 1259,Y
 1030 NEXT
 1040 NEXT
 1050 MOVE 640,260:PLOT 7,640,
764
 1060 MOVE 324,512:PLOT 7,958,
512
 1070 FOR A=1 TO 12
 1080 MOVE PX(A)-150,PY(A)-60
 1090 PRINT CHR$(&40+A)
 1100 NEXT
 1110 MOVE 330,322
 1120 PRINT'Parent Biomorph'
 1130 MOVE 330,755
 1140 PRINT'Generation Number
';gn%
 1150 VDU4
 1160 ENDPROC
 1165
 1170 DEF PROCchoose
 1180 VDU5:*FX178,255
 1190 MOVE 330,290
 1200 PRINT'Breed from (A-L) ?
';
 1210 *FX15,0
 1220 A$=GET$
 1230 PRINTA$;
```



```
 1240 C=ASC(A$)-&40
 1250 IF C<0 OR C>12 PROCrevie
w:ENDPROC
 1260 T%=parent(5) DIV 64
 1270 IF C=11 parent(5)=(paren
t(5) AND &38) OR T%:GOTO1320
 1280 IF C=12 parent(5)=(paren
t(5) AND &7) OR (T%*8):GOTO132
0
 1290 FOR A=0 TO 5
 1300 parent(A)=morph(A,C)
 1310 NEXT
 1320 VDU4:*FX178
 1330 ENDPROC
 1335
 1340 DEF PROCreview
 1350 VDU22,1
 1360 PROCtree(parent(0),paren
t(1),parent(2),parent(3),paren
t(4),parent(5),640,300)
 1370 VDU19,3,7;0;
 1390 PRINT""Current BIOmorph
has:-"
 1400 FOR A=0 TO 5
 1410 PRINT'GENE ";A;" VALUE "
;parent(A)
 1420 NEXT
 1430 PRINT TAB(0,30);"Press a
ny key to continue";
 1440 A$=GET$
 1450 gn%=gn%-1
 1460 VDU22,1
 1470 ENDPROC
 1475
 1480 DEF PROCtree(D,L,dA,DT,d
C,CM,X,Y)
 1490 VDU19,1,(CM AND 7);0;
 1500 VDU19,2,((CM DIV 8) AND
7);0;
 1510 VDU19,3,((CM DIV 64) AND
7);0;
 1520 IF A%=11 GCOL 0,3 ELSE G
COL 0,1
 1530 MOVE X,Y
 1540 DRAW X,Y-L
 1550 PROCgrow(PI/2,1+dC,X,Y,D
)
 1560 GCOL 0,3
 1570 ENDPROC
 1575
 1580 DEF PROCgrow(TH,C,X,Y,D)
 1590 LOCAL C%
 1600 IF D=0 ENDPROC
 1610 C%=INT(C) AND 3
 1620 IF C%=3 C%=1
 1630 IF C%=0 C%=2
 1640 GCOL 0,C%
 1650 IF A%=11 AND C%=1 C%=3
 1660 IF A%=12 AND C%=2 C%=3
 1670 GCOL 0,C%
 1680 MOVE X,Y
 1690 dX=L*COS(TH+dA)
 1700 dY=L*SIN(TH+dA)
 1710 PLOT 1,dX,dY
 1720 PROCgrow(TH+dA+DT,C+dC,X
+dX,Y+dY,D-1)
 1730 GCOL 0,C%
 1740 MOVE X,Y
 1750 dX=L*COS(TH-dA)
 1760 dY=L*SIN(TH-dA)
 1770 PLOT 1,dX,dY
 1780 MOVE X,Y
 1790 PROCgrow(TH-dA-DT,C+dC,X
+dX,Y+dY,D-1)
 1800 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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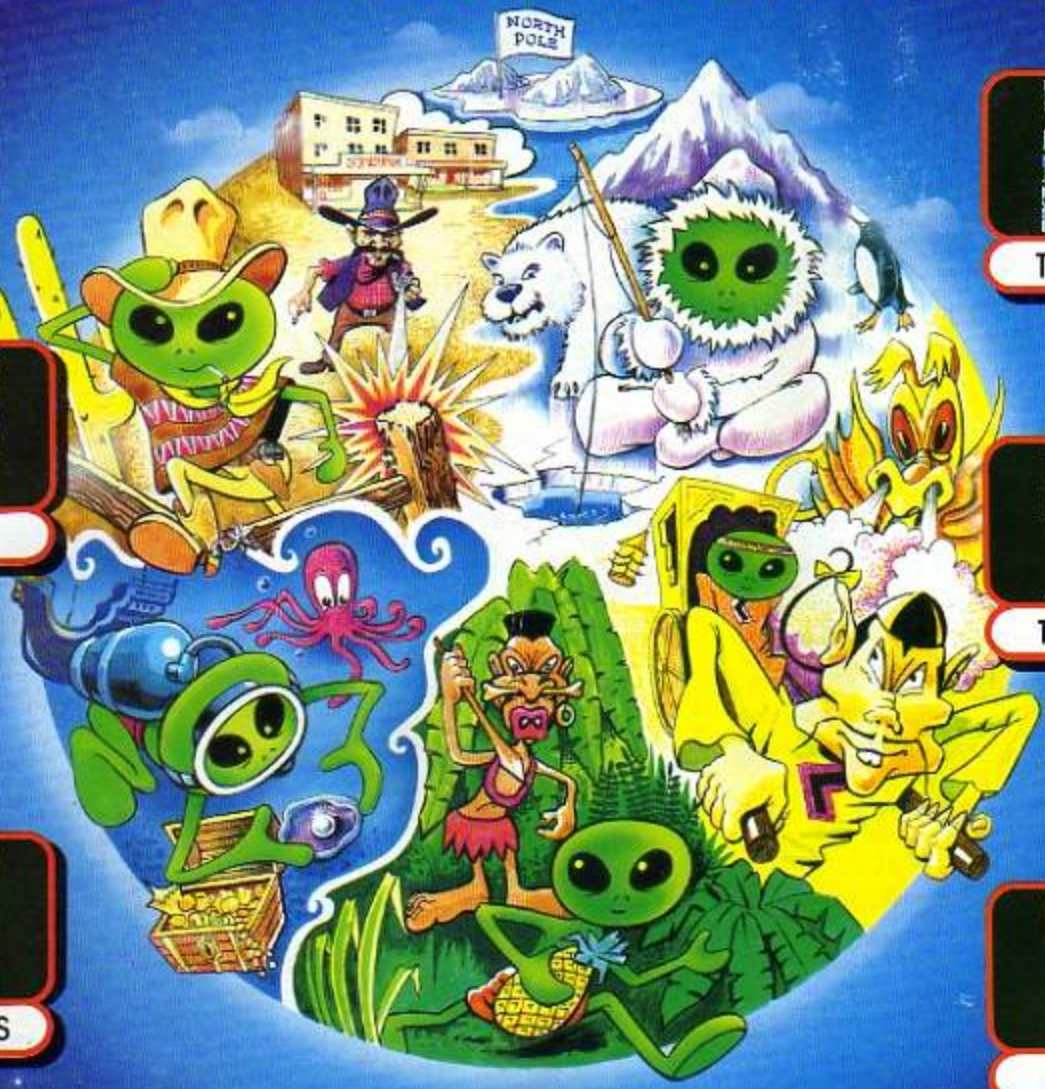
Around the World in 40 Screens

REPTON

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AMERICA


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THE OCEANS


AFRICA

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