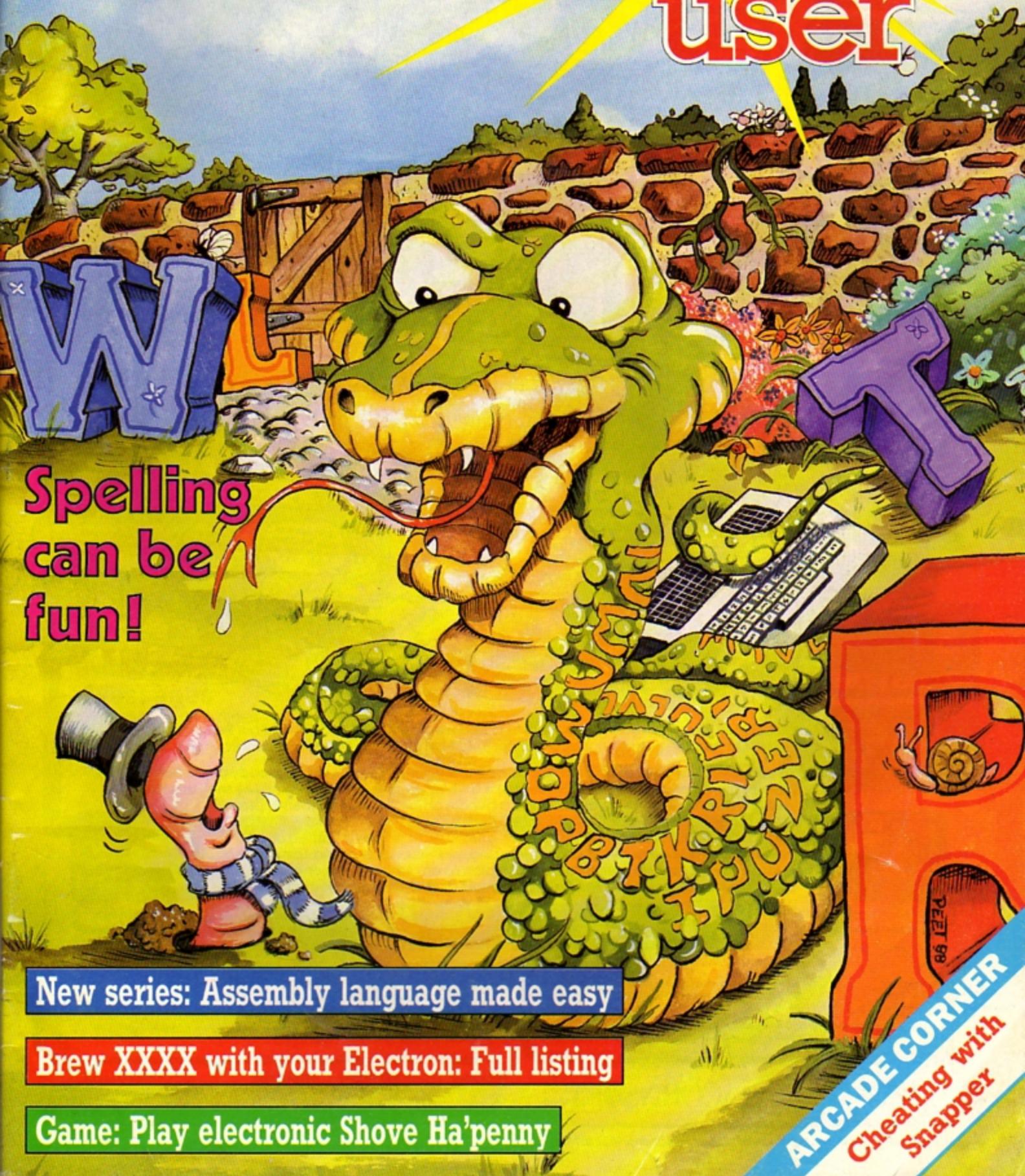


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electron

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user



Spelling
can be
fun!

New series: Assembly language made easy

Brew XXXX with your Electron: Full listing

Game: Play electronic Shove Ha'penny

ARCADE CORNER
Cheating with
Snapper

The Life Of Repton



REPTON AS A BABY



REPTON AT SCHOOL



REPTON AS A TEENAGER



REPTON AT WORK

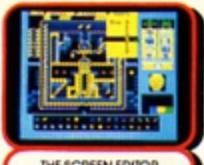


REPTON AS AN OLD MAN



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All the latest products and developments in the ever-expanding world of the Electron.

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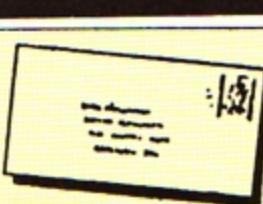
Pit your skills against the computer in this time-honoured game.

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electron NEWS

THE SHAPES OF THINGS TO COME

WHAT is claimed to be the first computer game from Russia for the Electron – Tetris – has been released by MirrorSoft.

The package is said to be simplicity itself. A series of different shapes appear one at a time, and by using keyboard or joystick control you have to move and turn the shapes to make them fit together in a line across the bottom of the screen.

As your skill level increases the shapes appear more rapidly. MirrorSoft (01-377 4837) is so confident that Tetris will attract a cult following that it is organising a national competition with a first prize of a trip for two to Russia.

Price £12.95 on cassette

Bugbyte's seeking a new top title

STAND by your computers – the search is on for a sequel to Bug-Byte's highly successful Plan B and Plan B2 games for the Electron.

In fact the titles have been so popular that it has put the company in an embarrassing position as to what to release next.

"We have an excellent development team working non-stop to find a sequel", said Peter Sleeman, Bug-Byte's product development manager. "However, winners like Plan B and Plan B2 are not all that easy to come by.

"New ideas are always welcome. If any *Electron User* readers think they have a game that will make it to the top of the software charts we would like to hear from them".

Bug-Byte (01-439 0666) has been producing quality computer games for the past six years. Top titles for the Electron include Dunjinz, Cricket, Twin Kingdom Valley, Templeton, Jack Attack, Skyhawk, Ice Hockey, and Uranians.

Duncan Lowthian, Bug-Byte's sales manager, said: "The Electron remains an incredibly popular machine and we are committed to producing as much software for it as possible.

"There is still a vast market for the machine and we are always on the lookout for new programs, or even ideas for a program".

So the challenge is on. If you think you can come up with a sure-fire winner on the Electron, Bug-Byte would like to hear from you.



Touchline founder Peter Reynolds

LEAGUE'S FACTS COME FROM THE TOUCHLINE

SCHOOLS, music shops and even a local football league are benefitting from a new information display system for the Electron from Touchline Computers.

The program is the second to be released by the company since its launch six months ago. Since then it has gone from strength to strength by providing top quality, low-priced software.

Based on the same idea as teletext, the Information Display System can be used to create, store and display up to 700 pages of information.

Users can call up from a menu various subsets of information on any topic, either page by page, or on a time delay carousel basis.

The program, which comes on a 3.5in disc with ADFS for £7.95, is suited to establishments where regular updates of information are required.

One store uses the system to display the prices and availability of musical items to shoppers.

By pressing a single key the

Electron fills the Scouts' bill

IF you are scouting around for a computer to help with all your administration needs, you can't go far wrong with an Electron.

That was the conclusion 17-year-old Tim Parfit of Arundel, West Sussex came to when he was called upon to act as secretary for the local Venture Scout group.

Tim is so committed to the machine that he was one of the first to buy one when they appeared on the market.

From the basic unit he has expanded the kit with a Plus 1 interface and Plus 3 disc drive that he bought on special offer from *Electron User*.

As Venture Scout secretary he is responsible for typing up all the decisions reached at the group's quarterly meetings. All records have to be meticulously prepared, as they contain details of the scouts' activities for the following three months.

Despite some of the excellent word processing packages available for the machine, Tim uses Text Editor – which he copied from the pages of *Electron User*.

Why didn't he use a commercially available program? He said: "I spent a long time typing in the listing and once I got to grips with it I

found that it was a doddle to use.

"Other packages are OK, but Text Editor is such a pleasure to use that I see no need to change".

Apart from the minutes of the meetings, sponsor forms for the various fund-raising activities are also produced. "Before I came along with my Electron the group had to rely on anyone who would lend them a typewriter", he said.

"Now with my computer and Centronics GLP printer I am able to produce professional documents in a fraction of the time that it would have taken".

Show stoppers

ONCE again the Electron & BBC Micro User Show – to be held at UMIST, Manchester, March 18 to 20 – will be the launching pad for a host of new products.

Many exhibitors are keeping the wraps firmly on their latest releases, but guarantee that Electron users will find the show well worth a visit.

Jaffa Systems will be introducing a sideways ram and rom board. Fitting into a Plus 1 slot, the board takes eight roms, one of which can be a 32k ram.

The roms are software selectable and can be selected to appear as rom one or two to the Electron.

And for anyone interested in experimenting with music or mice on the Electron, PRES will be unveiling its low-cost 1Mb bus and user port interfaces.

Permanent Memory Systems will be launching several new products at the show, including Multi-Font NTQ printer software specially designed for the Electron.

Electron NTQ has all the features of the BBC Micro version, offering varied height, width, font and pitch – all within one line of text.

Inverse text, backgrounds and underline are also supported, as is micro-justified text. Price £24.95.

PMS will also be offering the NTQ handbook, which

explains how to make the most of its Multi-Font software from View, Wordwise and Inter-Word.

All aspects of NTQ are covered in depth, from laying out a document to designing your own fonts. Price – for handbook and disc – £9.50.

And as a special show offer, PMS will be reducing its prices across the board, by as much as 50 per cent.

Ken's hooked on the Electron

THE Electron might seem an unlikely companion to take along on a fishing trip, but Ken Thomas wouldn't be without one.

Ken, secretary of the Welsh Federation of Sea Anglers, Eastern Region, finds the Electron is invaluable when it comes to sorting out the vast amount of paperwork and filing that his job entails.

He relies chiefly on View to carry out all of his word processing needs, although he is able to get through his work a lot faster with the package, he admits that a spell checker is his favourite piece of software.

Ken bought his Electron "in the year dot" and over the years has added a Plus 1, Plus 3, a DMP 2000 and, most recently, Slogger's Master Ram board.

FROM PAGE 5

prospective buyers can find out if the item they are after is in stock, and if required a hard copy of the details can be printed out.

Elsewhere, a school library is using the program to provide on-going information about its books to pupils who may otherwise not be interested in using the indexes.

And a local football league has employed an Electron to display the masses of data about the position of each team in the league.

Touchline (0203 374141) was founded by 17-year-old Peter Reynolds to provide Electron users with useful programs rather than just games. His initial capital was

a mere £200 which he won after entering a local business enterprise competition.

"I wanted to start developing software for the Electron because it was a great computer", he said. "As I was unemployed the £200 prize money provided me with the ideal opportunity to set up my own business".

Like many businesses, Touchline has started in a very small way, but it is growing fast.

"There is a tremendous user base out there for the machine and I intend to carry on supplying the right software at the right price", said Peter.

THE GALLUP CHART

TOP 10

ELECTRON SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	PRICE
1	1	AROUND THE WORLD IN 40 SCREENS <i>Superior</i>	6.95
2	2	PAPERBOY <i>Elite</i>	9.95
3	3	SOCER BOSS <i>Alternative</i>	1.99
4	5	SUPERIOR COLLECTION VOL. 3 <i>Superior</i>	9.95
5	6	FOUR GREAT GAMES <i>Micro Value</i>	3.99
6	8	CODENAME DROID <i>Superior</i>	9.95
7	•	COMBAT LYNX <i>Alternative</i>	1.99
8	•	ELIXIR <i>Superior</i>	9.95
9	10	MICROBALL <i>Alternative</i>	1.99
10	•	STRYKER'S RUN <i>Superior</i>	9.95

Compiled by Gallup/Microscope

Software house Superior and the budget house, Alternative seem to have the chart divided between them – yet Elite and Micro Value are holding their own with Paperboy and Four Great Games.

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VIEWSHEET – available on ROM cartridge – is probably the biggest and best known spreadsheet for the Electron. In this short series of articles we'll be taking a look at what it has to offer the serious Electron user.

If you already know the ins and outs of spreadsheets, bear with me for a while as I describe their origin and purpose to the uninitiated.

Not so long ago, accountants sat hunched over enormous, dusty ledgers filled with rows and columns of tightly-quilled, seemingly incomprehensible figures and calculations.

Such were the days when accounting was a highly coveted and closely guarded skill, way back before the advent of computing.

In the late 1970s, when the first affordable home micros appeared on the scene, programmers were more business oriented.

They used languages like Cobol and Fortran, and with these wrote the first spreadsheet programs, which took their name from the large sheets of ruled paper which accountants used to analyse cash flow.

Initially, they were designed so that accountants could transfer their

Let's spread the good news

CHRIS NIXON shows how to tap the potential of spreadsheets

skills to the computer with the minimum of teething troubles, and thus achieve higher turnovers with less strain on pencil and rubber.

However, as the price of computers fell, spreadsheet programs were written for more and more computers. The layman began to avoid the accountant's high fees by employing instead the friendly yet powerful help of the spreadsheet program.

But, I hear you ask, can a spreadsheet really manage my accounts? Is running a small company really possible using one? For the answer to these and many more questions, read on.

In this, and the following articles, I'll be introducing

ViewSheet, Acornsoft's very popular spreadsheet, which rose to fame initially on the BBC Micro, but which has been available for the Electron almost since its birth.

We'll kick off with a look at what a spreadsheet actually does, and toward the end of this article I'll set you working on a simple example sheet.

Essentially, a spreadsheet is a computerised version of the accountant's huge ledger. Imagine a book filled with graph paper, ruled into rows and columns.

If the book were a monthly balance sheet, then one column would be headed Date, a second Purpose, a third Debit, another



Credit and a final one Balance.

You would make entries in a similar way to your bank statement. At the top of the Balance column would be the carried over balance from the previous month.

Then each payment to or from your company would be entered with the date in the appropriate column, while the purpose of the payment would be summarised in the Purpose column and the amount of cash or cheque placed in the Credit or Debit column.

Finally the Balance column would be worked out by taking the previous balance from the row above, adding any credits in the current Credit column and subtracting any debits in the

A SLOT=A1
CONTENTS=Blank*

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
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15									
16									
17									
18									
19									

Figure 1: A blank spreadsheet

Debit column. A spreadsheet program works in almost exactly the same way, but allows a great deal more flexibility.

Imagine the dusty ledger full of graph paper again. Taking just one page, imagine labelling the left-hand edge of each row with an identifying row number, working from top to bottom down the page starting at one, then two, three and so on.

Now label the top of each column with a similar identifying letter, working left to right across the page starting with A, then B, C and so on.

What you now have is essentially an empty ViewSheet spreadsheet, ready for some figures to be entered into it.

With your ViewSheet cartridge installed, type:

```
*SHEET
MODE 3
```

This mode limits the number of entries you can place on the sheet, but makes for clearer reading – you really need to see as much of the sheet as possible at one glance.

You should now have a blank screen with a status message at the top left showing your current mode, the number of bytes free and the name, if any, of your current sheet. At the moment this line will just have the words "no file" printed next to it.

This is ViewSheet's command mode. To return to Basic at this point, simply type *BASIC and press Return. Similarly, to re-enter ViewSheet from Basic or another language, use *SHEET.

Things will be looking familiar to View users, but the similarity ends here. Press the Escape key and you will be faced not with an empty text area, but with a screen like Figure I.

Note the horizontal and vertical lines at the top and left of the screen. These are the sheet margins.

To the left and top of

LA SLOT=A1		CONTENTS=DATE							
B	A	B	C	D	E	F	G	H	I
1	DATE	PURPOSE	CREDIT	DEBIT	BALANCE				
2					3620				
3	6 MAR	DISCS		37.8					
4	8 MAR	PETROL		10					
5	11 MAR	CHEQUE	57.32						
6	20 MAR	TAX		689					
7	29 MAR	REBATE	273						
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

Figure II: Entering data

these you will see the letters and numbers, which when used together, provide a slot reference.

A slot is simply the name given to an intersection between a row and a column, into which we can place a word or value.

The large white blob is the slot cursor, and shows you which slot you are currently dealing with.

To find out what the current slot reference is, look above the top margin, directly above the cursor itself. You will see the letter A. Inside the left margin, parallel to the cursor, is the number 1.

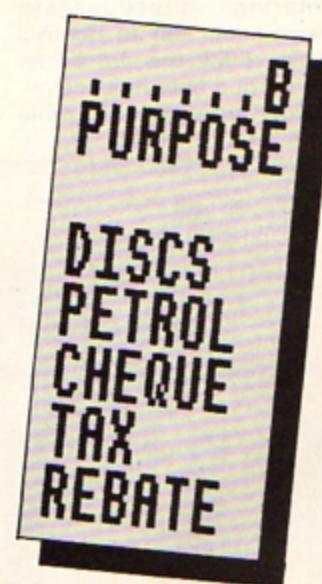
By placing the letter before the number, we obtain the current slot reference – A1. Now you are halfway to creating your own sheet.

To move the slot cursor around, use Func+S to move one slot left, Func+D to move one slot right, Func+E to move one slot up, and Func+X for the same amount down.

If you have moved to the right hand edge of the screen in your wanderings, you will notice that the cursor will stay in the same

place, but the top margin references begin to climb higher through the alphabet.

This is because the screen is only a small window look-



ing on to a much larger sheet – extending sideways and downwards for some distance – and at the moment we are moving this window sideways over the sheet.

To move more quickly in a given direction, use Func+A

to move left one screen at a time, Func+F one screen right, Func+R one screen up, and Func+C to move one screen down.

You may have noticed that the sheet extends vertically down to 255, while horizontal movement cycles from A to Z, then AB to AZ, right through to IU, therefore also giving 255 positions.

You are now ready to build a framework sheet and to input some data. An excellent example to practice with, which also illustrates all of the problems you are likely to come across, is a mock-up of a monthly bank statement. Indeed, I use a version of this idea every month as a check against the bank's own tally.

Move the cursor to slot A1. Either use the cursor movement keys, or press Func+8. This key is marked "Goto slot" on your ViewSheet key guide, and after pressing it you simply enter the full slot reference of where you want to be – A1 – and press Return.

Now type Date and press

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Feature

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Return. You will see the word Date appear in inverse type at the cursor position – all slots are inverted in this way as the cursor passes over them.

Notice that as you press Return, the line at the top left of the screen which says "contents:blank" changes to "contents:Date".

This display of a slot's contents is vital, as the information contained in a slot isn't always displayed exactly as stored. We'll see an example of this later.

Move the cursor right and type Purpose. Note that a slot can, by default, only display the first seven characters of any text typed into it, so it is wise to think of meaningful abbreviations if using lengthy headers.

Move right again and enter the words Credit into slot C1, Debit into D1 and Balance into E1.

Figure II is a more complete version of a statement slip for the month of March, showing how the text entries in your sheet should look.

Type in the rest of them exactly as shown at the slot references given by using the top and side margins as described earlier.

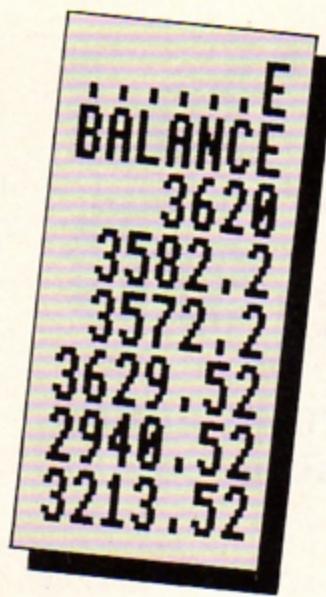
Your bank statement should now look like Figure II. Notice that the only figure in the Balance column is at E2. This is our imaginary carried-over balance from February.

As yet we have not covered using the sheet to calculate anything, but now we must do so in order to fill in the missing slots in the balance column.

The main reason for using slot references the way we do will now become clear. In slot coordinate terms, what we want to put into the next Balance row down could be written as:

E2+C3-D3

This is known in spreadsheet terms as a formula, although it's actually pretty uncomplicated, and nothing



like what we would expect a mathematical formula to look like.

Check the slot references in the formula against your sheet. What the formula is saying is: Take the carried over balance at slot E2. Add to it any credit which may happen to be in slot C3, and then subtract from this total any debits which may have been entered in slot D3.

This formula is correct for entering directly into ViewSheet, and to do this move to E3, the slot below the carried over balance.

Now type in the formula

exactly as shown and press Return. Voilà! Instead of the formula appearing as expected, the slot should show the value 3582.2.

You should now begin to appreciate the power of ViewSheet. Accurate predictions can be made with assurance by entering experimental data, and seeing what ViewSheet churns out at the other end of the formula.

Formulae don't have to be this simple. They can involve whole rows and columns at a time, using multiplication and division as well as addition and subtraction.

You can even make ViewSheet assess a particular result, and carry out a calculation according to its value.

However, for the purposes of our simple sheet we will limit ourselves for the time being to less advanced aspects of the program.

To continue with our statement, see if you can fill in the rest of the sheet. I'll start you off by giving you the next formula for slot E4:

E3+C4-D4

When you have finished, your sheet should look like Figure III. If not, re-read the

article carefully and check the slot contents status line to see if you have used any wrong coordinates. If you are still stuck, the other formulae are:

Slot E5: E4+C5-D5
Slot E6: E5+C6-D6
Slot E7: E6+C7-D7

Looking carefully at these formulae, you should be able to spot a pattern: They are all identical in every respect, except that the slot references grow one larger vertically each time.

It seems such a waste of effort to have manually duplicated these references for the balance column each time.

Wouldn't it be great if we could have somehow instructed ViewSheet to copy the formulae from slot E3 into slots E4 to E7, but taking their different positions into account?

Well, actually we could have. The process is called replication and we'll see how it works later on in the series.

For now, press Escape and save your work with:

SAVE balance

● *Next month we'll delve deeper into the world of spreadsheets – by showing you how to run a small software company with ease.*

LA SLOT=A1 CONTENTS=DATE						
	A	B	C	D	E	F
0	DATE	PURPOSE	CREDIT	DEBIT	BALANCE	
1	2				3620	
2	3 6 MAR	DISCS		37.8	3582.2	
3	4 8 MAR	PETROL		10	3572.2	
4	5 11 MAR	CHEQUE	57.32		3629.52	
5	6 20 MAR	TAX		689	2940.52	
6	7 29 MAR	REBATE	273		3213.52	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						

Figure III: The finished spreadsheet

Exploring printers Part 3

PRINTING A PRETTIER PICTURE

JULIA FORESTER presents a letterhead designer in the final part of her printer series

MOST printers can produce graphics to some degree, but how they actually do it varies considerably with individual designs.

As I explained in the first article in this series – in the January 1988 *Electron User* there are three distinct varieties in common use.

Of those, only two can produce graphics to an acceptable resolution – the dot matrix printer and the printer/plotter. The daisy-wheel can't produce graphics at all without changing to special graphics wheels – which are hard to come by and hideously expensive.

The printer/plotter produces graphic output by literally drawing a picture with a series of pens. In fact, plotters draw everything, text included.

In this way they are not really suitable for producing things like listings, documents and so on. Besides which, the software required to draw even a simple screen dump is horrendously complex.

This leaves the ever-useful dot matrix printer, a faithful beast, capable of producing high quality text and graphics almost at the same time. In addition, many dot matrix printers follow a common standard set by the Seiko-Epson corporation. This makes the task of writing a screen dump considerably simpler than it otherwise would be.

Producing screen dumps is where the bit-image or graphics mode comes in. In this mode, the print head fires its pins in an order defined by a binary bit pattern.

Like many of today's computers, the Electron's screen memory is bit-mapped, but because its Basic features the POINT command, there

isn't any need to access this memory directly, thus easing the task further.

In fact, all that's necessary is to read the area of the screen to print using a couple of nested FOR ... NEXT loops, convert the information into a format the printer can understand and print it.

The most complex part is, of course, the conversion from screen data to printer data.

To grasp how this is done requires an understanding of bit-image mode itself. This gives you complete control of the print head.

By sending a pattern of

bits, individual pins can be made to fire. They fire in a vertical line, eight pins at a time, and as the print head moves horizontally, the picture is made up.

To complicate matters still further, most printers offer a variety of different print densities, from the standard 60 dots per inch to quadrupal density – 240 dots per inch.

Clearly, the more dots printed in the same space the better the quality of the finished article.

The Panasonic KX-P1081 printer offers four distinct eight-pin bit-image modes, standard density, double

density, double density – double speed and quadrupal density.

In addition, it offers several nine-pin modes, but the differences are superfluous to our example.

The commands to enter bit-image mode may look a little daunting at first, but they're really quite straightforward.

To take a case in point, consider the command to enter standard density (60 dots per inch) bit-image mode: Esc+^{"K"}+n1+n2

Here, n1 and n2 refer to

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Editing the
letterhead
on screen



Exploring Printers Part 3

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the number of points on a line — that is the total number of horizontal pixels that will be sent.

This odd looking format is used because you'll almost certainly want to send more than 255 points.

Since the Electron's printer port is only eight bits wide, numbers greater than 255 have to be sent as two chunks — the low byte followed by the high byte.

To calculate these numbers you must decide how many bits will be sent. This will depend on the graphics mode in use, but for the sake of argument we'll use Mode 4.

This has a screen resolution of 320*256, which means in standard density you'll have to send 320 points for each of the 256 lines.

In double or quadruple density, simply multiply this number by two or four respectively.

Because, this number is bigger than 255, to find $n1$

```

10 REM Letterhead Generat
or
20 REM by Julia Forester
30 REM (c) Electron User
40 MODE4
50 fini=0
60 VDU 23,224:FOR NX=0 TO
7:VDU 255:NEXT
70 VDU 224,10,224,10,224
80 *FX 4,1
90 REPEAT
100 PROCdisp
110 IF G>=0 AND G<=8 PROCe
dit
120 UNTIL 0
130
140 DEF PROCdisp
150 FOR NX=0 TO 7:PRINT TA
B(NX*5+2,3);NX+1:NEXT
160 PRINT TAB(0,31)'Edit 1
-8, Quit, Save, Load, Print
;:G=GET:VDU G:G=G-49
170 XX=G*160:PX=XX
180 IF G=32 END
190 IF G=31 PRINT TAB(0,5)
STRINGS(40, '):PROCscreen_d
ump:END
200 IF G=34 THEN *SAVE 'HE
ADING" 5800+3C0
210 IF G=27 THEN *LOAD 'HE
ADING" 5800
220 ENDPROC
230
240 DEF PROCedit

```

```

250 AX=0
260 FOR X%=X% TO X%+159 ST
EP 4
270 BX=5
280 FOR Y%=1023 TO 1023-92
STEP -4
290 PRINT TAB(AX,BX);
300 IF POINT(X%,Y%) VDU 22
4 ELSE VDU 32
310 BX=BX+1
320 NEXT
330 AX=AX+1
340 NEXT
350 PROCkey
360 ENDPROC
370
380 DEF PROCkey
390 AX=0:BX=5:exit=0
400 REPEAT
410 IF INKEY(-122) AX=AX+1
420 IF INKEY(-26) AX=AX-1
430 IF INKEY(-58) BX=BX-1
440 IF INKEY(-42) BX=BX+1
450 IF INKEY(-2) exit=1
460 IF AX>39 AX=0
470 IF AX<0 AX=39
480 IF BX<5 BX=28
490 IF BX>28 BX=5
500 IF INKEY(-99) PROCinpv
ix
510 PRINT TAB(AX,BX);
520 TIME=0:REPEATUNTILTIME
>5
530 UNTIL exit
540 *FX15

```

```

550 ENDPROC
560
570 DEF PROCinpix
580 XX=P%+AX*4:Y%=1020-(BX
-5)*4
590 GCOL 3,1: PLOT 69,XX,YX
600 PRINT TAB(AX,BX);:IF P
OINT(XX,YX) VDU 224 ELSE VDU
32
610 ENDPROC
620
630 DEF PROCscreen.dump
640 LOCAL XX,YX,AX,BX
650 VDU 2,1,27,1,65,1,8
660 FOR Y%=1023 TO 1023-92
STEP-16
670 VDU 1,9
680 VDU 1,19,1,27,1,90,1,0
,1,5
690 FOR XX=0 TO 1276 STEP
4
700 AX=0:BX=128
710 FOR CX=0 TO 14 STEP 2
720 IF POINT(XX,YX-CX) AX=
AX+BX
730 BX=BX DIV 2
740 NEXT
750 FOR N=0 TO 3
760 VDU 1,AX
770 NEXT
780 NEXT
790 VDU 1,10
800 NEXT
810 VDU 3
820 ENDPROC

```

and $n2$ (low byte and high byte) you have to do a little calculation thus:

```

n1=320 MOD 256
n2=320 DIV 256

```

Therefore the final command to switch the printer into standard density

bit-image mode for a Mode 4 dump is:

```

VDU 2,1,27,1,75,1,64,1,1

```

Remember, the number one preceding each item of data ensures that it's sent just to the printer.

Now all that remains is to

send the actual data. This is a simple matter of reading down the screen eight pixels at a time and setting one bit in a byte for every pixel set.

This construct can be defined in a loop — as in lines 710-740 of the accompanying letterhead designer — and is simple enough not to require any explanation here.

The complete dump, converted for quadrupal density can be found in PROCscreen_dump.

The program is a simple editor to produce and print out a fancy letterhead. The screen dump has been modified slightly to give double-height printing and only dump the first three screen lines (six on the printed page).

The number keys from one to eight select the area of screen to be edited. When selected, use the cursor keys to move the flashing cursor, the spacebar to toggle a bit and Control to exit back to the main editor.

While in this mode press Q to finish, S or L to save or load a screen and P to dump the design to a printer.

ELECTRON USER CLUB NEWS

A RECORD AGAIN

Electron supplier Superior Software doubled its previous record sales figures last year. And the company also doubled its yearly turnover for the third year in succession. "We're going to try and do it again this coming year", said manager, Steve Botterill. "About 40 per cent of our sales were due to the tremendous support of the Electron market. We are committed to continuing to supply quality software for the machine as long as there is a demand". Four new games scheduled should have the same impact on the market as Elite, says the company.

The finished letterhead printed on a club news sheet

Classic collection

Product: Five Star III

Price: £8.95

Supplier: Beau-Jolly, 29A Bell Street, Reigate, Surrey RH2 7AD.

Tel: 0737 222003

THIS is Beau Jolly's third Five Star compilation and, as expected, the games are yet again classic selections from the list of Electron best-sellers. Altogether there are seven games, making up a twin cassette package.

First on tape one is *Southern Belle*, a realistic simulation of an old King Arthur class steam locomotive hauling a passenger train from London to Brighton during the early 1930s. I missed this title at its first release, so I was anxious to find out what it was really like.

As it turned out, I was going to have to wait a while because my Plus 1 caused no end of problems during loading, and eventually had to be completely disabled – the software should do this automatically. The idea behind *Southern Belle* is simple enough in theory, if not in practice. You must drive the locomotive from London to Brighton, stopping at each station along the way, while observing the proper conventions such as blowing the whistle before entering a tunnel and stopping at signals.

The cassette insert supplied sufficient explanation of the controls to get me going, and I was soon chug-

ging out of Victoria heading over the Thames and towards Battersea power station.

Several things surprised me about *Southern Belle*. Firstly, each station on the route is represented by detailed line graphics, together with the station's name at the top of the screen.

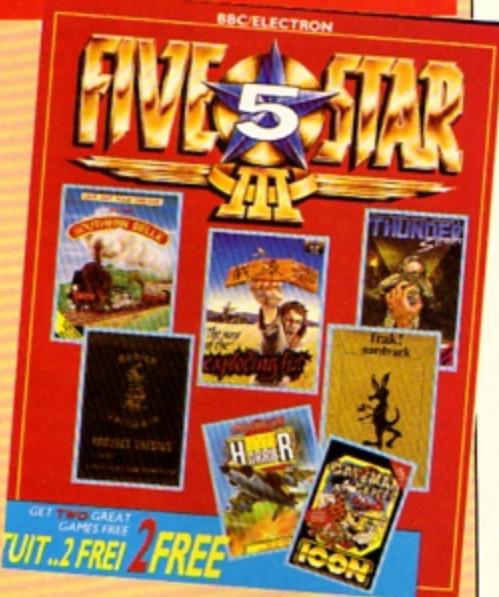
Secondly, the whole train run is in real-time, which means that each station rolls into view only after the correct mileage has been covered, and it can take over an hour to reach Brighton on a normal run.

The fun begins when you select the Record Run option – this reconstructs the conditions of the famous record-breaking Brighton run in 1903, and you really have to concentrate to perform well. I regularly managed to either blow the pressure plugs or boil the engine dry after only 10 miles or so!

Moving on to the next program, *The Way Of The Exploding Fist* needs no introduction to the vast majority of Electron owners as the original – and some say still the best – martial arts combat game.

I am a Fist fan of long standing, albeit on the BBC Micro. I was pleasantly surprised, therefore, to find the Electron version just as smooth and responsive, and extremely playable.

Fist, although over two years old now, is my favourite out of all the games on the Five Star III tapes. Far from being conducive to causing violent acts, it is a great game with which



to work off your aggression.

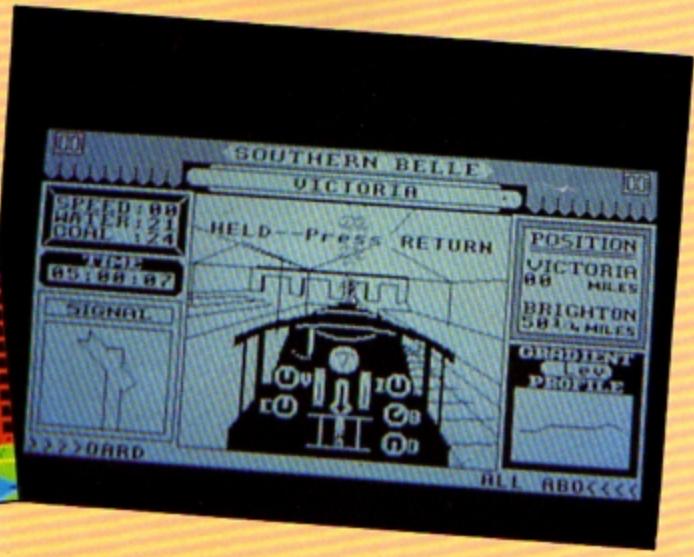
The keyboard arrangement looks a little bewildering at first. However, your fingers will soon find their way around the 10 player keys with remarkable ease. To win a round, you must either be the first to have scored two full hits, made up from any combination of full or half hits, or have the most hits by the time the 30 second round is over.

The computer player falls down with such a satisfying crunch when hit properly, yet displays uncanny intelligence on the harder levels. Each level appears in the form of a more highly qualified opponent, and the

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Jetting around in Strike Force Harrier



Heading for Brighton on the Southern Belle

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reward for vanquishing him is a higher Dan rating. Anyone reaching fourth Dan or higher will have a tough job keeping their status during the ensuing onslaughts.

The third program on the compilation is **Thunderstruck**, an arcade adventure. You play the part of Spreco, the space refuse collector, who has been transported to an eerie castle by a space-time thunderstorm.

All you want to do is get back to Myrtle and the kids, but you are trapped here amongst all manner of medieval trappings, and the only company is a bunch of hostile assistdroids.

These used to be your garbage collection droids, but they are convinced that their incarceration is all your doing and in true Frankenstein form turn on their benefactor.

The castle is inhabited by eight characters, all of whom will help you by supplying useful objects in return for something which they in turn can use. Objects are to be found scattered about the dusty corridors of the castle, and some require careful thought if you intend to pick them up.

I enjoyed this game. The large spaceman sprite moves about smoothly, as do the various characters and other objects. The gameplay was a bit frustrating at times due to the fact that I tend to find arcade adventures a strain on the old grey matter.

Nevertheless, **Thunderstruck** is a fun game and a worthy inclusion for this compilation tape set.

The next game, **Strike Force Harrier**, marks the start of the second cassette. This is a full-scale flight and battle simulator involving that most famous of jet aircraft, the Harrier Jump-Jet.

There is a great deal to this game, but briefly you are in control of a Harrier during a large-scale battle. Your objective is to clear the way for ground troops to assault enemy HQ, which is 500 miles to the North-East.

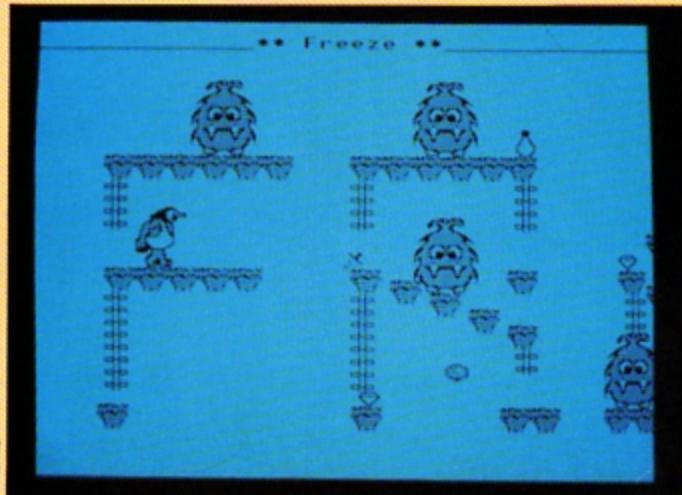
In order to enable the troops' forward movement you must prepare landing sites along the way before signalling the troop carriers to move forward. However, the odd obstacle is ready and waiting to thwart your plans in the shape of SAM surface-to-air missile sites, enemy tanks sporting very accurate artillery, and supersonic jets which are closely modelled on the MIG23.

But all is not lost. You have at your disposal a high-velocity cannon, two Sidewinder infra-red homing missiles and three bombs. The cannon is quite tricky to fire, but effective against tanks.

The sidewinders, on the other hand, are a joy to use. Once you hear the steady growling which signals that a sidewinder has locked on a target, just launch the missile, bank off to one side and watch the fun as it disappears



Riding Kickstart the turtle in Caveman Capers



Playing with your yo-yo in Frak!

into the distance to be followed by a rewarding explosion.

Now for the disappointing part. **Strike Force Harrier** is a brave attempt to bring a successful flight simulator to the Electron, but the view from the cockpit window can become so complex that quite a reduction in speed becomes apparent at these times.

The scrolling movement of the hills is far from smooth for the same reason. One minute you can be flying low, watching the radar and thinking how lovely and flat the horizon looks, when suddenly a 1000 foot mountain appears out of the blue. After a while you learn to give the mountains a very wide margin.

All in all, an excellent battle simulation with all the tactical ingredients necessary for hours of wit-straining fun, let down only by slow screen-handling.

Now on to **Caveman Capers**, game number five. You, as Ogg the caveman, have just found a new form of transport - Kickstart the turtle. Needless to say, Kickstart is far from

amenable to the idea of giving anyone a ride, and is doing his best to throw you off balance. This is something at which he is rather adept.

The object of the game is to manage to stay aboard Kickstart while controlling his progress past various obstacles. Holes have to be jumped, pterodactiles dodged, and snakes ducked under as they fly overhead.

Caveman Capers is quite good fun. The characters are large and friendly-looking, especially Ogg, who looks just as if he was taken straight from an animator's table.

I did tire of the whole idea eventually, because although the smoothly scrolling background is always presenting yet more hazards to Ogg in his travels, I just couldn't complete more than the first handful of screens, and there are 60 in all. Still, **Caveman Capers** is a great fun game where humour is definitely the order of the day.

The next game of the set is a text adventure, **Project Thesius: Rick Hanson 2**. As such adventures on the Electron go, this has got to be one of

the best ever. I simply couldn't believe the amount of detailed, atmospheric description which abounded with every location.

The program was written using a unique text-compression system, and very impressive it is too. The descriptions ranged from 50 to 80 words each, and kept me hooked by the sheer escapism of the game.

Project Thesius is, as the subtitle suggests, the sequel to the first Rick Hanson adventure from Robico. This time the plot involves an unnamed enemy who has secretly made a major breakthrough in particle beam technology, and is currently developing an advanced weapons system, codenamed Project Thesius.

As special agent Rick Hanson you must maintain the balance of power by finding out as much as possible about Project Thesius. You will be taken by submarine to the enemy coastline and left in Fisherman's Cove. The rest is up to you. The submarine will wait offshore until you have completed the mission, whereupon it will take you back to H.Q.

I found Project Thesius immensely enjoyable. Some of the puzzles are infuriating, but I'm sure that the solution was always within my grasp. At one point I was greeted by a particu-

larly officious lady guard who insisted that I'd been swimming - which I couldn't deny - whereupon she announced that swimming was strictly illegal and promptly shot me with her rocket launcher.

That brings us to the last game in this classic collection - the famous **Frak!** by Aardvark. Again, this program needs no introduction as one of the most original, humorous and playable Electron games of all time.

Frak! involves a caveman, several large hairy monsters and a yo-yo. Before you close this magazine in disgust, let me assure you that **Frak!** is in the best possible taste.

You play the part of the hapless caveman who, armed only with his trusty yo-yo, must find and collect a large key which will allow him to pass on to the next screen.

Each screen is a maze of platforms, ladders and ropes populated by incredibly cute-looking eight foot high hairy monsters which look incredibly gormless. Touching a monster, though, is not recommended as you will lose a life and have to start again from the beginning of the level.

What sent **Frak!** rocketing to the top of the charts at its original release is probably the funniest idea ever incorporated into a game. To kill the

monsters no axe, bow-and-arrow or club is needed. Instead, with a flick of his powerful wrist the wily caveman shoots out his yo-yo which promptly dislodges any monster careless enough to be sitting in its path.

The title of the game comes from a little cartoon bubble containing the word "Frak!", which appears above your caveman's head when he is unlucky enough to touch a monster or fall off a log.

Add to this game three amazing background tunes - and you can quickly see why it was so successful the first time round. In my opinion, it deserves to do well this time too.

There you have it. Seven games, each one a timeless classic, and all for £8.95. Bear in mind that the marks given below are general averages over all the games, as they differ one from another so widely.

Although I had my doubts about one or two of the games at times, as a package Five Star III is pretty unbeatable value.

Chris Nixon

Sound.....	7
Graphics.....	8
Playability.....	9
Value for money.....	10
Overall.....	9

Over-priced budget game

Product: Creepy Cave
Price: £1.99
Supplier: Atlantis Software Limited, 28 Station Road, London SE25 5AG.
Tel: 01-771 8642

CREEPY Cave is a budget-priced game from Atlantis where you, as Dirk Daring, must recover your front door key from an evil ghost who nicked it from you one day. Quite what a ghost would want with your front door key, apart from gaining access for a quick spot of haunting, isn't too clear - but the game is quite good fun anyway.

The first thing that greets you when you load Creepy Cave is precisely that - a foreboding picture of a very creepy-looking cave indeed. After the game starts, you must wait for the ghost to float across the first cavern where it begins to leer at you in safety, dangling your door key like a carrot before a donkey.

Infuriated by this show of arrogance, you start out across the cavern floor - and promptly dive head first into a pool of acid. Back at the cave entrance you try again. This time a great leap sails you across the acid to the far shore. Ahh! Now you know

how to make that infernal ghost grin from the other side of its ectoplasm. Or do you? With mounting satisfaction you hop from ledge to ledge and finally the opposite side of the cavern is within sight.

With one mighty leap the ghost is before you. Except that you are now in the second cave, and that manic ghost again floats away from you to a safe position, still dangling your key enticingly.

Cave number two is much more interesting, with moving belts to contend with besides the ever-present acid pools. After negotiating a relatively safe path and receiving only a couple more acid baths, again the far end of the cave is reached.

But what's this? Now flaming red-hot chunks of stone are falling from the ceiling and plopping into the acid pools. You begin to wonder whether a quick trip to the key-cutting shop with your spare key might not have been in order after all.

Creepy Cave is quite good family fun. There is no blood and guts, the game is easy to play yet quite addictive, and you never know what surprises the next cave will hold. The story is perhaps a little off-the-cuff, but



who cares? The days when games were sold on a storyline itself are long gone.

For a little less money Creepy Cave would be an excellent buy. As it is, with dozens of great budget games appearing every year, Atlantis may have less of a demand for it than there would have been even as little as a year ago.

Barry Wood

Sound.....	5
Graphics.....	6
Playability.....	7
Value for money.....	5
Overall.....	6

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A294

electron ARCADE CORNER

user
Compiled by MARTIN REED

EVEN SNAPPIER!

THIS month Arcade corner is devoted entirely to an upgrade for Acornsoft's Snapper, probably one of the longest-lasting games ever seen on the Electron.

The upgrade was originally written for the BBC Micro by Hac-Man, my opposite number at *The Micro User*, but converted for the Electron by David Donaldson of Amersham, Bucks. Regular readers will remember David for the Killer Gorilla mini-upgrade in the October 1987 issue.

Type in the listing exactly as shown, then save it to your own blank cassette using the following procedure:

```
*SPOOL SNAPUP
LIST
*SPOOL
```

This stores the upgrade program in a form in which it can easily be merged with the Basic loader of the original game. To play the upgraded game, first enter:

```
PAGE=84600
```

then chain the original Snapper tape as normal.

As soon as the Acornsoft title page has been displayed and the *Searching* message has appeared, stop the tape and press Escape. Put your own cassette into the recorder and type:

```
*EXEC SNAPUP
```

Disregard the two *Mistake*

error messages at the beginning and end of the merge - everything's fine.

After SNAPUP has finished loading, put the Snapper cassette back into the recorder, press Play and type:

```
GOTO 120
```

The main machine code file, called ?, will then load.

After this has loaded, you will be presented with a menu offering the options of higher starting levels and extra or infinite lives. The game normally awards an extra life at 15000 points: You can now choose not to have this extra life or to have an extra life every 15000 points.

Although you begin on the level selected from the menu (with the chosen number of lives), you can still play the original game. On the high-score page press O to select ordinary mode - a normal game - and P to start the next game in practice mode with the chosen level and number of lives.

Incidentally, the tip given in last month's column for the rom version of Snapper also works on the cassette version. Simply add the following line to the upgrade program before SPOOLing it:

```
145 !&89=RND(0)
```

Well done, David. Watch out for more goodies in next month's Arcade Corner.

Share your hints, tips, peeks and pokes with fellow *Electron User* arcade addicts, but please ensure they are all your own work.

Send them to: Arcade Corner, *Electron User*, Adlington Park, Adlington, Macclesfield SK10 4NP



Acornsoft Snapper upgrade listing

```

150 PROClod
160 MODE 6:VDU 23,1,0;0;0
0;19,0,4,0,0,0
170 PROCuupgrade
180 CALL &3400
190 :
1000 DEFPROCuupgrade
1010 REM Snapper upgrade
1020 REM original BBC version by Hac-Man 1987
1030 REM adapted for Electron by David Donaldson 1988
1040 REM (c) Electron User
1050 :
1060 SX=0:L%2:keyread=&19B
B:Level=&30:Live=&50:yesif
e=&6A:numex=&7B:sc1=&34:sc2=
&35:sc3=&36:tempsc1=&78:temp
sc2=&79:tempsc3=&7A:bonit=&
15:hidat1=&32C0
1070 inflife=&112A:ret_bon=
&1209:pracpatch=&325E:bonpatch=&
12C5
1080 BX=0:OSX=S%:OL=L%:osw
rch=&FFEE:osword=&FFF1:osbyt
e=&FFF4:oscli=&FFF7
1090 PRINT TAB(9,1);"Snapper - The Upgrade"
1100 VDU 26:PRINT TAB(2,6);
"Normal(Y/N)? ";:GX=GET:IF G
%>78 THEN PRINT"Y":GOTO 1
230
1110 PRINT"No";TAB(0,8);PL
ease type the screen no.(1-1
7): "
1120 INPUT"AS:IF AS=CHR$(1
3) OR VAL(AS)<1 OR VAL(AS)>1
7 THEN AS='1:PRINT TAB(34,8
7): "
1130 SX=VAL(AS)-1:REM start
Level
1140 PRINT"Do you want inf
inite Lives(Y/N)? ";
1150 GX=GET:IF GX<>89 THEN
PRINT"No" ELSE PRINT"Yes":!i
nflife=&003001A9:GOTO 1230:R
EM infinite lives
1160 PRINT TAB(0,11);"Please type the no. of lives(1-12
8): ";
1170 INPUT"AS:IF AS=CHR$(1
3) OR VAL(AS)<1 OR VAL(AS)>1
28 THEN AS='3':PRINT TAB(37,
11):AS
1180 LX=VAL(AS)-1:REM no. o
f lives in reserve
1190 PRINT"Do you want an e
xtra life EVERY 15000 poin
ts(Y/N)? ";:AX=GET:IF AX<>89
THEN PRINT"No" ELSE PRINTY
es:BX=1:GOTO 1230
1200 PRINT"Do you want NO
extra life(Y/N)? ";:AX=GET:I
F AX<>89 OR VX=1 THEN PRINT
"No":GOTO 1230
1210 PRINT"Yes":?&12CD=&A9
1220 :
1230 FOR IX=0 TO 2 STEP 2:P
X=&A00:[OPT IX
1240 .practice LDX# 0:STX y
eslife:STX numex:\ reset ext
ra life and no. of lives fla
gs
1250 JSR keyread:LDA &8C:\

Turn to Page 18 ▶

```

Acornsoft Snapper upgrade listing

From Page 17

scan keyboard
1260 .p.check CMP# 837:BNE
o.check:LDX# 1:STX toggle:\nsee if 'P' key pressed, if so
then switch practice mode on
1270 .o.check CMP# 836:BNE
pmode:LDX# 0:STX toggle:\nsee if 'O' key pressed, if so then
switch practice mode off
1280 .pmode LDX toggle:CPX#
0:BEQ omode:LDX# S%:STX Lev
el:LDX# L%:STX Lives:LDX# 0:
RTS:\nset practice mode
1290 .omode LDX# OSX:STX le
vel:LDX# OLX:STX lives:LDX#
0:RTS:\nset ordinary mode
1300 .toggle EQUB 1:\nflag
for practice mode on/off
1310 :
1320 .bonus LDX sc2:STX tem
psc2:LDX sc3:STX tempsc3:\nco
py score
1330 LDX# 0:.bonloop LDA te
mpsc2:SEC:SED:SBC# bonint:ST
A tempsc2:LDA tempsc3:SBC# 0
:STA tempsc3:CLD:BPL next:\nsubtract multiples of 15000
from score
1340 LDA tempsc2:BM1 loop_c

heck:BEQ loop_check:\nif res
ult <=0 check for extra life
1350 .next INX:JMP bonloop:\n\ count number of loops
1360 .loop_check CPX numex:
BNE excheck:\nif number of loops
greater than last time
make next check on no. of lives
1370 LDA# 0:STA yeslife:\nreset 'life already awarded'
flag
1380 .no_bonus JMP cont:\nno extra life - return to game
1390 .excheck LDA yeslife:B
NE no_bonus:\ncheck if extra
life already awarded this loop
1400 INC numex:INC lives:LD
A# &FF:STA yeslife:\naward extra life
1410 JSR &1832:JSR &17FD
1420 .cont JMP ret_bon:]RE
M return to main game
1430 :
1440 P%:pracpatch
1450 !&E1A=&EAEAEAE:&E1C=&EAEAEAE
1460 COPT IX:JSR practice::
]REM patch for practice mode

1470 IF BX=0 THEN 1500:REM
check if bonus life mode in
operation
1480 P%:bonpatch
1490 COPT IX:JMP bonus:NOP:
]REM patch for bonus every
15000 points if selected
1500 NEXT
1510 :
1520 \$&355B= 0-Ordinary mode - P-Practise mode
1530 :
1540 REM data for personali
sed high score table
1550 hidat1!&00=81000:\$hid
at1+&3C)=Acornsoft"
1560 hidat1!&03=82000:\$hid
at1+&50)=Acornsoft"
1570 hidat1!&06=83000:\$hid
at1+&64)=Acornsoft"
1580 hidat1!&09=84000:\$hid
at1+&78)=Acornsoft"
1590 hidat1!&0C=85000:\$hid
at1+&8C)=Acornsoft"
1600 hidat1!&0F=86000:\$hid
at1+&A0)=Acornsoft"
1610 hidat1!&12=87000:\$hid
at1+&B4)=Acornsoft"
1620 hidat1!&15=88000:\$hid
at1+&C8)=Acornsoft"

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

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TO ORDER TURN TO THE FORM ON PAGE 53

GONE are the days when old-timers used to pass the evening at the local public house, playing shove-ha'penny with the youngsters. However, now you can try your hand against your Electron's nimble fingers in this faithful reproduction of the original – but with a difference.

Shove Penny consists of a special playing table divided into different score zones by horizontal lines.

The idea is to place a penny at the front of the table, and use the palm of your hand to shove it across the table top – hopefully to stop between the borders of a score zone.

Your penny must not lie across a zone boundary, nor even touch one, to score the points for that zone. Therefore, a fair amount of skill is needed to place your penny, because the higher scoring zones are at the far end of the table, and are much narrower than the lower scoring zones.

Each player takes it in turn to shove a penny, and the highest scorer wins the round. The player with the highest cumulative score after 20 rounds wins the game.

Your score is displayed at the top right of the screen, in the colour of your counter – blue – with your opponent's below it in red.

At this point I should introduce your opponent – the Electron. Veteran of many a long session at the table, your adversary is no mean player. So you'll have your work cut out to gain the skill necessary to make any impression on its scoring abilities.

Shove too hard and your penny will bounce off the wooden guard at the end of the table and slide back toward the lower scoring areas.

Shove too gently and you won't score highly enough to win – a simple yet subtle set of rules designed to cause much frustration, not to mention costing you the odd naughty wager.

There is a difference with



Try pitting your wits against your penny-pinching Electron in CHRIS NIXON's arcade game

this version of the game, though. Wafer thin counters are used instead of pennies so they glide over each other when a collision would normally have taken place. Therefore a new rule has to be added:

If one player's counter lands on the other's, covering any portion of it at all, then that player will pick up the opponent's score for that round – if any – to add to his own, if any.

This turns the gameplay into quite an aggressive tactical battle. The Electron will always try to cover your counter if you score in one of the top two areas – the 100 point and the 50 point zones.

It won't always manage this, but it does try, and succeeds all too often. Therefore your strategy could be to go for the lower scoring zones where possible so as not to attract the Electron's attention to your counter. But is this best? Try it and see!

Always try to cover the

Electron's counter when it has scored highly, as you only have to cover one edge to add his points to your own. It's always worth a try.

After each round the order of play swaps, with the player who went first in the previous round now going second. This gives both players the chance to "huff" the opponent's counter an

equal number of times during each game of 20 rounds.

The spacebar is used to control all the action, as your counter will cycle across the bottom of the table continuously, letting you stop it at the best spot.

Wait until it is where you

Turn to Page 21 ▶

VARIABLES

sc%	Player's score
sc1%	Computer's score
p%	Power of current shot
turn%	Number of rounds played
go%	Who goes first
pow%()	Lookup table

PROCEDURES

setup	Set up variable
assem	Assemble machine code
sh	Print shadowed text
power	Power meter routine
scan	Move player's counter

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◀ *From Page 19*

and the power meter on the right of the screen will begin to climb.

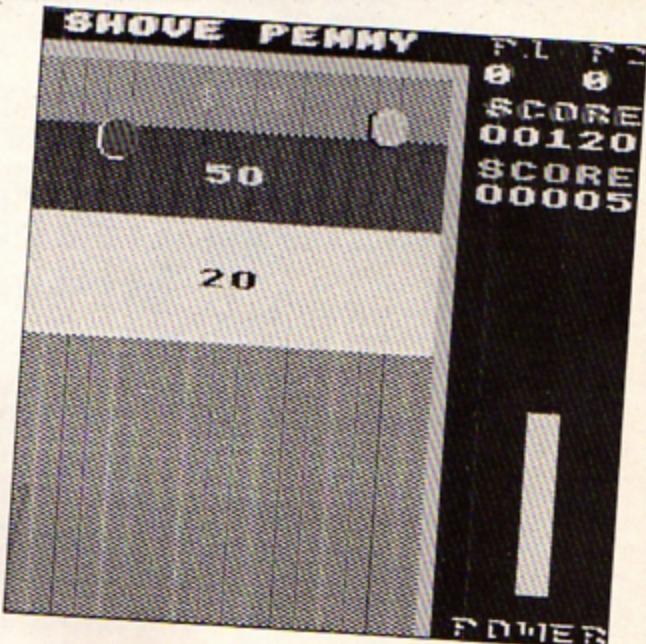
When you have collected enough power for the shot, release the spacebar. If you keep it pressed, the power meter will reset to zero and begin climbing again and continue cycling until you release the key. Your counter will be fired, and the computer will calculate your score according to the rules of play.

If either of you lands on the other's counter you will hear a two-tone sound let-

ting you know that extra points have been gained by the top counter.

If you don't hear this sound when the counters are overlapped it means that the lower counter had not scored anyway, and there were no points to be collected by the top counter.

At the end of 20 rounds the computer will add up the scores, awarding the game to the player with most points. You can then begin another game, and it is then up to you to halt the action when a pre-decided number of games have been played. want to fire from, and press space. Hold the key down,



```

10 REM SHOVE PENNY
20 REM By Chris Nixon
30 REM (c) Electron User
40 REM
50 IF PAGE=&E00 THEN 100
60 *FX21,0
70 *K.0 *T.1MFORIX=&0TO(TO
P-PAGE)STEP4:1%=&E00=I%:PAGE
:NEXT:MPAGE=&E00:IMOLD:MRUN:IM
80 *FX138,0,128
90 END
100 *FX16
110 MODE2:VDU23;8202;0;0;0
:;PROCsetup
120 REPEAT:PROCnewgame:REP
EAT
130 PROCplay:UNTILturn%>20
140 PROCSq(56,228,11,0,12)
150 IF sc%>sc1% p1%=p1%+1:
SOUND1,1,50,30:PROCsh("YOU W
IN!",4,1,200,600)
160 IF sc%<sc1% p2%=p2%+1:
SOUND1,2,150,30:PROCsh("I WI
N!",4,1,250,600)
170 IF sc%=sc1% p1%=p1%+1:
p2%=p2%+1:SOUND1,3,100,50:PR
OCsh("DRAWN GAME",4,3,180,60
0)
180 PROCsh("ANOTHER GAME?"
,4,7,50,512):FX21
190 REPEAT:GX%:GET AND 223:
UNTILGX%ASC"Y" OR GX%ASC"N":
IF GX%ASC"Y" ask%:TRUE ELSE
ask%:FALSE
200 UNTILNOTask%:END
210 DEFPROCsetup:PROCassem
:>FORL=&0 TO &9F STEP8:READVS:
FORC%=&1TO(LENVS)/2:B%:EVAL(
"&+MIDS(VS,C%*2-1,2))?:(&900
+L%+C%-1)=B%:NEXT:NEXT
220 p1%:p2%:DIMpow%(10
):FORL%=&1010:READpow%(L%):N
EXT
230 ENVELOPE1,128,1,1,1,50
,50,50,0,0,0,0,0:ENVELOPE2
,128,-1,-1,-1,50,50,50,0,0
,0,0,0:ENVELOPE3,1,-1,1,-1,1
,0,20,10,0,0,0,0,0:ENVELOPE
4,128,4,-2,-3,10,20,30,0,0,0
,0,0,0

```

```

240 ENDPROC
250 DEFPROCnewgame:PROCdb
d:ps%:0:cs%:0:go%:0:turn%:0:
sc%:0:sc1%:0:PROCheader:ENDP
ROC
260 DEFPROCdrbd:RESTORE107
0:PROCsq(56,228,3,0,12):PROC
sq(52,216,14,2,24):PROCsq(52
,48,11,2,80):PROCsq(52,36,56
,2,44):PROCsq(52,26,50,2,18)
:PROCsh("SHOVE PENNY",1,3,96
,1023):VDU5:FORLX%:1T04:READx
%,y%,c%,v$:GCOL3,cX:MOVEx%,y
%:PRINTv$:NEXT
270 VDU4:PROCsh("P1 P2",5,
2,928,1023):PROCsh("SCORE",3
,4,928,927):PROCsh("SCORE",2
,1,928,831):PROCsh("POWER",7
,2,928,96):ENDPROC
280 DEFPROCplay:IFgo%:0 PR
0Cscan:PROCpower:PROCfire:PR
0Crobot ELSE PROCrobot:PROCs
can:PROCpower:PROCfire
290 PROCdecide:sc%:sc%:ps%
:IF sc%<0 sc%:0
300 sc1%:sc1%+cs%:IF sc1%<
0 sc1%:0
310 PROCheader:go%:go% EOR
1:turn%:turn%+1:PROCpause:X
%:?xcopy:Y%:?ycopy:CALLrepla
ce:PROCrestore:ENDPROC
320 DEFPROCcassem:DIMcode%
700:b=&50:screen=&55:data=&5
7:buffer=&70:FORpass%:0T02ST
EP2:P%:code%:OPT pass%
330 .square:LDY #0:LDA b,Y
:STA width:INY:LDA b,Y:STA h
eight:INY:LDA b,Y:STA colour
:INY:LDA b,Y:STA xcoord:INY:
LDA b,Y:STA ycoord:.rowloop1
:JSR convert:LDX width:LDY #
0:.columnloop1:LDA colour:STA
(screen),Y:CLC:LDA screen:
ADC #8:STA screen
340 LDA screen+1:ADC #0:ST
A screen+1:DEX:BNE columnloo
p1:LDA colour:PHA:AND rightm
ask:LSR A:STA temp:PLA:AND l
eftmask:ASL A:ORA temp:STA c
olour:INC ycoord:DEC height:

```

```

BNE rowloop1:CLI:RTS
 350 .print:STX xcoord:STY
 ycoord:ASL A:TAX:LDA lookup,
 X:STA data:LDA lookup+1,X:ST
 A data+1:JSR convert:LDA #15
 :STA height:LDA ycoord:AND #7:STA temp:LDA #7:SEC:SBC te
 mp:STA offset:LDA #0:STA tem
 p:LDX #0:.p1:LDA #4:STA widt
 h:LDY #0
 360 .p2:LDA (screen),Y:STA
 buffer,X:STA scr:STY temp:T
 XA:TAY:LDA (data),Y:LDY temp
 :STA spr:AND rightmask:BNE r
 nib:LDA scr:AND rightmask:.r
 nib:STA leftside:LDA spr:AND
 leftmask:BNE put:LDA scr:AN
 D leftmask:.put:ORA leftside
 :STA (screen),Y
 370 CLC:TYA:ADC #8:TAY:INX
 :DEC width:BPL p2:DEC offset
 :BMI newoffset:CLC:LDA scree
 n:ADC #1:STA screen:LDA scre
 en+1:ADC #0:STA screen+1:.re
 enter:DEC height:BPL p1:RTS:
 .newoffset:CLC:LDA screen:AD
 C #879:STA screen:LDA screen
 +1:ADC #2
 380 STA screen+1:LDA #7:ST
 A offset:JMP reenter:.replac
 e:STX xcoord:STY ycoord:LDA
 #15:STA height:LDA ycoord:AN
 D #7:STA temp:LDA #7:SEC:SBC
 temp:STA offset:JSR convert
 :LDX #0:.r1:LDA #4:STA width
 :LDY #0
 390 .r2:LDA buffer,X:STA (
 screen),Y:CLC:TYA:ADC #8:TAY
 :INX:DEC width:BPL r2:DEC of
 fset:BMI newoff1:CLC:LDA scr
 een:ADC #1:STA screen:LDA sc
 reen+1:ADC #0:STA screen+1:.
 reenter1:DEC height:BPL r1:RT
 S:.newoff1:CLC:LDA screen:AD
 C #879
 400 STA screen:LDA screen+
 1:ADC #2:STA screen+1:LDA #7
 :STA offset:JMP reenter1:.co
 nvert:LDA #0:STA store+1:STA
 screen:LDA xcoord:ASL A:ASL
 A:ROL store+1:ASL A:ROL sto

```

```

re+1:STA store:LDA ycoord:AN
D =&F8:LSR A:LSR A:STA screen
n+1:LSR A:LSR A
    410 ROR screen:ADC screen+
1:TAY:LDA ycoord:AND #7:ADC
screen:ADC store:STA screen:
TYA:ADC store+1:ADC =&30
    420 STA screen+1:RTS:.fire
:STX xcoord:STY ycoord:STA p
ower:LDA #0:STA flag:.move:L
DX xcoord:LDY ycoord:JSR rep
lace:LDA flag:BNE movedown
    430 SEC:LDA ycoord:SBC pow
er:CMP #16:BCS nobounce:LDA
#1:STA flag:JMP move:.noboun
ce:STA ycoord:DEC power:BMI
done:LDX xcoord:LDY ycoord:L
DA shape:JSR print:LDY #5:d
el1:LDX #100:del2:NOP:NOP:D
EX:BPL del2:DEY:BPL del1
    440 JMP move:.done:LDX xco
ord:STX xcopy:LDY ycoord:STY
ycopy:LDA shape:JMP print:.
movedown:CLC:LDA ycoord:ADC
power:CMP #240:BCC nobounce:
LDX xcoord:LDY ycoord:JMP re
place
    450 .leftmask:OPT FNnequ(&
55):.rightmask:OPT FNnequ(&A
A):.temp:BRK:.width:BRK:.hei
ght:BRK:.colour:BRK:.xcoord:
BRK:.ycoord:BRK:.scr1:BRK:BR
K:.store:BRK:BRK:.temp:BRK:.
spare:BRK:.offset:BRK:.lefts
ide:BRK:.scr:BRK:.spr:BRK:.p
ower:BRK
    460 .count:BRK:.shape:BRK:.
flag:BRK:.xcopy:BRK:.ycopy:
BRK:.lookup:OPT FNnequw(&900)
:OPT FNnequw(&950):.xc1:BRK:.
yc1:BRK
    470 .buffer1
    480 J:NEXT:ENDPROC
    490 DEF FNnequ(N%):?P%=&N%
500 P%=&P%+1:=pass%
510 DEF FNnequw(N%):!P%=&N%
520 P%=&P%+2:=pass%
530 DEFPROCsq(w%,h%,c%,x%,
y%)

```

Turn to Page 22 ►

Shove Penny listing

◀ *From Page 21*

```

540 ?b=w%?:?b+1)=h%?:?b+2)
=c%
550 ?(b+3)=x%?:?b+4)=y%
560 CALLsquare:ENDPROC
570 DEFPROCsh($S,c1%,c2%,x%
%,y%)
580 VDU5:GCOL0,c1%:MOVE x%
,y%:PRINTAS
590 GCOL0,c2%:MOVE x%-8,y%
-4:PRINTAS
600 VDU4:ENDPROC
610 DEFPROCpower:y%:=208:x%
=66:p%:=1
620 REPEAT:IFp%<10 PROCsq(
4,12,43,x%,y%) ELSE PROCsq(4
,12,3,x%,y%)
630 y%:=y%-12:p%:=p%+1:IFp%=
13 PROCsq(4,144,0,x%,y%+12):
p%:=1:y%:=208
640 UNTILNOTINKEY(-99):p%=
(p%*1.5-(RND(3)-2))+10:ENDPR
OC
650 DEFPROCscan:IF go%<1 X%
=cx%:Y%:=cy%:PROCstore
660 x1%:=3:y1%:=232:AX:=0:REP
EAT:XX:=x1%:YY=y1%:CALLprint:
TIME=0:REPEAT:I%:=INKEY(-99):
UNTILTIME=10 OR IX%
670 IF NOT IX CALLreplace:
x1%:=1%+2:x1%>48 x1%:=3
680 UNTILIX%:SOUND1,-15,150

```

```

,2:ENDPROC
 690 DEFFPROCfire:SOUND1,4,8
0,10:XX=x1%:Yy%:A%:p%:sh
ape%:CALLfire:px%?:xcoord:p
y%?:ycoord:PROCsq(4,144,0,x%
,76):?xcoord=px%?:ycoord=py%
:ps%:FNscore:ENDPROC
 700 DEFFPROCrobot:IF go%=0
XX=px%:Yy%:PROCstore
 710 FORLX=1TO1000:NEXT:SOU
ND1,4,80,10
 720 IF go%=1 OR (go%=0 AND
ps%<50) XX=RND(45)+4:Yy%=232
:A%:pow%(RND(10)) ELSE XX=px%
-3+RND(7)-1:Yy%=232:AX=p%+(R
ND(3)-2)
 730 ?shape=1:CALLprint:CAL
Lfire:cx%?:xcoord:cy%?:ycoor
:d:cs%:FNscore:ENDPROC
 740 DEFFNscores:y%?:ycoord:
IF yy%>18 THENIF yy%<28 =100
 750 IF yy%>44 THENIF yy%<64
=50
 760 IF yy%>80 THENIF yy%<112
=20
 770 IF yy%>128 =5 ELSE =0
 780 DEFPROCdecide:IF NOT(p
x%>cx%-4 AND px%<cx%+4 AND p
y%>cy%-14 AND py%<cy%+14) EN
DPROC
 790 IF go%>0 AND ps%>0 SOU
ND1,-15,248,5:SOUND1,-15,200
,5
 800 IF go%>1 AND cs%>0 SOU
ND1,-15,248,5:SOUND1,-15,200
,5
 810 IF go%>0 cs%:cs%+ps% E
LSE ps%:ps%+cs%
 820 ENDPROC
 830 REM first counter
 840 DATA001A303000053034
 850 DATA302005343034201A
 860 DATA303030301A303030
 870 DATA301A383030381A30
 880 DATA3030301A30303030
 890 DATA1A303030301A3830
 900 DATA30381A303030301A
 910 DATA3030303005343034
 920 DATA200530343020001A
 930 DATA30300000050F0A00
 940 REM second counter
 950 DATA0009030300040307
 960 DATA0302040703070209
 970 DATA0303030309030303
 980 DATA03090B030303080903
 990 DATA0303030903030303
1000 DATA0903030303090003
1010 DATA0308090303030309
1020 DATA0303030304070307
1030 DATA0204030703020009
1040 DATA03030000040C0800
1050 DATA20,16,21,10,18,26,
23,21,20,16
1060 DATA20,21
1070 DATA352,912,2,100,384,
790,5,50
2000:NEXT:ENDPROC
 1080 DATA384,625,1,20,416,4
00,2,5
 1090 DEFPROCshow(v%,y%):sc%
=STR$v%:IF LENsc$<5 sc$=STRI
NGS(5-LENsc$,0):sc$%
 1100 FORLX=1TOLENsc$:IFMIDS
(sc$,LX,1)=0 sc$=LEFT$(sc$
,LX-1)+RIGHT$(sc$,LENsc$-
-LX)
 1110 NEXT:PROCsq(20,9,0,58,
255-y%/4):PROCsh(sc$,6,7,928
,y%):ENDPROC
 1120 DEFPROCheader:PROCsq(2
0,9,0,58,9):PROCsh(STR$p1%,4
,3,928,980):PROCsh(STR$p2%,4
,3,1120,980):PROCshow(sc%,88
4):PROCshow(sc1%,788):ENDPRO
C
 1130 DEFPROCstore:FORLX=0TO
79:buffer1?LX=buffer?L%:NEXT
:xc1=XX?:yc1=Yy%:ENDPROC
 1140 DEFPROCrestore:FORLX=0
T079:buffer?LX=buffer1?L%:NE
XT:XX?:xc1=Yy%?:yc1:CALLrepla
ce:ENDPROC
 1150 DEFPROCpause:FORLX=1TO

```

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

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LINERS

THIS month's 10 Liners consists of four machine code integer maths programs provided by Julie Boswell. These ready-made routines are designed to be incorporated into your own machine code programs.

The first 10 Liner will prompt for two numbers. These will be stored at &70 and &72. When the machine code is called they will be added and the result placed at &74.

The second program is very similar – it subtracts the second number from the first and prints out the result. The same memory locations as before are used.

The third program, Division, will prompt for two numbers. The second is divided by the first then the quotient and remainder are printed out. The memory locations from &90 to &93 are used as workspace.

The last is Multiplication. The two numbers are multiplied and the result printed out. Two-byte integers are used to store the numbers and result, so these must all be below 65535.

ADDITION

```
1 REM Addition
2 INPUT First number:"nu"
m1%
3 INPUT Second number:"n
um2%
4 !870=num1%:!872=num2%:
P%=&900
5 [ CLC:LDA 870:ADC 872:
STA 874:LDA 871:ADC 873:STA
875:RTS:]
```

```
6 CALL 8900
7 PRINT"Result=";!874 AN
D &FFFF
```

74+56

SUBTRACTION

```
1 REM Subtraction
2 INPUT First number:"nu"
m1%
3 INPUT Second number:"n
um2%
4 !870=num1%:!872=num2%:
P%=&900
5 [ SEC:LDA 870:SBC 872:
STA 874:LDA 871:SBC 873:STA
875:RTS:]
```

```
6 CALL 8900
7 PRINT"Result=";!874 AN
D &FFFF
```

160
23

4523-741

DIVISION

```
1 REM Division
2 INPUT First number:"nu"
m1%
3 INPUT Second number:"n
um2%
4 !870=num1%:!872=num2%:
P%=&900
5 [ LDA #0:STA 890:STA 891:STA
892:STA 893:LDY #16:L
X:ASL 890:ROL 891:ASL 870:R
OL 871:ROL 892:ROL 893:INC &
90
6 SEC:LDA 892:SBC 872:ST
A 892:LDA 893:SBC 873:STA 89
3:BCS PX+16
7 LDA 892:ADC 872:STA 89
2:LDA 893:ADC 873:STA 893:DE
C 890:DEY:BNE LX
8 LDY #4:L
X:LD A 890:STA 870:STA
870:LDA 891:STA 871 \quoti
ent
9 LDA 892:STA 872:LDA 89
3:STA 873 \remainder
10 RTS:]CALL 8900:PRINT"
Result=";!870 AND &FFFF;" R
remainder ";"!872 AND &FFFF" R
```

MULTIPLICATION

```
1 REM Multiplication
2 INPUT First number:"nu"
m1%
3 INPUT Second number:"n
um2%
4 !870=num1%:!872=num2%:
P%=&900
5 [ LDA #0:STA 874:STA &
74+1:LDY #16
6 .loop:ROL 873:ROR 872:
BCC P%+15
7 CLC:LDA 870:ADC 874:ST
A 874:LDA 870+1:ADC 875:STA
875
8 ASL 870:ROL 871
9 DEY:BNE Loop:RTS:]
10 CALL 8900:PRINT"Result
=";!874 AND &FFFF
```

33
X
591

IN this short series we'll be looking at some of the techniques involved in moving characters around the screen.

The characters we'll be using aren't the normal built-in or user defined ones, but are multicoloured sprites of any size or shape, like the ones found in top-selling arcade games.

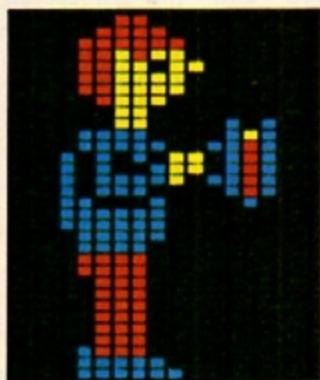
The sprites will be able to move anywhere on the screen with pixel accuracy and we won't be restricted to normal character print positions as with Basic.

And the techniques used are among the fastest around to achieve the speed necessary for quick-fire arcade shoot-'em-ups.

You'll need to be fairly familiar with 6502 assembly language to follow the programs and routines given, and I am going to assume this is the case.

The machine code will be fairly advanced, but you won't need to fully understand how the routines work - you can get by with simply understanding how to use them (many people can drive a car, but few know how they actually work).

Last month I started the



series by presenting a Mode 5 multicolour sprite designer. This enables you to create any number of sprites, and you can work on up to four frames of animation at once.

The sprite editing grid in the designer can cope with sprites from a minute one pixel by one pixel up to a massive 24 by 32 pixels.

The characters designed are saved to disc (a disc system is essential for

Are you in on the plot?

In Part 2 of his sprite animation series ROLAND WADDILOVE shows how to go about plotting them on the screen

machine code games programming) as a series of screen data bytes. The first two bytes hold the width and height.

The sprites can be loaded directly into memory by your machine code program. However, it is often useful to store them as a series of data statements in a separate program, or at the end of the assembly listing.

Program I will take a sprite

```
10 REM Data Maker
20 MODE 6
30 INPUT "Sprite file name: " sprite$
40 OSCLI "LOAD "+sprite$+" 800"
50 PRINT "Sprite loaded.
...
60 INPUT "Data file name: " name$
70 OSCLI "SPOOL "+name$+" 800:Y%=?&B00:L%=?&B01:LX%=?&B02:a$=?&B02:DATA"
80 PRINT "0000REM "+a$+" 9000REM "+name$+" 100 PRINT "9010REM X=?;X%;Y%=?;Y%
90 FOR I%=? TO X%-1
100 FOR J%=? TO Y%-1
110 a$=a$+STR$(?B%)+";";B%=?+1
120 IF LEN(a$)>200 OR (I%=?-1 AND J%=?-1) a$=LEFT$(a$,LEN(a$)-1):PRINT a$;L%=?+10;a$=STR$(L%)+"DATA"
130 NEXT
140 NEXT
150 *SPOOL
```

Program I

off disc and convert it into a *SPOOLed file of Basic data statements. This file can be tagged on to the end of a program by *EXECing it.

The first line will be a REM

with the sprite name and the second line will tell you the sprite width in columns and height in rows.

If you have created a sprite with last month's



editor, run Program I and enter the name of the sprite at the prompt. Now enter the name for the *SPOOLed file and it will then be written to disc. The data statements can be *EXECed on

to the end of a program at any time.

Having created our sprites using last month's designer and the data maker presented here, it's time to move on to plotting them on the screen. For this we'll need to know how the Electron organises its screen memory.

Figure I shows the top left corner of the Mode 5 screen. Note that as you go down the screen the addresses increment by one quite nicely until the bottom of the first character row.

Then there is a jump of &139 to the next byte on the top of the second character row, and after this they increment by one again till the next row.

Going across the screen there is an eight-byte jump each time.

Armed with this information we can write a

Row 0:	&5800	&5808	&5810	...
	&5801	&5809	&5811	...
	&5802	&580A	&5812	...
	&5803	&580B	&5813	...
	&5804	&580C	&5814	...
	&5805	&580D	&5815	...
	&5806	&580E	&5816	...
	&5807	&580F	&5817	...

Row 1:	&5940	&5948	&5950	...
	&5941	&5949	&5951	...
	&5942	&594A	&5952	...
	&5943	&594B	&5953	...

Figure I: The top left corner of the Mode 5 screen

Programming

```

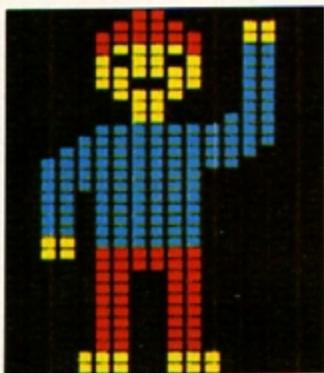
10REM Simple Print
20PROCassembly
30MODE 5
40CALL 8900
50END
60
70DEF PROCassembly
80new=870
90temp=872
100rows=874
110temprows=875
120columns=876
130FOR pass=0 TO 2 STEP 2
140PX=8900
150C OPT pass
160
170\new=screen address
180LDA #85D00 MOD256
190STA new
200LDA #85D00 DIV256
210STA new+1
220
230\newdata(sprite address
240LDA #sprite MOD256
250STA newdata+1
260LDA #sprite DIV256
270STA newdata+2
280
290\X=width,Y=height
300LDX #4
310LDY #32
320JSR print
330RTS
340
350.print
360 STX columns
370 STY rows
380 LDX #0
390 LDY #0
400 LDA new
410 STA temp
420 LDA new+1
430 STA temp+1
440 Loop1
450 LDA rows
460 STA temprows
470 Loop2
480.newdata
490 LDA &3000,X
500 STA (new),Y
510 INX
520 LDA new
530 AND #7
540 CMP #7
550 BEQ bottom
560 INC new
570 BNE next
580 INC new+1
590 JMP next
600.bottom
610 LDA new
620 ADC #838
630 STA new
640 LDA new+1
650 ADC #1
660 STA new+1
670.next
680 DEC temprows
690 BNE Loop2
700 LDA temp
710 ADC #8
720 STA new
730 STA temp
740 LDA temp+1
750 ADC #0
760 STA new+1
770 STA temp+1
780 DEC columns
790 BNE loop1
800 RTS
810
820.sprite
830]
840NEXT
850FOR i=0 TO 127
860READ ?P%
870P%=P%+1
880NEXT
890ENDPROC
900
910REM SPRITE
920REM X=4/Y=32
930DATA 0,0,0,0,0,0,0,0,0,
0,0,0,17,17,0,0,17,17,17,0,
0,0,0,0,1,1,3,207,207,238,1
19,3,7,15,45,60,60,60,52,48,
48,255,255,85,85,221,221,102,
102,186,184,253,15,15,14,14,
13,13,11,9,0,17,0,0,8,12,19
2,96,192
940DATA 192,128,0,0,0,136,
136,204,204,204,204,204,136,
136,0,0,0,0,8,12,12,14,63,12
7,238,204,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,136,0,0,0

```

Program II

machine code routine to plot our sprites. Program II is a demonstration which prints a large sprite on the screen.

Enter it, save it, then run it – the machine code will be



assembled and called, displaying a single frame of a walking man on a Mode 5 screen.

The method used by the sprite print routine – labelled *print* – is to draw the character column by column, each one byte wide. The sprite data is stored in

the data statements starting at line 930 (created by Program I) and the size is stored in line 920.

As you can see, X is four and Y is 32 so the sprite is four columns wide and 32 rows deep. The *print* subroutine consists of two loops – an outer and an inner. Written in pseudo code it would look like:

```

FOR column=1 TO 4
FOR row=1 TO 32
Get byte of data
Store it in screen ram
NEXT row
NEXT column

```

The screen address is incremented by one for each row in the inner loop and the bottom of a character row is detected by ANDing the low byte of the address with seven, then comparing it with seven. If it is equal to seven then an extra &138 is added to the address to move on to the next screen row.

Before calling the print routine it is necessary to set up several variables. The address to print the sprite at should be stored in *new*, the sprite data address in *newdata+1* and the X and Y registers loaded with the width and height before calling *print*.

Line 490 is unusual – this is the line which picks up the sprite data from memory:

```
490 LDA &3000,X
```

It assembles to:

```
BD 00 30
```

The sprite data address is poked into the second and third bytes – 00 30 – *newdata+1* and *newdata+2*. The reason for using this method is that this is an absolute indexed instruction taking just four cycles. We could have used something like:

```
LDA (sdata),Y
```

but at five cycles this is

slightly slower and would involve extra code to boot.

As it stands, the print routine simply pokes the sprite data directly to the screen. This means that any background stored underneath it will be destroyed. Furthermore, we haven't yet got a method of removing the sprite from the screen.

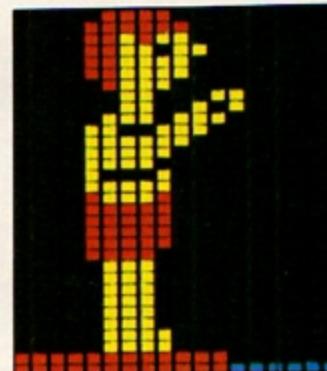
These minor difficulties are easily circumvented by adding the following lines to Program II:

```

44 G=GET
46 CALL 8900
495 EOR (new),Y

```

Now the sprite data will be EORed with the screen. Run the program and when the character is printed, press a key to erase it – the machine code is called



again to EOR the data with the screen a second time.

Now you've got a routine to print and erase sprites on the screen, moving one around is a simple matter of printing it at one position, erasing it and printing it again at another position.

Moving a sprite by calling *print* to erase it then *print* again to redraw it at the new position is rather slow and long winded. It is much better to combine the two operations – erase and re-draw at the same time.

Program III shows how this is achieved. It contains a similar, but slightly modified *print* routine. Enter it, save it and run it. Press a key to move the sprite. A lot of

Turn to Page 27 ▶

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Programming

◀ From Page 25

initialisation is required before *print* can be called as quite a few variables have to be set.

The old address of the sprite is stored in *old*, the new address in *new*, the old data (frame one of the animation sequence) in *old-data+1*, and the new data (frame two) in *newdata+1*. The size is passed in the X and Y registers. (Program III uses the same frame twice so there isn't any animation).

To put the sprite on the screen initially, *put* is called. The old address and data aren't important, and all you need to do is set the new address and data.

Finally, Program IV contains a routine called *con-*

vert which will convert an x,y coordinate into a screen address. These aren't the normal graphics coordinates however, but are based on a 40 by 256 screen with the origin in the top left corner of the display. This is the byte size of the screen - 40 bytes across by 256 down.

Type in Program IV and run it. Enter the x and y coordinates at the prompts and the address will be printed out. Stick to within the screen limits otherwise you'll just get a nonsense address.

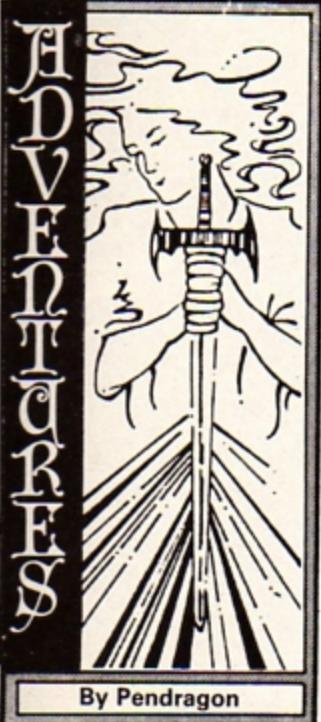
- There is enough material here to keep you going till next month, when I'll show how to move sprites in front or behind other objects on the screen without affecting them in any way.

```

10 REM Get screen address
20 PROCassembly
30 PRINT
40 INPUT" coordinate",XX
50 INPUT" coordinate",YY
60 CALL &900
70 PRINT"Address=";?"!&70
ND &FFF
80 END
90
100 DEF PROCassembly
110 temp=&70
120 FOR pass=0 TO 2 STEP 2
130 PX=&900
140 E OPT pass
150
160 \X,Y --> address
170 .convert
180 LDA #0
190 STA temp+1
200 TXA
210 ASL A
220 ASL A
230 ROL temp+1
240 ASL A
250 ROL temp+1
260 STA temp
270 TYA
280 AND #7
290 ADC temp
300 STA temp
310 LDA temp+1
320 ADC #0
330 STA temp+1
340 TYA
350 LSR A
360 LSR A
370 LSR A
380 ASL A
390 TAY
400 LDA table,Y
410 ADC temp
420 STA temp
430 LDA table+1,Y
440 ADC temp+1
450 STA temp+1
460 RTS
470
480 .table
490 OPT FNtable
500 ]
510 NEXT
520 ENDPROC
530 '
540 DEF FNtable
550 FOR IX=0 TO 31
560 [OPT pass
570 EQUW &5800+IX*8140
580 ]
590 NEXT
600 =pass

```

Program IV



By Pendragon

I MUST tell you about a fabulous new release from Larsoft, entitled simply, **Hex**. This, as all Classics scholars will know, is the Greek word for six, and is the sixth adventure to spring from the pen of that master of the Quill, Geoff Larsen.

The action is centred in and around a small Cornish fishing village circa 1900. The area is rich in folklore and superstition is rife.

Centuries previously a witch known as Vianna had

You'll be bewitched by stormy Cornwall

lived in the area. On certain stormy nights, or when the moon is full, Vianna is reported to return from the dead to stalk the night.

She is also supposed to conjure up demons and familiars to assist her in her unholy deeds.

People have reported hearing strange whistles and voices in the dark, with no visible persons being apparent. Footsteps have been heard and the whinnying of horse-like creatures has occasionally come from thin air.

You play the part of a travelling stranger who arrives in the village on just such a night, and unwillingly becomes caught up in the strange events which follow.

If you wish to know more, I suggest that you rush your order to Larsoft now!

As with all Larsoft adventures, the background has been thoroughly researched for authenticity by Mr Larsen. The adventure reeks of atmosphere and the

appetite is whetted for Geoff's machine code epic which he is currently writing for Robico.

Wychwood, Nine Dancers and **The Puppet Man** are still available from Larsoft, priced £3.95 each and as such are masterpieces which should not be missing from any text adventure collection.

Geoff's first adventure, a two-parter entitled **The Rising of Salandra** is an absolute classic and retails at a bargain £4.95.

In a matter of only one year, Larsoft has firmly ensconced itself as one of the leading text adventure software houses for the Electron, along with the supreme Robico, Epic and Shards.

In my opinion Electron adventures are now outstripping BBC Micro adventures for originality, atmosphere and playability.

Just compare three recent Electron releases, **Hex**, **Village of Lost Souls** and **The Hunt** with the cream of BBC newbies, the dire **Yes Prime Minister**, the awful **Not a Penny More Not a Penny Less** and the abysmal **The Archers**, and you will see what I mean.

No wonder, following my review in *The Micro User* of **Epic's Lost Crystal**, BBC Micro owners have clamoured for, and obtained, a conversion for their machine of this all-time Electron classic.

We may have a smaller user-base than our BBC brother, but above all, Electron users are clannish, loyal to their machine and support good software.

This month I begin serialising in Hall of Fame a complete solution to **Operation Safras**. This is particularly for the pupils of Wigmore High School, who en masse seem stuck with every aspect of this Shards riddler.

Also I have given **Enthar Seven** a break this month as it seems to have been running for an eternity, but don't worry, next month will see the continuation of this giant solution for an even bigger adventure.

Until the midnight oil burns low, happy adventuring.

Adventurer's Glossary

(continued from last month)

Earth-stone: A symbol of power and good.

Eggs: Could be a chicken's, but more likely a dragon's, so take care.

Elephant: They're frightened of mice.

Elevator: Present in a number of adventures. Usually some obscure method of operation - a bit of experimentation is probably called for.

Elixer of Life: Try drinking it.

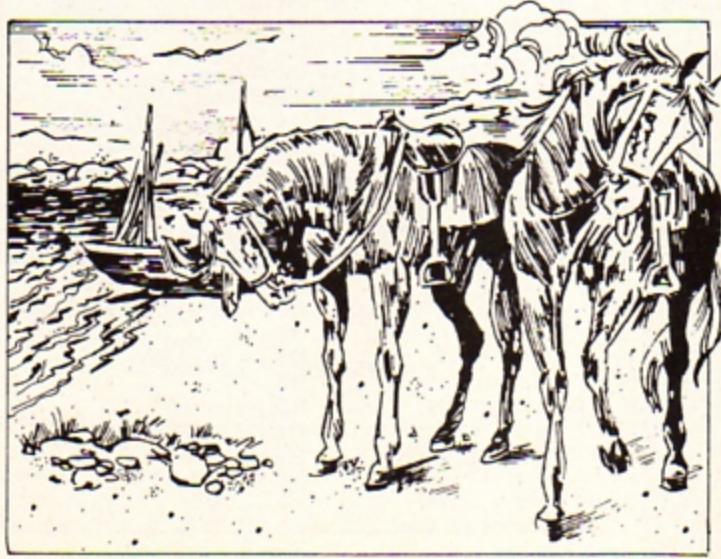
Elves: Usually friendly, but often mischievous and certainly magical.

Emerald: Almost certainly a treasure.

Entrance: Usually plenty of these in most adventures. Could be booby-trapped, or you may need a magic key or password.

Eternal Passages: Bound to be a maze, or at least a bit confusing.

Evil Eye: Evil beyond imagination - must be destroyed.



Readers' Hall of Fame

Operation Safras - Harry Bastien

This solution only gives the elementary actions. The passwords, clues and more subtle actions are left for you to discover:

LONDON - EXAMINE LIFT - EXAMINE MAN - ASK MAN - EAST - GET FIVER - GO TO BRISTOL - EXAMINE SEAT IN COACH - GIVE FIVER TO TRAMP - GO TO COVENTRY - EXAMINE CART - GO TO LIVERPOOL - GET KEY - ASK MAN AT BAR.

GO TO ABERDEEN - BLOW NOSE IN SHOP - GO TO DUNDEE - BREAK GLASS - ENTER WINDOW - EXAMINE COMPUTER - TYPE RU - EXAMINE VAULT - GET TRIPP.

GO TO OXFORD - ENTER FARMHOUSE - EXAMINE ROOM - GO TO EXETER - EXAM KEY - OPEN LOCKER 21 - GET EGG - GET NOTE - READ NOTE.

GO TO NEWPORT - EXAM TREES - EXAM CROSS - EXAM HOLE - GET BOTTLE - GO TO PLYMOUTH - EXAM CAVE.

GIVE BOTTLE TO LADY - GO TO ABERDEEN - GIVE EGG TO MAN - GO TO COVENTRY - SCRATCH EAR - READ PAMPHLET.

Philosopher's Quest - John Tipper

When you start off you will need the rod, keys and aqualung from the shop. Take the rod and throw it. Now you can safely get the other two items. Once outside the shop type GET twice to obtain the rod and lamp. Now use ON to switch on the light and you can move about safely.

Go South and throw the rod to prevent the wall from crushing you. Carry on South until you reach the beach. Drop the aqualung and go West along the beach. Go Northwest to the bungalow and open the larder with the keys and enter.

Get the cup of tea, leave the larder and go North into the sitting room. A lady will tell you about her dog then shoo you out. Go to the location outside the shop then Go East. Get the amulet and then think. Go down, then go North and rub the amulet to raise the drawbridge.

Continue North in the following way: JUMP NORTH, GET MASK, CRAWL NORTH, GET TROPHY, HOP SOUTH, RUN SOUTH, SOUTH to reach Picadilly Circus. A random move generator operates here, so experiment with NE, NW, SW, and SE.

Leave the matches for the time being, but get the cheese. Drop your treasures in the shop on the way back. As soon as you have got the cheese, go to the beach. You must now drop the cheese and move away from it every three moves to prevent yourself from choking on the foul stench.

Problems Solved

Lady Fee, Clive Mahoney and James Farmer are all stuck at various points in **Micropower's Adventure**. Clive needs to say OPEN SESAME to open the closed cavern door at the start.

Lady Fee must kill the spider with the axe, turn off her lamp and HOOT to get rid of the rat.

James should steal a treasure to get thrown into the dungeons, but should ensure that he has his keys with him first.

James is also stuck in **Escape from Pulsar Seven**. This is a game which I have not seen; can anybody help with a full solution?

Clive needs help with an age-old problem in **Stranded**. You must get the gun then JUMP and SHOOT to kill the robot.

In the **Stolen Lamp** you must be brutal, as I suggested last month, but should also drop the grenade and get the red herring before acquiring some of the treasures, Clive.

Andrew Young cannot

seem to get started in **Wychwood**. Use the credit card to open the cabin door and fill the bucket at the pond.

Straighten the paper clip and use it with the newspaper to pick the lock of the front door. That should get you into the adventure.

This may also help Mark Deehan who should also FEEL and PULL CORD when in the dark under the trapdoor.

Mark is also flummoxed at the end of the **Nine Dancers**. You should talk to the princess, get the garland and a galleon will provide your transport to the island.

In **Myorem**, Mark must make a catapult from the bandage and forked stick in order to frighten the puma.

A number of readers who have written in are stuck with some of the ingenious puzzles in **Tynesoft's Oxbridge**. To reach the island you must embark in the punt.

Once equipped with the punt pole, ordinary direction

commands will manoeuvre the punt round to the pub jetty where you may safely step ashore. But take care not to cross via the No Entry bridge.

Do not disembark at the No Punters jetty. Avoid the low bridge and also avoid the temptation to catch the crab.

To work the service till in the bank you will need the card from the dining hall. You must also have taken note of the numbers written on the blackboard in the maths lecture theatre.

The ID number is the missing term in the sequence. INSERT CARD, wait, 2101, wait, TAKE WAD. To avoid trouble with the manager troll, refrain from visiting his office.

Vic Robinson and Fiona Reynolds among many, have asked for the significance of the Rector's Bible in **Village of Lost Souls**. Find the Rector's Bible and act on the information therein.

Take the Bible, read it, get

the parchment, read it, drop it, D, NW, KNEEL, PRAY, STAND, EXAMINE ALTAR. You should now get some of the objects requested.

Robert Henderson has written to mention a useful bug in **Denis through the Drinking Glass**. You can hide in the cupboard for innumerable moves to escape Maggie's clutches.

Has anyone finished this adventure yet?

Bill Trevelyan has also written to say that the decompiler for Melbourne House adventures which I printed in the November 1987 edition of this column will not work with **Dodgy Geezers**.

This is apparently because the adventure holds its vocabulary in compressed cryptic form.

Bill suggests the following short program should be used to print out the game's vocabulary.

First set PAGE to &5600 and then *LOAD D2 if you're

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interested in part one or "LOAD DODGY2 if it's part two you wish to cheat with.

Now LOAD DG/VOC and put end=&5D47 in line 40 for part 1, or end=&5DC4

for part 2. The vocabulary is printed out in neat columns giving the first four letters of the word followed by its index number in hex.

I will finish by thanking Ann Youde for the reams of help she has given in my last few mailbags.

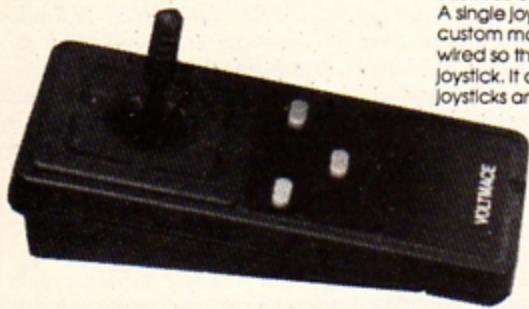
```

10 REM Program DG/VOC
20 :
30 HIMEM=85A00
40 end=$xxxx
50 @%=$0
60 FOR IX=1 TO 83FF
70 IX$85A00=IX$&E00 EOR &
42
80 NEXT
90 PRINT"V O C A B U L
A R Y"
100 PRINT STRINGS(19,"=")
:PRINT
110 FOR JX=$5A00 TO end
120 PRINT" ";
130 FOR KX=0 TO 3
140 IF ?(JX+KX)>=32 AND ?(JX+KX)<127 PRINT CHR$(JX+K
X);ELSE PRINT CHR$32;
150 NEXT
160 IF JX>4<16 PRINT "0"
;"JX>4;" ; ELSE PRINT "
;"JX>4;" ";
170 NEXT
180 PRINT
190 END

```



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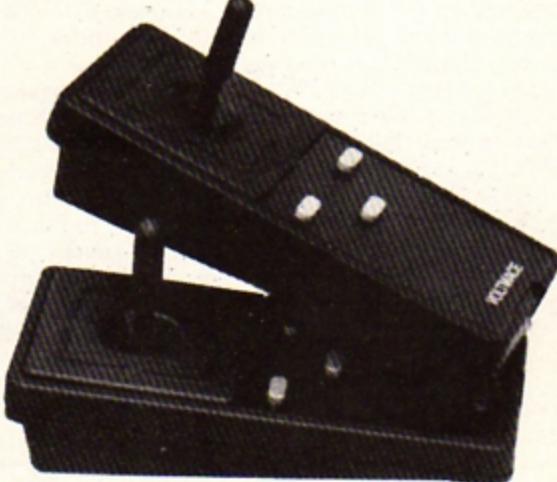
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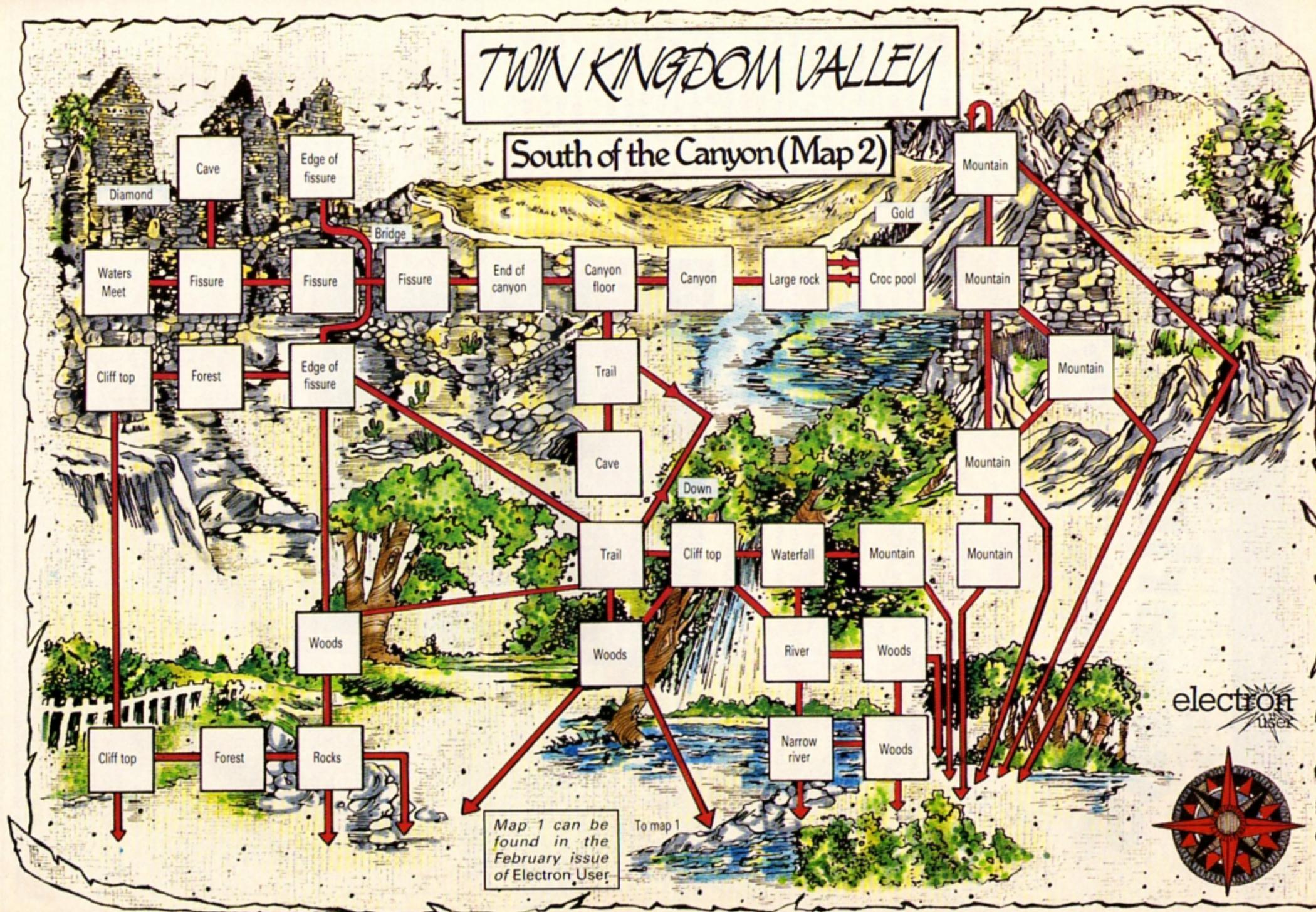


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TWIN KINGDOM VALLEY

South of the Canyon (Map 2)



Slithering snakes

Find the lost word in this addictive educational game
by JASON BRASIER

Hiss is an exciting educational arcade game intended for young children, but it also provides hours of addictive fun for older children and adults.

Splodd the snake is enjoying a quiet slither in the garden one morning when some noisy children drop their alphabet bricks over his hedge on to the lawn.

Being very litter conscious, Splodd quickly begins to tidy the bricks away into a corner of his garden, when he realises that together they make up the letters of a word. But what is the word?

Quickly he scurries from brick to brick, looking for the next in order, but being a very greedy snake he keeps getting side-tracked into gobbling up the odd tasty worm which pokes its head

up to see what all the fuss is about.

Will Splodd be able to piece all the bricks together before he crashes into the garden wall, or will he trip over his own tail in his excitement?

Find out by typing in **Hiss**, and give yourself and your younger friends a hugely entertaining time.

When the game starts, you are shown a word at the top of the screen which flashes for a few seconds before disappearing. This is

the word you must make up from the jumble of letters which appears on the grass below.

You must guide Splodd around the garden, moving over each letter in the right order to make up the word, which must be remembered correctly to complete the screen.

Each time Splodd slithers over the correct letter, your score will increase. For each wrong letter, no points will be awarded, and the letter will vanish to re-appear elsewhere in the garden.

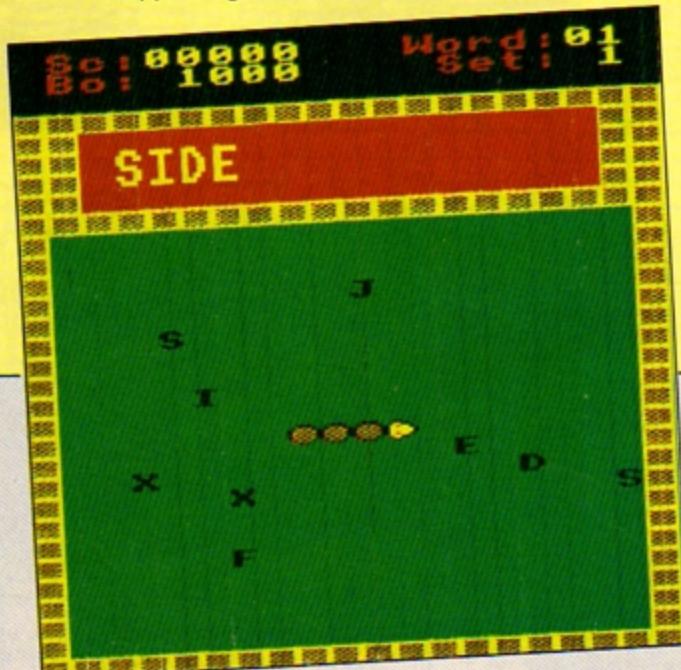
There is also a bonus

which starts at 1250 before every game. As you move around the garden collecting letters, this slowly counts down to zero. But if you are fast some bonus points will be left after each word has been collected and they will then be added to your score.

Occasionally, a worm will pop its head up, giving you the chance to add extra bonus points to your score. Mind you, waste too much time waiting for them to appear and any bonus you have gained so far will soon dwindle to nothing.

There are two things to look out for during your frenzied scurrying — the brick wall which surrounds the garden, and your own tail.

Crashing into either will unceremoniously lose you the game, and each worm you eat makes your tail grow longer, as does



```

10 REM HISS
20 REM By Jason Brasier
30 REM (c) Electron User
40 REM
50 IF PAGE>8000 PROCdload
60 PROCinit
70 ONERRORGOTO3640
80 MODE6:PROCinstruct
90 REPEAT
100 MODE4:PROCtable
110 MODE5:PROCgame
120 MODE4:PROChri
130 UNTIL0
140 END
150 DEFPROCgame
160 CLS:VDU23,1,0;0;0;0;19
,3,2,0;
170 *FX21
180 COLOUR2:PROCdouble(2,1
,3,Speed (1 to 5) ?):REPEAT
:SP%:=GET-48:UNTILSP%>0ANDSP%
<6:SP%=(5-SP)*15
190 PROCgame_init:PROCdisp
lay:PROCdraw_snake
200 PROCchoose
210 SOUND&11,4,20,10
220 *FX11,1
230 FX21:Z%:=GET:FX138,0
,+STR$Z%
240 *FX11

```

```

250 REPEAT
260 PROCsna
270 IFBO%>0 BO%:=BO%-10:PRO
Cbonus
280 IFRND(50)=32THENPROCne
w_worm
290 UNTIL DEX OR NE%
300 IF DEX PROCdead:ENDPRO
C
310 SOUND&11,0,0,1:FORI%=
T03:SOUND1,4,150,5:NEXT
320 IFBO%>0THEN350
330 PROCdelay(200)
340 REPEAT:SC%:=SC%+10:BO%=
BO%-10:PROCscore:PROCbonu
SOUND&11,1,1,1:UNTILBO%>
350 PROCclear
360 WO%:=W0%+1:IFW0%>21THE
W0%:=1:LEX%:=LEX%+1:IFLEX%>5THE
N%:=0
370 COLOUR128:COLOUR2:PRIN
TTAB(17,1);FNnum(W0%,2):TAB(
18,2);FNnum(LEX%,1,1);
380 IF(TX-1)<0THENTX%:=TX-
1:IFTX<0THE
N%:=0
390 GOT0200
400 ENDPROC
410 DEFPROCsnake
420 PROCdelay(SP%):PROCKey
S
430 COLOUR131:PRINTTAB(X%?
TX,Y%?T%);":TX=TX+1:IFTX>
80THE
N%:=0
440 PROCcheck
450 PROCprint(X%?H%,Y%?H%,
body%)
460 H%:=H%+1:IFH%>80THENH%=
0
470 X%?H%:=SX%:Y%?H%:=SY%
480 PROCprint(SX%,SY%,head
%(MX))
490 ENDPROC
500 DEFPROCKeys
510 A$:=INKEY$(1):*FX21
520 IFAS$=L$THE
N%:=D$THE
N%:=0:YD%=
0:MX=3
530 IFAS$=R$THE
N%:=1:YD%:=
0:MX=1
540 IFAS$=U$THE
N%:=0:YD%=-
1:MX=0
550 IFAS$=D$THE
N%:=0:YD%:=1
:MX=2
560 IFAS$=S$THE
N%:=FX210
570 IFAS$=Q$THE
N%:=FX210,1
580 IFAS$=CHR$127$THE
N%:=
use:GOT0510
590 ENDPROC
600 DEFPROCcheck
610 SX%:=SX%+XD%:SY%:=SY%+YD%
%:YD%:=0
620 COLOUR131:Z%:=FNread(SX
%,SY%)
630 IFZ%>64ANDZ%<91THE
N%:=

```

completing a word successfully.

Therefore your task becomes gradually more difficult as you haul behind you an ever-growing length of body.

As the game progresses, the words to collect become gradually more and more difficult to spell.

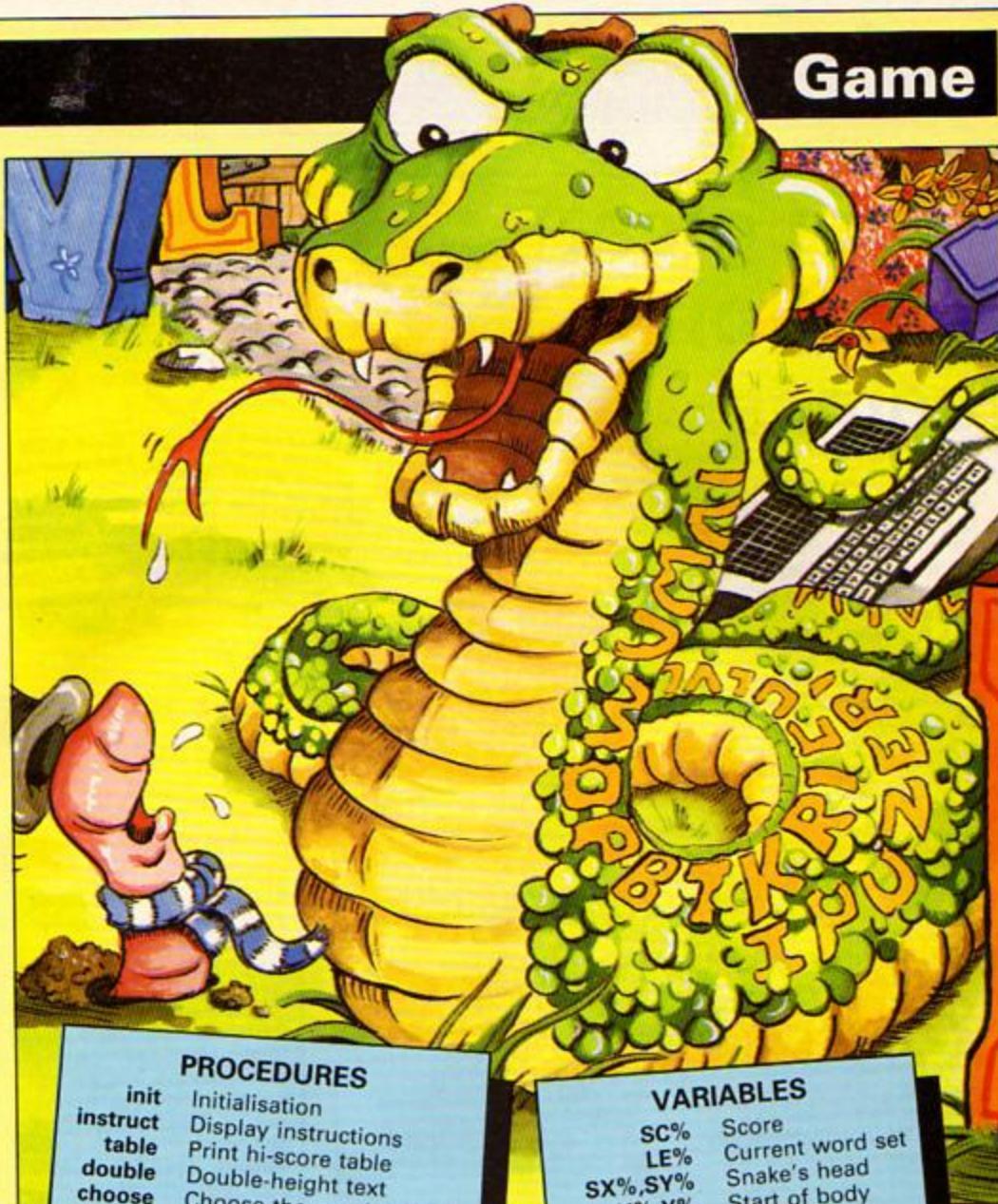
There are five different sets of words built in to the game, each set comprising several words of a certain length, which is proportional to the difficulty of that level.

However, all words can be changed to a selection of your choice before each game by pressing O to display the options menu. This allows you to change any word and then save the altered word lists, or you can load in a previously saved selection.

To make things easier Splodd's speed can be altered to one of five settings at the start of each game.

The slowest is ideal for younger children, letting Splodd creep along at a relaxing pace.

The fastest speed, however, is far from relaxing – even the hardened arcade fan will be more than satisfied by its performance.



PROCEDURES

init	Initialisation
instruct	Display instructions
table	Print hi-score table
double	Double-height text
choose	Choose the word to find
display	Print main screen display
letter	Pick up a letter

VARIABLES

SC%	Score
LE%	Current word set
SX%,SY%	Snake's head
X%,Y%	Start of body
M%	Head direction
WX%,WY%	Worm's position

```

Cletter:ENDPROC
 640 IFZ%<32THENENDPROC
 650 IF$X%=>W$XANDSY%=>W$THE
NPROCate:ENDPROC
 660 DE%>TRUE
 670 ENDPROC
 680 DEFPROCletter
 690 A$=CHR$Z%
 700 IFAS$<>MIDS$(W$,P0%,1)TH
ENPROCwrong:ENDPROC
 710 SOUND&11,1,1,10:SC%>SC
%+20:PROCscore
 720 COLOUR129:COLOUR2:PROC
double(2+P0%,6,A$):P0%>P0%+1
 730 IFP0%>LEN$THEHENNE=TRU
E
 740 ENDPROC
 750 DEFPROCwrong
 760 SOUND&11,2,20,4
 770 IFSC%>9THENSC%>SC-10:
PROCscore
 780 PROCplace(A$)
 790 ENDPROC
 800 DEFPROCclear
 810 COLOUR131:FORJ%>10TO30
:FORI%>1TO18
 820 Z%>FNread(I%,J%):IFZ%>
64ANDZ%<91THENPRINTTAB(I%,J%
);";
```

```

 830 NEXT:NEXT:ENDPROC
 840 DEFPROCdead
 850 SOUND&11,3,200,40
 860 DATA G,a,m,e, ,o,v,e
, ,r, ,i
 870 COLOUR128:COLOUR2
 880 PROCdelay(400):RESTORE
 860
 890 FORI%>0TO9:READAS:PROC
double(1%+5,19,A$):SOUND&11,
-15,10+20*I%,2:PROCdelay(50)
:NEXT
 900 PROCdelay(100):ENDPROC
 910 DEFPROCnew.worm
 920 COLOUR131
 930 IFW$X%>0THENPRINTTAB(WX
%,WY%); "
 940 REPEAT:I%>RND(18):J%>R
ND(21)+9:UNTILFNread(I%,J%)=
32
 950 WX%>IX%:WY%>J%
 960 PROCprint(IX%,J%,worm%)
 970 ENDPROC
 980 DEFPROCate
 990 SOUND&11,4,100,3
1000 SC%>SC+100:PROCscore
```

```

 1010 IF(T%>1)<>H$THENIX%>T%-
1:IFT%<>0THENIX%>0
 1020 W$X%>0:ENDPROC
 1030 DEFPROCpause
 1040 FX21:REPEAT:AS$=GET$:
 1050 IFAS$=S$THEN*FX210
 1060 IFAS$=Q$THEN*FX210,1
 1070 UNTILAS$=CHR$135
 1080 PROCdelay(50)
 1090 ENDPROC
 1100 DEFPROCgame.init
 1110 SC%>0:LE%>0:BX%>0:WX%>
1:DE%>FALSE:WX%>0:WY%>0
 1120 ENDPROC
 1130 DEFPROCdisplay
 1140 CLS
 1150 COLOUR:PRINTTAB(1,1);
"Sc:":TAB(1,2);"Bo":TAB(12,
1);Word:;TAB(13,2);Set:
 1160 FORI%>0TO19:PROCprint(
I%,4,wall%):PROCprint(I%,9,W
all%):PROCprint(I%,31,wall%)
:NEXT
 1170 FORI%>5TO30:PROCprint(
0,IX%,wall%):PROCprint(19,IX%,
wall%):IFIX%<9THENPROCprint(1
```

Turn to Page 35 ▶

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.

So give yourself a treat... with the most popular games compilations we've ever produced.



Volume 1

Jam Butty: Machine code simulation of high drama on a building site.
Golf: Play a round by yourself, or play against your pals.
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.

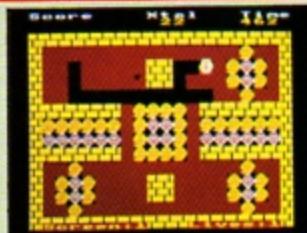
Rally Driver: All the thrills of high-speed driving with none of the risks.
Alphaswap: Your letters are in a twist. Can you put them in order.
Knockout: Fast and furious action as you batter down a brick wall.
Money Maze: Avoid ghosts and collect coins in an all-action arcade classic.
Lunar Lander: The 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



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 maze 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.

NEW

TO ORDER PLEASE USE THE FORM ON PAGE 53

Hiss listing

From Page 33

```

1320 VDU28,2,8,17,5,17,129,
12,26
1330 WS=WS$(LEX,RND(15)-1)
1340 BOX=250*LENWS:PROCbonu
s
1350 FORIX=1TOLENWS
1360 PROCplace(MID$(WS,IX,1
))
1370 NEXT
1380 FORIX=1TO5:PROCplace(C
HRS(RND(26)+64)):NEXT
1390 COLOUR129:COLOUR2:FORI
X=1TO5
1400 PROCdouble(3,6,WS):PRO
Cdelay(50)
1410 PROCdouble(3,6,STRINGS
(14, ")):PROCdelay(50)
1420 NEXT
1430 NE$=FALSE:POX=1
1440 ENDPROC
1450 DEFPROCprint(x%,y%,c%)  

:AX=85800+X%*16+y%*320:R72=
AXMOD256:R73:AXDIV256:R70=
CXMOD256:R71=c%DIV256:CALLC
:ENDPROC
1460 DEFFNread(x%,y%):PRINT
TAB(x%,y%):CALLRXX:=?74
1470 DEFPROCdouble(x%,y%,t$  

):PRINTTAB(x%,y%):$str%:t$:
CALLD%:ENDPROC
1480 DEFFNnum(x%,y%)=RIGHT$  

("0000000+STR$X%,y%")
1490 DEFPROCcls:VDU28,1,30,
18,10,17,131,12,17,128,26:EN
DPROC
1500 DEFPROCscore:COLOUR128
:COLOUR2:PRINTTAB(4,1):FNnum
(SC%,5):ENDPROC
1510 DEFPROCbonus:COLOUR128
:COLOUR2:PRINTTAB(5,2):FNnum
(B%,4):ENDPROC
1520 DEFPROCplace(t$)
1530 COLOUR131:COLOUR0:REPE
AT:J%=RND(18):K%=RND(21)+9:U
NTILFNread(J%,K%)=32AND(J%<
X%?T%ANDK%<Y%?T%):PRINTTAB
(J%,K%):t$;
1540 ENDPROC
1550 DEFPROCdelay(x%):TIME=
0:REPEATUNTILTIME>x%:ENDPROC
1560 DEFPROCtable
1570 VDU23,1,0;0;0;0;19,1,3
;
1580 PROCdouble(13,0,"Hiss
Hi-Scores")
1590 FORIX=0TO5:PROCdouble(
0,5+3*IX,STR$(IX+1)+" "+FNnu
m(HX$(IX),8)+" "+HS$(IX)):NEXT
1600 PROCdouble(6,24,"Your
last score was "+FNnum(SC%,8
))
1610 PROCdouble(2,29,"Press
SPACE to play or 0 for opti
ons")
1620 "FX21":REPEAT:Z%=INSTR
(" 0",GET$):UNTILZ%>0
1630 IFZ%<2THENENDPROC ELSE
PROCopts
1640 CLS:GOT01570
1650 ENDPROC
1660 DEFPROCopts
1670 CLS
1680 PROCdouble(13,10,"Opti
ons Menu")
1690 PROCdouble(13,14,"1. C
hange words")
1700 PROCdouble(13,17,2, R

```

```

edefine keys")
1710 REPEAT:Z%GET-48:UNTIL
Z%>0ANDZ%<3
1720 IFZ%1THENPROCwords:EN
DPROC
1730 PROCred.keys:ENDPROC
1740 DEFPROCred.keys
1750 CLS:VDU19,1,5;0;
1760 PROCdouble(11,7,"Left:
":LS=FNkey(7)
1770 PROCdouble(11,10,"Righ
t":RS=FNkey(10)
1780 PROCdouble(11,13,"Up:
":US=FNkey(13)
1790 PROCdouble(11,16,"Down
":DS=FNkey(16)
1800 PROCdelay(100)
1810 ENDPROC
1820 DEFFNkey(y%):REPEAT:A$  

=GET$:UNTILINSTR("S0"+CHR$12
7+CHR$135+CHR$13,AS)=0:PROCd
ouble(28,y%,AS):=AS
1830 DEFPROCh
1840 VDU23,1,0;0;0;0;19,1,1
;
1850 I%=-1:REPEAT:I%I%+1:U
NTILSC%>H%(IX)ORI%5
1860 IFIX=5ANDSC%<=H%(5)THE
NENDPROC
1870 PROCdouble(12,6,"CONGR
ATULATIONS")
1880 IFIX=5THEN1900
1890 FORJ%4TO1STEP-1:H%(J
%+1)=H%(J%):H$(J%+1)=H$(J%):
NEXT
1900 IFIX=0THENAS$="1st"
1910 IFIX=1THENAS$="2nd"
1920 IFIX=2THENAS$="3rd"
1930 IFIX>2THENAS$=STR$(1%+1
)+"th"
1940 PROCdouble(14,10,"You
are "+AS)
1950 PROCdouble(8,14,"Pleas
e enter your name:")
1960 *FX12
1970 HS$(I%)=FNinput(5,18,29
,32,126)
1980 HX$(I%)=SC%
1990 ENDPROC
2000 DEFFNinput(x%,y%,m%,m
i%,ma%)
2010 A$=":REPEAT:*FX21
2020 KEY=GET
2030 IFK%127ANDAS<>"THEN
A$=LEFT$(A$,LENAS$-1):PROCd
ouble(x%-1,y%, "):x%=x%-1:GOT
02020
2040 IFK%13THEN2080
2050 IFK%<m%ORK%>ma%ORLE
NAS$=L%THEN2020
2060 A$=A$+CHR$K%:x%=x%+1
2070 PROCdouble(x%-1,y%,CHR
$K%)
2080 UNTILK%13
2090 =AS
2100 DEFPROCwords
2110 CLS:VDU19,1,2;0;
2120 PRINTTAB(11,9);Change
words Menu"
2130 PRINT"
2140 PRINTSPC(11);1. List
word set 1"
2150 PRINTSPC(11);2. List
word set 2"
2160 PRINTSPC(11);3. List
word set 3"
2170 PRINTSPC(11);4. List
word set 4"
2180 PRINTSPC(11);5. List
word set 5"
2190 PRINTSPC(11);6. Save
the words"
2200 PRINTSPC(11);7. Load
new words"
2210 PRINTSPC(11);8. Exit"
2220 PRINTSPC(11);Select y
our option"
2230 "FX21":FX12"
2240 REPEAT:Z%GET-48:UNTIL
Z%>0ANDZ%<9
2250 IFZ%8THENENDPROC
2260 IFZ%7THENPROCload:GOT
02110
2270 IFZ%6THENPROCsave:GOT
02110
2280 CLS:PRINTTAB(0,5);Wor
d Set ";Z%
2290 Z%Z%1
2300 FORIX=0TO14:PRINTTAB(0
,7+I%);FNnum(I%+1,2);";WS(
Z%,I%);:NEXT
2310 VDU28,20,31,39,0,12
2320 PRINTTAB(0,7);C. Chan
ge"
2330 PRINTTAB(0,8);E. Exit"
2340 PRINTTAB(0,10);Please
select"
2350 REPEAT:K%INSTR("CcEe"
,GET$):UNTILK%0
2360 IFK%>2THENVDU26:GOT021
10
2370 PRINTTAB(0,13);Which
word?"
2380 KX=VAL(FNinput(0,15,2
,48,57))
2390 IFK%0ORK%>15THENPROCd
ouble(0,15, "):GOT02380
2400 KX=K%-1
2410 PRINTTAB(0,18);Enter
word:";
2420 WS(Z%,K%)=FNinput(0,20
,14,65,90)
2430 IFWS(Z%,K%)="THEN2420
2440 VDU26:PRINTTAB(3,7+K%)
;SPC(14);TAB(3,7+K%);WS(Z%,K
%);
2450 GOT02310
2460 ENDPROC
2470 DEFPROCsave
2480 CLS:PROCdouble(0,13,"S
AVE: Please enter filename:
":A$=FNinput(29,13,10,33,126
)
2490 IFAS=":REPEAT:FX21
2500 PRINT"
2510 Z%OPENOUT(A$)
2520 FORIX=0TO4:FORJ%0TO14
2530 PRINT%2,WS(I%,J%)
2540 NEXT:NEXT
2550 CLOSE#Z%
2560 ENDPROC
2570 DEFPROCload
2580 CLS:PROCdouble(0,13,"L
OAD: Please enter filename:
":A$=FNinput(29,13,10,33,126
)
2590 IFAS=":REPEAT:FX21
2600 Z%=(A$)
2610 FORIX=0TO4:FORJ%0TO14
2620 INPUT#Z%,WS(I%,J%)
2630 NEXT:NEXT
2640 CLOSE#Z%
2650 ENDPROC
2660 DEFPROCinstruct
2670 VDU23,1,0;0;0;0;19,1,6
;
2680 PRINTTAB(10,12);Instr
uctions (Y/N) ?":REPEAT:Z%I
NSTR("Y/N",GET$):UNTILZ%>0
2690 CLS
2700 PRINTTAB(18,0);Hiss";
TAB(18,1);-----
2710 PRINT" The object o
f the game is to guide asnak
e to pick up letters to spel
l certain words. The c
omputer will show which wo
rd to spell at the beginning
of the game."
2720 PRINT" You must sim
ply guide your snake over
the correct letters in the
same order as the spelt w
ord."
2730 PRINT" When you com
plete a word, you go onto
the next, and so on. The ga
me will get harder as your s
nake grows."
2740 PRINT" You will die
if you either run into your
own tail or run into the wa
ll around the outside.
You will only get the one
life!"
2750 PRINT" A bonus of 1
00 points is available when
you eat the worms that pop
up from beneath the ground."
2760 "FX21":PRINTTAB(7,23);
"Press SPACE to continue...
";REPEATUNTILGET=32:CLS
2770 PRINTTAB(18,0);Hiss";
TAB(18,1);-----
2780 PRINTSPC(7);Here are
your controls:
2790 PRINTSPC(7);L$;" ....
Move snake left"
2800 PRINTSPC(7);RS;" ....
Move snake right"
2810 PRINTSPC(7);US;" ....
Move snake up"
2820 PRINTSPC(7);D$;" ....
Move snake down"
2830 PRINTSPC(7);Extra key
s are:
2840 PRINTSPC(7);S .... T
urn sound on"
2850 PRINTSPC(7);Q .... T
urn sound off"
2860 PRINTSPC(7);DEL ... P
ause"
2870 PRINTSPC(7);COPY .. R
estart paused game"
2880 PRINTSPC(7);ESC ... I
nstructions"
2890 PRINTSPC(7);(Ensure C
APS LOCK is ON)
2900 PRINTTAB(7,23);Press
SPACE to continue...";"FX21
";REPEATUNTILGET=32
2910 ENDPROC
2920 DEFPROCinit
2930 Q%RND(-TIME)
2940 DIM0%238,str%21,X%80,
%80,W$(4,14),H$(5),HS$(5),he
d$(3)
2950 FORIX=0TO5:H$(IX)=6000
-1000*I%:H$(I%)="***** Jaso
n Brasier "+STR$(IX+1)+" ***"
***:NEXT
2960 PROCoats:PROCdata
2970 L$=Z%:RS="X":US="":D
$="":SC%0
2980 ENVELOPE1,1,3,2,1,10,1
,0,10,126,0,0,-126,126,126
2990 ENVELOPE2,2,-1,0,0,10,
0,0,126,0,0,-126,126,126

```

Turn to Page 36 ▶

LAST month we examined ways of exploding user-defined character definitions (a term used for expanding the memory allocated to the character set).

Now we will look at how to print these characters on an Epson compatible printer.

You should by now have created your own character set using last month's editor. But don't worry if you haven't, because the techniques we'll be using work equally well with the Electron's own built-in character set.

The way you get an Epson to print out any character definition is called bit imaging. Once bit image mode has been initialised, in place of sending the Ascii value of a character to the printer, the character's definition is sent – one byte at a time.

This definition works in a similar manner to VDU 23, except that the character needs to be rotated through 90 degrees. This is because the pins on a dot matrix printer are arranged vertically, as you can see in Figure I.

You may also notice that the Epson has nine dot wires. The ninth is used for underlining and lower case descenders. As descenders and underlining are kept within the eight by eight character cell on an Electron, the ninth wire is not used in bit image mode.

Let's have a look at how

Creating the right image

In Part 2 of his series ROBIN NIXON continues his exploration into creating new character sets for your printer

we would print the letter A in bit image mode.

To define A in Basic as a user-defined character, assuming it doesn't already exist, we would enter the command:

```
VDU 23,65,56,108,108,198,25
4,198,198,0
```

The result can be seen in Figure II. So far, so good.

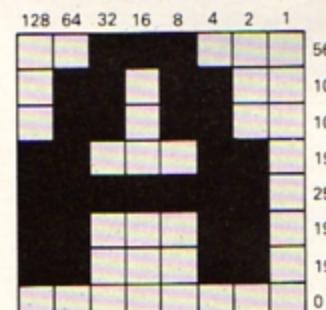


Figure II: The character definition of A held in the Electron

But as the character has to be rotated to the left by 90 degrees for the bit image definition shown in Figure III, we have to send the following sequence to the printer:

```
30,126,232,136,232,126,30,0
```

Before we send the

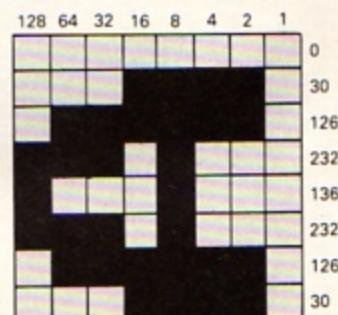


Figure III: The definition as it must be sent to an Epson printer

rotated A however, we must first tell the printer to go into

bit image mode by sending the escape sequence:

```
1,27,1,75
```

The 1 before the 27 and 75 tells the computer to send the next byte to the printer only. The 27 tells the printer that an escape sequence is to follow and the 75 is ASC"K" which instructs the printer to go into bit image mode.

Next we must say how many bytes of bit image information are to follow so the Epson knows when to go back to normal printing, and doesn't confuse ordinary letters with bit image data.

In the case of the letter A this is eight bytes because we are only sending the one character, which has a definition made up of eight bytes.

Because there may be more than 256 bytes of data sometimes, the format we send this number in is the low byte followed by the high byte of the number of data items.

If you look at Program I, you will see that lines 80 to 100 initialise the printer to bit image mode and prepare it for eight bytes of data.

Then line 110 sends the data for character A which is printed out when all the data has been received by the printer.

Program II, Printit, assembles a machine code

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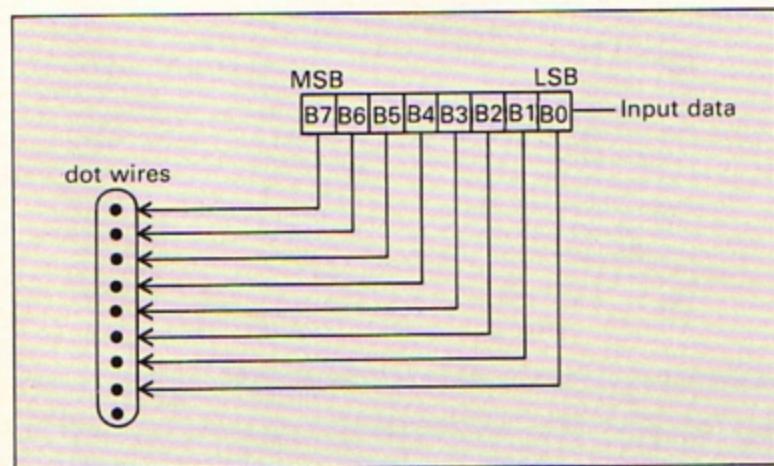


Figure I: Relationship between data and dot wires

Programming

◀ From Page 37

program called Driver which, when *RUN or called, intercepts the print vector oswrch at &20E and waits for a VDU 2 - printer on - ignoring anything else.

When a VDU 2 is received all following bytes are assumed to be printable characters.

The definitions of these are then looked up using osword &A, rotated and sent to the printer. This

means that no matter what characters you've defined in your programs using VDU 23, they will be displayed correctly on the printer.

When run, Printit asks you for an address to assemble to. You can experiment with different locations altering HIMEM or PAGE accordingly - either lower HIMEM or raise PAGE to make room for the code.

Remember, if you press BREAK the utility will be destroyed and you'll have to

```
10 REM Program to
20 REM print 'A'
30 REM
40 REM By Robin Nixon
50 REM (c) Electron User
60 REM
70 VDU 2
80 VDU 1,27
90 VDU 1,ASC('K')
100 VDU 1,8,1,0
110 VDU 1,30,1,126,1,232
120 VDU 1,136,1,232,1,126
130 VDU 1,30,1,0
140 END
```

Program I

reload it. Thereafter, to use Driver, always set PAGE or HIMEM to the value it was set at when you ran Printit.

Although the program runs fairly slowly, it is still faster than a screen dump, and in fact, with a little ingenuity could be used as one.

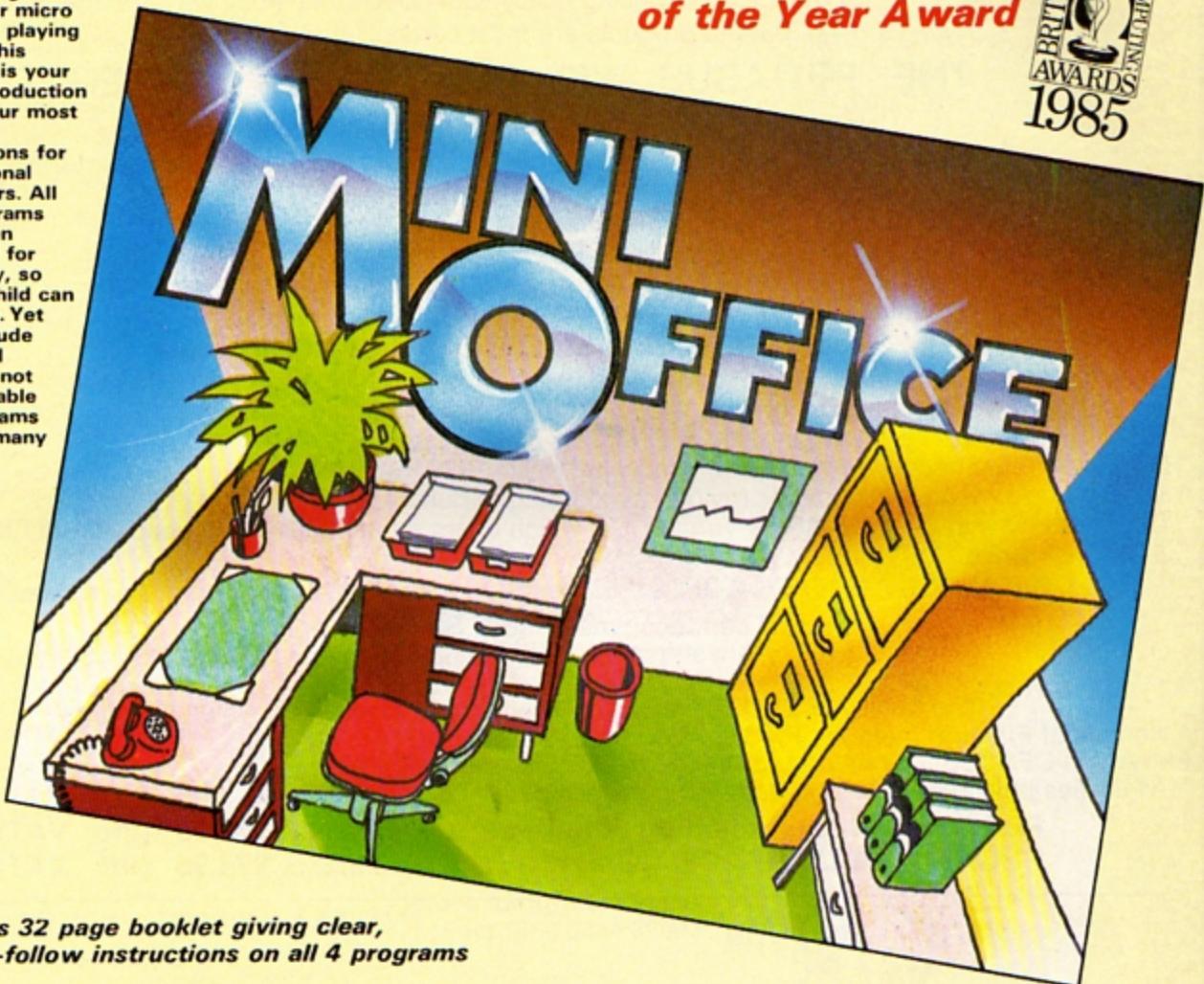
● Next month I'll show how to create a squashed character set giving 40 characters per line in Modes 2 and 5 or 80 characters per line in Mode 1.

10 REM PRINTIT	530 \	1100 \	1650 CMP #1
20 REM	540 CMP #3	1110 LDY #chartable MOD &1	1660 BNE notcr
30 REM By Robin Nixon	550 BNE notprintero	00	1670 LDA &73
40 REM (c) Electron User	560 PHA	1120 LDY #chartable DIV &1	1680 CMP #13
50 REM	570 LDA #0	00	1690 BNE notcr
60 MODE 6	580 STA &72	1130 LDA &73	1700 LDA #0
70 chartable=&80	590 PLA	1140 STA chartable	1710 STA &7F
80 INPUT 'Enter address	600 JMP (&70)	1150 LDA #&A	1720 STA &72
to assemble to (in hex)''&	610 \	1160 JSR &FFEE	1730 LDA #13
'\$:\$:\$=&80+A\$:\$START=EVAL A	620 .notprintero	1170 LDA #128	1740 JSR &FFEE
\$	630 \	1180 STA &75	1750 LDA #1
90 FOR PASS=0 TO 3 STEP	640 PHA	1190 \	1760 STA &72
3	650 TXA	1200 .loop1	1770 SEC
100 P%=\$START	660 PHA	1210 \	1780 LDA #76
110 [670 TYA	1220 LDA #0	1790 SBC &7C
120 OPT PASS	680 PHA	1230 STA &76	1800 STA &7D
130 \	690 PHP	1240 LDA #128	1810 LDA #0
140 .init	700 LDA &73	1250 STA &77	1820 STA &7C
150 \	710 CMP #32	1260 LDY #1	1830 \
160 LDA &20E	720 BCS testsendflag	1270 \	1840 .loop3
170 STA &70	730 JMP quit	1280 .loop2	1850 \
180 LDA &20F	740 \	1290 \	1860 LDA #88
190 STA &71	750 .testsendflag	1300 LDA chartable,Y	1870 STA &7E
200 LDA #start MOD &100	760 \	1310 BIT &75	1880 \
210 STA &20E	770 PHA	1320 BEQ notset	1890 .loop4
220 LDA #start DIV &100	780 LDA #1	1330 CLC	1900 \
230 STA &20F	790 CMP &72	1340 LDA &77	1910 LDA #1
240 LDA #0	800 BEQ send	1350 ADC &76	1920 JSR &FFEE
250 STA &72	810 PLA	1360 STA &76	1930 LDA #0
260 STA &74	820 JMP quit	1370 \	1940 JSR &FFEE
270 STA &7C	830 \	1380 .notset	1950 DEC &7E
280 STA &7F	840 .send	1390 \	1960 LDA #0
290 RTS	850 \	1400 LSR &77	1970 CMP &7E
300 \	860 PLA	1410 INY	1980 BNE loop4
310 .start	870 LDA #1	1420 CPY #9	1990 DEC &7D
STR\$"START"+STR\$"P%"	880 STA &74	1430 BNE loop2	2000 CMP &7D
320 \	890 LDA &7F	1440 LDA #1	2010 BNE loop3
330 PHA	900 CMP #1	1450 JSR &FFEE	2020 \
340 LDA #1	910 BEQ alreadyset	1460 LDA &76	2030 .notcr
350 CMP &74	920 LDA #1	1470 JSR &FFEE	2040 \
360 BNE noskipflag	930 STA &7F	1480 LDA &75	2050 LDA #6
370 PLA	940 JSR &FFEE	1490 LSR A	2060 LDX &75
380 JMP (&70)	950 LDA #27	1500 STA &75	2070 JSR &FFEE
390 \	960 JSR &FFEE	1510 CMP #0	2080 PLP
400 .noskipflag	970 LDA #1	1520 BNE loop1	2090 PLA
410 \	980 JSR &FFEE	1530 LDA #0	2100 TAY
420 PLA	990 LDA #75	1540 STA &74	2110 PLA
430 STA &73	1000 JSR &FFEE	1550 INC &7C	2120 TAX
440 CMP #2	1010 LDA #1	1560 LDA &7C	2130 PLA
450 BNE notprinteron	1020 JSR &FFEE	1570 CMP #60	2140 LDA &73
460 PHA	1030 LDA #224	1580 BNE notcr	2150 \
470 LDA =1	1040 JSR &FFEE	1590 LDA #13	2160 .exit
480 STA &72	1050 LDA #1	1600 STA &73	2170 \
490 PLA	1060 JSR &FFEE	1610 \	2180 JMP (&70)
500 JMP (&70)	1070 JSR &FFEE	1620 .quit	2190]
510 \	1080 \	1630 \	2200 NEXT
520 .notprinteron	1090 .alreadyset	1640 LDA &72	2210 OSCLI("SAVE DRIVER")

Program II

If you want to start doing more with your micro than just playing games, this package is your ideal introduction to the four most popular applications for professional computers. All the programs have been designed for simplicity, so even a child can use them. Yet they include advanced features not yet available on programs costing many times as much!

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LET'S start off this month by looking at the software for the temperature probe we built last time.

The easiest way to use the probe is to load Program II from last month's article and run it whenever you want a temperature reading. This can then be recorded on paper.

Of course, a more sophisticated way would be to use the facilities offered by the computer's filing system. Program I shows a simple method of recording a temperature reading and storing it in a file when it is run.

The data can then be printed out from the array using the Print option on the menu displayed. You might like to consider writing additional software to calculate the average temperature over a number of readings.

You could run this program twice a day - the array as it stands, would allow you to record 50 days' worth of readings.

A date and time at which the reading was taken can be recorded, along with the

Whether it's wet, or whether it's dry...

JOE PRITCHARD continues construction of his useful Electron weather station

temperature, which is taken as an average over several readings from the ADC.

Option one from the menu - Initialise new files - allows you to set up a blank file, and this must be done before any readings can be taken. It writes a blank file out to the current filing system.

Option two - Write file - writes the array of temperature/date or time readings stored in the machine, out to a named file. This allows you to save temperature data.

Option three - Read a file from disc - allows you to read in an existing file from disc and use it. For instance, you could read a file in and print its contents out, or add

further temperature readings to it.

Option four - Do a temperature reading - finds a space in the file automatically, and you are then prompted for a time or date by which you can identify the temperature reading.

Once this is in, the average temperature read back after 200 readings of the ADC is stored in the temperature array.

Option five - Print dates/temperature - lists the date/time information and the corresponding temperature to the screen. You can change this to send the information to a printer by inserting a VDU 2 at line 805 and a VDU 3 at line 885.

A further way of using the

temperature sensor is to leave the computer running and get the machine to display the current temperature, and the maximum and minimum temperatures recorded since the program started running. Program II shows how this can be done.

A later part of this series will give listings for a suite of programs that will include versions of both these pieces of software.

We'll move on now to positioning the temperature sensor. We need to have it outdoors, but protected from the excesses of nature. It needs to be fairly dry, out

Turn to Page 45 ▶

```
10 REM Temperature Sensor
20 REM By Joe Pritchard
30 REM (c) Electron User
40 :
50 PROCinitialise:PROCini
t_records
60 REPEAT
70 MODE 6
80 PRINTTAB(10,10) 1. In
itialise NEW files
90 PRINTTAB(10,11) 2. Wr
ite file to tape/disc
100 PRINTTAB(10,12) 3. Re
ad file from disc
110 PRINTTAB(10,13) 4. Do
a temperature reading
120 PRINTTAB(10,14) 5. Pr
int dates / temperature
130 PRINTTAB(10,15) 6. Fi
nish
140 PRINT"
150 REPEAT
160 INPUT "Which option? "
,option
170 UNTIL option>0 AND opt
ion<7
180 IF option=1 THEN PROG
nit_records:PROCwrite_rec
ord
190 IF option=2 THEN PROG
rite_records
200 IF option=3 THEN PROG
read_records
210 IF option=4 THEN PROG
find_blank_record:PROCmake_re
```

```
ading
220 IF option=5 THEN PROCp
rint_records
230 UNTIL option=6
240 END
250 :
260 DEFPROCinitialise
270 W%>20209
280 DIM date$(100),tempera
ture(100)
290 ENDPROC
300 :
310 DEFNAdval
320 =INT(ADVAL(1)/256)
330 :
340 DEFNTemperature
350 counts_per_degree=6.4
360 temp0=17
370 =(FNAdval-temp0)/count
s_per_degree
380 :
390 DEFPROCfind_blank_reco
rd
400 rec%=0
410 REPEAT
420 rec%=rec%+1
430 IF rec%>101 test=1000
ELSE test=temperature(rec%)
440 UNTIL test>998
450 IF test=1000 CLS:PRINT
TAB(10,10)'No more space in
file"
460 ENDPROC
470 :
480 DEFPROCinit_records
```

```
490 FOR rec%0 TO 100
500 temperature(rec%)=999
510 date$(rec%)=STRINGS(30
,")
520 NEXT rec%
530 ENDPROC
540 :
550 DEFPROCwrite_records
560 CLS
570 REPEAT
580 INPUTTAB(10,10) "Name
of the file? ",name$
590 UNTIL LEN(name$)<8 AND
name$<>-
600 Y%>OPENOUT(name$)
610 FOR rec%0 TO 100
620 PRINT%Y%,date$(rec%),t
emperature(rec%)
630 NEXT rec%
640 CLOSE%Y%
650 ENDPROC
660 :
670 DEFPROCread_records
680 CLS
690 REPEAT
700 INPUTTAB(10,10) "Name
of the file? ",name$
710 UNTIL LEN(name$)<8 AND
name$<>-
720 Y%>OPENIN(name$)
730 FOR rec%0 TO 100
740 INPUT%Y%,date$(rec%),t
emperature(rec%)
750 NEXT rec%
760 CLOSE%Y%
```

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```

10 REM Temperature Sensor
20 REM By Joe Pritchard
30 REM (c) Electron User
40 :
50 MODE 6
60 PROCinitialise
70 PRINTTAB(5,8);"Current
temperature"
80 PRINTTAB(5,10);"Maximu
m temperature"
90 PRINTTAB(5,12);"Minimu
m temperature"
100 REPEAT
110 current_reading=FNtemp
erature
120 PROCmini_max
130 PROCprint_values
140 UNTIL FALSE
150 :
160 DEFFNadval
170 =INT(ADVAL(1)/256)
180 :
190 DEFFNtemperature
200 counts_per_degree=6.4
210 temp0=17
220 =(FNadval-temp0)/count

```

```

s_per_degree
230 :
240 DEFFPROCmini_max
250 IF current_reading>max
temp THEN max_temp=current_
reading
260 IF current_reading<min
temp THEN min_temp=current_
reading
270 ENDPROC
280 :
290 DEFFPROCprint_values
300 PRINTTAB(27,8)current_
reading;"C"
310 PRINTTAB(27,10)max_tem
p;"C"
320 PRINTTAB(27,12)min.tem
p;"C"
330 ENDPROC
340 :
350 DEFFPROCinitialise
360 min_temp=FNtemperature
370 max_temp=FNtemperature
380 @%=&20209
390 VDU23,1,0;0;0;0;
400 ENDPROC

```

Program II

◀ From Page 43

of draughts, but still able to follow changes in the outside air temperature.

Figure I shows a possible enclosure for the temperature probe.

The size isn't important, but it's a good idea to make it around 30cm square. This allows other bits and pieces to be mounted inside as well.

The electronics are probably best kept indoors; as well as keeping them dry and out of harm's way, it simplifies the wiring. As to

positioning the box outside, keep it out of direct sunlight if possible, as on a summer day the temperature sensor would show a much higher temperature than actually present.

Also don't run too much cable between the sensor and the amplifier.

Humidity is a measure of the amount of water vapour in the air. The higher the humidity, the more water vapour there is in the air.

The close, sticky weather associated with thunderstorms in summer is a typical example of what to

expect when the humidity is high.

Measuring it isn't as difficult as it sounds, and there are two ways in which we can go about it.

The wet and dry thermometer is shown in Figure II. We use two temperature measuring circuits, with one of the sensor diodes covered with a piece of felt or cloth leading to a small container of water. This is the wet thermometer.

software to read channel one rather than channel zero.

The biggest problem is making sure the two thermometer circuits return identical readings over a range of temperatures when both the diodes are dry.

This can be done by carefully adjusting the preset resistor in the temperature sensor circuit and by making allowances in the software.

Of course, much of the

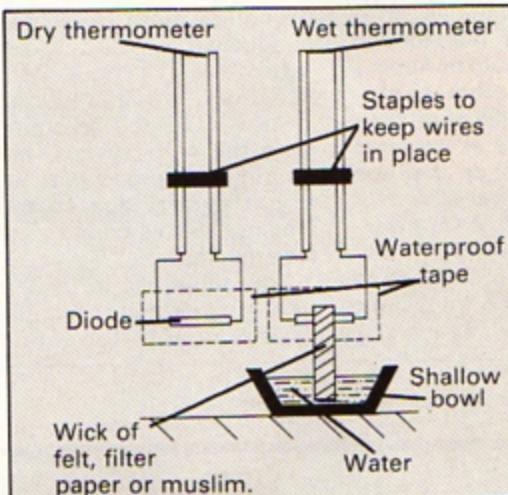


Figure II: The wet and dry thermometers for measuring humidity

The other one is the dry thermometer. Under most circumstances, there is a difference in temperature read by the two thermometers, and the difference depends upon the humidity.

The wet and dry thermometer method of measuring humidity works due to the fact that water will be constantly evaporating from the wick covering the wet diode. This cools it down and so the temperature read here will be lower than that on the dry sensor.

The size of the difference depends upon the amount of water evaporating. The higher the humidity, the less water will evaporate from the wick and so the smaller the temperature difference will be.

In practical terms, we simply build a second thermometer circuit. You can connect this one up to channel one of the ADC, rather than channel zero.

Don't forget to alter the

allowances in the software will be taken care of when you calibrate the second thermometer, as described last time.

Once the readings are the same with both diodes dry, you can put the wick on one of them and see how the temperature varies with humidity.

It may be quite difficult to get the diodes to produce the same readings at a wide range of temperatures.

Not only will the diodes differ a little, but there is likely to be a difference in the amount of amplification given by the operational amplifier to the signal returned from the diode.

However, these problems can largely be cancelled out with the calibration process, as follows:

- If one thermometer circuit constantly reads low by a varying amount over a range of temperatures, try altering the value of *counts_per_degree*.

Turn to Page 46 ▶

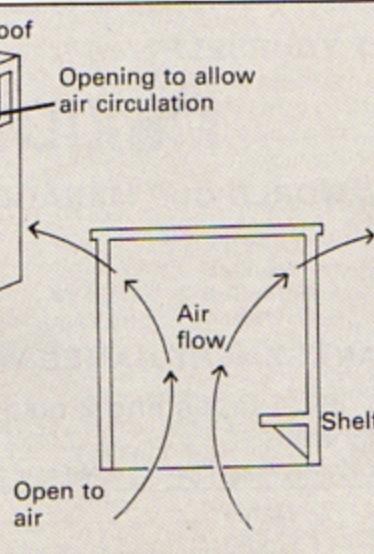


Figure I: Housing the Electron weather station sensors

Hardware Projects

◀ From Page 45

per_degree in FNtemperature while calibrating.

- If the difference is a constant value over the range, then change the temp0 value in FNtemperature.

Once working, the difference between the wet and dry temperatures is called the depression of the wet bulb.

This should always read lower than the dry one, and the greater the depression the less humid the air.

When in use, the wet and dry diodes should be kept as close to each other as possible, and should be as similar to each other as possible, with the exception that one diode has the wet wick over it and the other is kept dry.

The plastic tape in the diagram serves to prevent splashes of water from short circuiting the wires leading

to the diode. Both diodes should be kept out of direct sunlight, rain and draughts. The enclosure shown in Figure I will fulfill this condition.

The water needs to be kept topped up, as eventually it will evaporate.

A quicker, cheaper, but less effective method of measuring humidity is to use the apparatus shown in Figure III. This relies upon the salt absorbing water vapour from the air and so becoming more electrically conductive.

However, it isn't very sensitive. It will respond quite well to you breathing onto the salt crystals, but humidity changes that we might expect due to the weather in this country are less marked.

You might like to try this as an experiment, but the results aren't too good

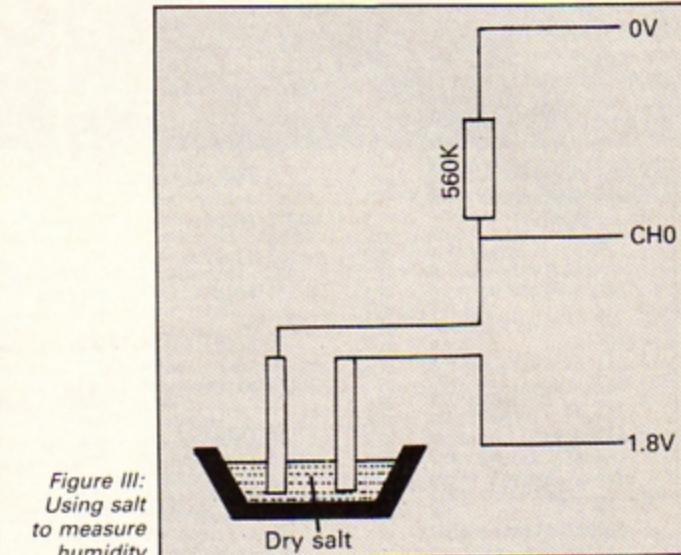


Figure III:
Using salt
to measure
humidity

without an operational amplifier circuit to boost the resistance changes.

A further disadvantage of this method of measuring humidity is that the salt soon gets waterlogged, and

will no longer return sensible results. When this happens, you'll have to replace the salt.

- Next time, we'll see how we can measure windspeed and direction.

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MICRO MESSAGES

Teachers have problems, too

I AM writing in response to the letter from R. H. Hill in the January 1988 issue of Electron User concerning the use, or lack of use, of computers in education. To paraphrase Mr. Hill, I am not very impressed.

His accusations are wrongly directed and his attitude towards schools and teachers is offensive.

Mr. Hill says he regards himself in such a position as gives him a right to preach.

He hammers on school doors, suggests they lack determination and imagination, accuses schools of using their capitation recklessly and of not being concerned about their pupils' prospects, and suggests that schools are not taking steps to accommodate future advances.

I am a teacher totally sold on the idea of introducing computers into the classroom. I envisage an ideal in which all pupils are supplied with a terminal and almost all work is done through the computer.

As an English teacher I did at first have some qualms about the swamping of creativity through technology, but I no longer believe this to be the case.

Word processors will aid creativity mainly because of their ability to join or divide sections of an essay, replace words and sentences and format the finished product. Moreover, the technical side of the subject is ideally suited to computerisation.

I also believe, and have suggested, that all marks and records be recorded on databases and spreadsheets. The latter can be

used to help pinpoint the strengths and weaknesses of individual pupils.

I have written various letters to software houses, advisers and companies. I have attempted to use the school's computers for producing a newspaper and as an electronic display board. However, the result of all this is very slight.

In short I too, Mr. Hill, have hammered on doors – without presuming to preach – but the result, from my side of the fence, has been equally frustrating.

How can schools be in a position to utilise computers when we do not have the money, time, security, mains sockets, furniture, support, technical help or training?

Teaching is a full-time job and all ideas are on top of, never instead of, classroom teaching.

Furthermore, computers do not need to be pushed, as their worth is self-evident.

The reason I have not been able to implement the above ideas is because they cannot be done in a classroom with a single power socket which does not always work, walls through which a fist could be forced, and absolutely no security.

My situation is quite typical. Ultimately, where does the money come from? Is it my job to support an innovation – which Mr. Hill has likened to a second Industrial Revolution – through holding a car boot sale?

How many jumble sales has Mr. Hill's business held

to raise funds for itself? – or is it that education with all of its aspects, and the second industrial revolution are only important to warrant jumble sales?

I am not at all impressed, Mr. Hill. – P.F. Doran B.A., Little Sutton, South Wirral.

● Both sides of this argument seem to have been well covered, but we would tend to agree with Mr. Doran that it is unfair to level criticism at our over-worked, underfunded teachers and schools for the lack of widespread, proper computer access for pupils.

Desk diary

on disc

AS Electron databases go, I have found Acornsoft's Desk Diary much the friendliest and most useful. It would become even more valuable if I could transfer it easily to disc.

I realise it is protected, but I would be glad if you or any of your readers could tell me if there is a way of listing it for transfer to disc.

Alternatively, would Acorn reveal the secret, since they are unlikely to issue further Electron databases on disc? – Bernard Causden, London.

● Acorn is unlikely to divulge the secrets of its protection techniques. However, there is a utility available which should do the job for you.

Slogger produce the T2P3 rom, which transfers protected tapes to Plus 3 discs. If you have a Plus 4, you will need T2P4 instead.

The roms protect the soft-

ware on disc and it is instantly recognisable as a T2P3 or T2P4 file. It won't run without the roms being present, so discouraging piracy.

You will need a rom cartridge and a Plus 1, or Slogger's Rombox Plus, in which to place the rom.

Card swap

crashes

IS there a bug in the Newmarket listing published in the January 1988 issue of Electron User? Approximately four times out of five, if I want to swap hands, the program freezes during the swap routine and I have to press Break and start again.

The fifth time it works perfectly and the game can proceed without a hitch. If I decide not to swap, the game always works okay.

Putting an error report at line 20 gives the message Bad DIM at line 180. As the game does work sometimes I don't know what is wrong – any ideas? – N. Gill, Camberley, Surrey.

● Your problem lies in the value of the variable Z when the program reaches line 180. Something is causing it to be unrealistically high, forcing the DIM statement to be rejected.

Check lines 160 and 170 to see that you haven't misspelled Z as something else.

What a

clock-up!

WHOEVER made the mistake in the clock program listing in the January 1988 issue of Electron User does not deserve 40 lashes, but perhaps two would be in order.

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From Page 47

for the two mistakes present.

In lines 830 and 860 there should be an apostrophe before the inverted comma.

The result is that the prompt "Enter hours" prints too high, and there is no gap between the prompts "Enter seconds" and "Press a key". Not serious mistakes, because even I know how to remedy it, but mistakes nonetheless.

A much more serious mistake, and one which I have not been able to remedy (I have tried VDU 28, and inserted apostrophes at all possible places) is that the clock display in the top right hand corner is unreadable because its top half is out of the screen frame.

Since you promise to publish all mistakes and therefore the ones I have pointed out, you might also like to publish how the clock display can be lowered. — P. Eisler, London.

● Thank you for drawing our attention to the two missing apostrophes. Apologies are due to those who, unlike P. Eisler, were unable to correct the listing.

However, there is no mistake elsewhere in the listing. Your problem stems from the fact that you probably use a television with your Electron rather than a monitor.

For some reason, the UHF output from the Electron produces a picture that is slightly too high for many TVs, and there is no equivalent of the BBC Micro's *TV command to rectify the situation.

Ask a TV engineer to lower the top of your television picture.

Spotting the socket

As a French reader of your magazine, I am always grateful for the information contained in Electron User each month. Having added a Plus 1 to my Electron and filled both sockets with a Cumana disc interface and the View cartridge, I am left with no space for my NTQ multi-font rom.

Is there no solution other

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.

than changing my Plus 1 for Slogger's Rombox Plus? — Serge Courouau, Paris, France.

● If you look inside your Cumana interface you will find an empty rom socket into which your NTQ rom will fit. You could then buy a 32k battery backed ram cartridge from ACP and place View in one 16k bank.

You will then not only be able to use NTQ with View and your disc drive, but you will still have one spare 16k bank of ram inside the cartridge for other roms.

MicroLink

mystery

FIRSTLY a word of explanation. I am a doddery old bird, with precious little to do with my time other than typing out the programs published in Electron User.

I derive considerable pleasure from typing and correcting my mistakes, to arrive eventually at a working program. I have had a number of successes, which I will not gloat over, and my fair share of failures too.

Firstly, you quote time and time again: "This is one of hundreds of programs now available FREE for downloading on MicroLink". What in heaven's name is this? Where is it? Does downloading mean typing on to tape?

Secondly, because there are only 10 lines in your Disabler program from the August 1987 issue, I am fairly confident that I haven't made a mistake, but I still get Bad command error at line 6. I am

prepared to donate 9p to the charity of your choice if I am wrong.

Thank you for your publication, but publish it twice a month to keep me busy. — F.A. Wyeth, Congleton, Cheshire.

● MicroLink is an electronic database accessed via the telephone. You need an RS423, modem and software to use it — Slogger and Pace can supply this.

A modem is a device which couples your computer to the phone line, through which the information travels.

MicroLink provides many services to subscribers, including the one you mentioned — telesoftware. Every program published by Electron User is stored in the MicroLink main computer, and can be transferred down the telephone line into any computer in the country using the right equipment. It is this process which is known as downloading.

Your problem concerning the Disabler 10 liner is due to the fact that you do not have a Plus 3, which is the Acorn disc drive unit.

Line 6 attempts to issue two star commands to this unit, *MOUNT and *DIR, and the Electron will return the Bad command error if the Plus 3 is not present.

And as for publishing Electron User twice a month, we're overworked enough as it is!

Electrons

obsolete?

EVERY month in your excellent magazine I read

about an upsurge in sales and interest in the Electron computer. I would however, be grateful for the real truth.

I have tried most shops in the Hull area for an Electron, to be greeted by a variety of comments. These range from "We just don't sell it" to "They're an old machine".

How can there be an upsurge if you can't buy the machine? I would be grateful for your comments, and information of anyone in Hull who stocks the Electron. I do own one, but am looking to replace it because of a fault. — Mrs R. Pearlman, Hull, N. Humberside.

● The Electron is far from obsolete. Although difficult to find in the shops, there are stocks and you can buy one by mail order direct from Slogger — £64 for a standard model and £99 for one fitted with an additional 32k of ram and turbo driver.

Ziggy's

bad habits

I WOULD like to thank Electron User for publishing my program Ziggy in the January issue. My main reason for writing this letter is to apologise to your readers for the programming styles employed.

Many people will not have realised that Ziggy was actually written as a program for Electron User's 10 Liner feature, and that somebody in the editorial department actually unravelled it from 10 lines of Basic to 96. (Incidentally, my congratulations to the person who untangled my twisted program logic.)

However, the program code is almost exactly the same as when it was a 10 Liner. Electron User has simply inserted new lines to break it up, presumably to make it easier to read.

Unfortunately, some of the bodge which I felt were acceptable in order to squeeze the program into 10 lines look awful in a properly laid out program and I would appeal to everyone to ignore my programming style and not pick up any of my bad habits!

In particular line 540 is a bit dodgy, and the exit from PROCpseg in line 920 is very

messy. Furthermore, my use (or abuse) of REPEAT/UNTIL looping in the main program is enough to make GOTO look structured.

I'd also like to comment on Electron User's recommendation that the program be run in Mode 2 instead of Mode 5 if it is found to be too fast.

I admit the game is fast, but this is really one of its main attractions – it becomes rather pointless if slowed down.

If anyone does find it too fast, a better solution is to change it back to Mode 5 and add the line:

905 *FX 19

This takes the edge off the game's speed without making it too slow to be fun.

Finally I'd like to thank David Walton (Micro Messages, January 1988) for his answer to my ViewSpell query. – Neil Hoggarth, St. Cross, Winchester.

• We think the reason for suggesting the game be slowed down was because the poor old Editor couldn't hack the pace!

The game was expanded because it was too good for a 10 Liner and deserved a full page on its own.

Amstrad

conversion?

OVER Christmas I bought a Smith-Corona Fastext-80 dot matrix printer. I am having success in printing letters and documents using Mini Office, but I am being increasingly frustrated because I can't reproduce screen dumps.

However, my uncle has given me a screen dump program from his Amstrad DMP 3000 printer manual.

We have managed to convert most of it into BBC Basic, but there are two commands we can't convert. They are XOR and TEST. Can you or any other readers help? – Robert Cooper, Thatcham, Berkshire.

• The BBC Basic equivalent of XOR is EOR, while TEST x,y becomes POINT (x,y).

However, although the Amstrad and Electron both use very similar screen modes, the number of pixels present and graphics coordinates used are different for

JP-101 printer solution

REGARDING Greg Cassar's problems when using the Acorn/Olivetti JP-101 printer with a driver created by the Printer Driver II program (Micro Messages, January 1988), I can confirm that the JP-101 can produce both the underline and double height print styles.

When the codes are being entered in response to the prompts, enter ESC and follow it with the ASCII codes

in decimal, separated by commas. This will avoid most typing mistakes caused by missed quotes and so on.

I have found, however, that when using the JP-101 with View it is not possible for double height mode to be turned on or off part-way along a line, despite what is stated in the JP-101 user manual.

Double height mode must be turned on by calling up

the appropriate highlight at the start of a line, and cancelled by placing the highlight at the start of the line following the last line of double height print.

It is possible to have double height style operating simultaneously with another print style, provided double height is turned on before the other style, and cancelled after it.

The table shows a list of codes for the JP-101 printer – F. Anderson, Stirling, Scotland.

• This letter is typical of the dozens which flooded our office following Greg Cassar's letter in the January 1988 issue.

Thanks to all of you who wrote in, it shows how many loyal JP-101 owners there are out there.

The reader who couldn't get the driver to produce NLQ on his dot matrix printer should look up the codes in the manual and enter them as ESC, followed by decimal codes only.

Print styles for JP-101	
Underline ON	ESC,42,48
OFF	ESC,43
Double underline ON	ESC,42,49
OFF	ESC,43
Dash underline ON	ESC,42,50
OFF	ESC,43
Condensed (12/inch) ON	ESC,61
OFF	ESC,60
Condensed (18/inch) ON	ESC,62
OFF	ESC,60
Double width ON	ESC,51
OFF	ESC,52
Double height ON	ESC,39
OFF	ESC,37

each micro, so you may encounter some additional problems.

In the June 1986 issue of Electron User is an article on producing screen dumps, which contains some programs you can use instead of the converted Amstrad listing.

Frustrated

driver

AFTER being a subscriber to your magazine for more than two years I must say that all of the listings such as Grebit and Dungeon Quest I have ever typed in have all worked.

So I find it puzzling and frustrating that a short program like Printer Driver II – published in the August 1987 issue – should cause me so much trouble.

After reading the letter from Greg Cassar in the January 1988 issue about using this driver with an Olivetti JP-101 printer, which

I own, I set about typing in the listing.

After days of checking it through, I still come up with the same conclusion, which is that the program is either faulty or incomplete.

The error message No such variable at line 760 appears when the code is entered for turning highlights off, and if the Return key is pressed without entering a pad character the program returns the error message Byte at line 400.

Enclosed with my letter is a photocopy of the magazine listing together with a print-out of my version. As you can see, they are identical – but the program still won't run properly – M. Taunton, Bridgwater, Somerset.

• Yes, the listings are indeed identical. However, there is no fault as such in either listing.

What is happening is that when you enter a highlight code, the program uses Basic's EVAL function to interpret whatever format the input was in. This allows you

to use decimal, hex, characters and so on.

However, EVAL does much more than this. It will attempt to return the value of a named variable passed to it, and if the variable has not been defined elsewhere then it will generate the No such variable error.

Therefore the reason you are receiving this error must be because you have entered the codes in a form which is not understood by the program, and part of it is instead interpreted as a variable.

As for the other error, you must always give a pad character. It doesn't have to be used, but if you simply press Return you are entering a null string which, of course, cannot return an ASCII value.

To prevent this occurring, add the following line to the program.

75 IF pad\$="" pad\$="£"

If you use the £ symbol elsewhere in your text, simply insert another less frequently used character in line 75.

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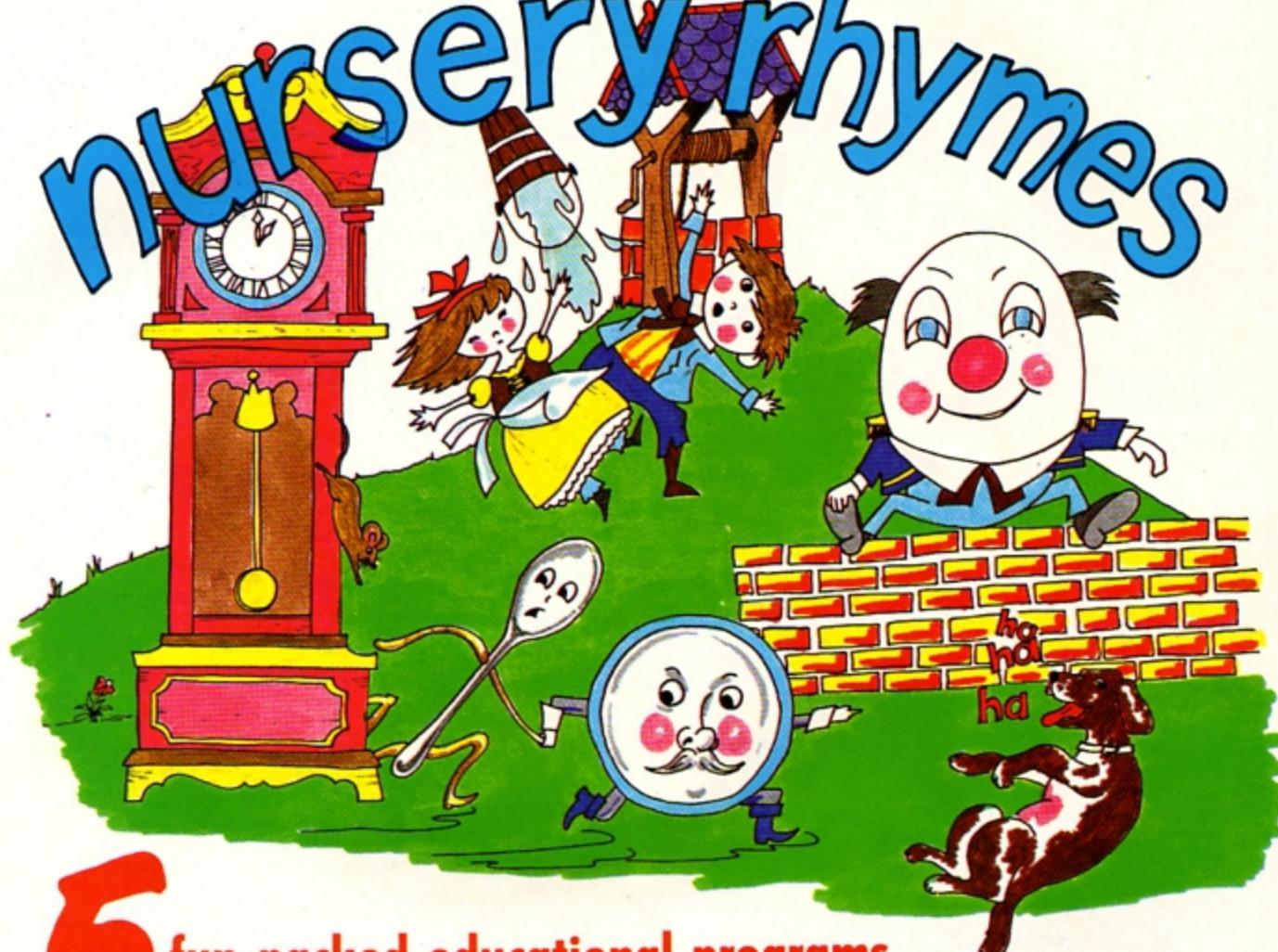
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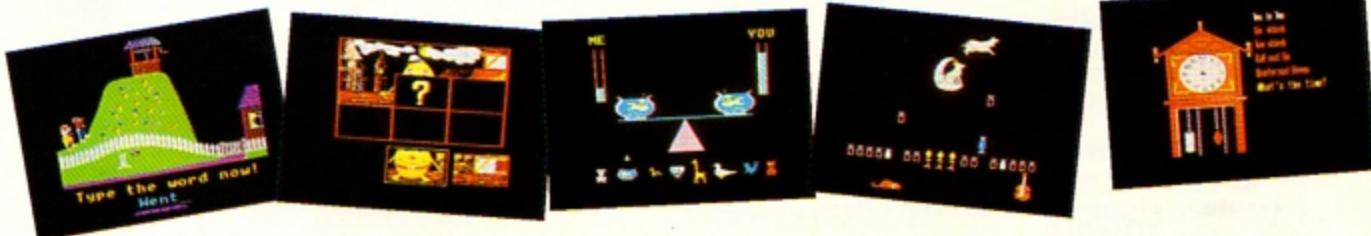
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TO ORDER PLEASE USE THE FORM ON PAGE 53

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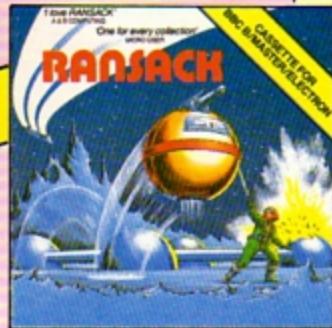
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— Ian Waugh, Electron User, January 1988.

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TO ORDER TURN TO THE FORM ON PAGE 53

HOME brewing is quite a difficult art to master effectively, despite the claims found on the instruction labels of some beer kits.

There is such a bewildering collection of hints and techniques to learn, and anyone who has ever dabbed in this time-honoured hobby will sympathise with the first time brewer.

The Beer Kit Handbook is therefore designed as a stand-by reference and cataloguing system for the newcomer to the art, although the recipe section would be useful to any beer hobbyist.

When you run the program, you are presented with the main menu, which offers three options - recipe book, brewing guide and problem finder. Pressing the spacebar scans through the menu, and the Return key selects the currently highlighted option.

The recipe book uses a

The ELECTRON USER
Beer Kit Handbook

By Chris Nixon

- 1) Recipe book
- 2) Brewing guide
- 3) Problem Finder

The main menu screen

disc file to store all your favourite formulae for good beers in a compact, easily retrievable form - so you must have a disc drive to use this utility.

The recipe book presents you with another menu of three options - find a recipe, add a recipe and print a recipe.

Because there is as yet no recipe file to search through, we'll first create one and add a recipe to it. Select option two, and you will be asked for the beer type. Answer with bitter, lager, ale or whatever.

Next you are asked for the

beer's name. This would be whatever variety is on the kit's label, such as Extra-strong, Old fashioned and so on.

Next, you are prompted for the original gravity. This is the gravity obtained before fermentation starts, and should be around 1038 for best bitters, or 1040 and upwards for a lager.

The final gravity is asked for next, and is the gravity obtained immediately before bottling. It should be close to the 1000 mark to indicate successful primary fermentation.

You now have eight lines of text with which to enter all the ingredients. Unless you are trying for a very fancy brew, this should more than suffice.

Press Return at the end of each line, and if there are some lines left spare press Return until you are prompted for the method.

This time you have 12 lines in which to enter the method. Proceed as for the ingredients, and when the final line has been entered the whole recipe will be saved to disc.

If it is the first time you have used the program, a new file will first be opened before the recipe is stored.

To retrieve a recipe for either casual scanning or printing out, select option one or three respectively from the recipe book menu.

The procedure is the same for both - you are asked first for the type, and then the name, of the beer you want.

The whole file is scanned, and if no matching beer is

found the computer will beep, and you will be returned to the program's main menu.

If a match was found and you selected the Find option, your recipe will appear neatly on the screen, otherwise it will be printed - so make sure that the printer is on, and at the top of a new page, before selecting option three.

You will notice at this stage that the program has performed a rough calculation of the percentage alcohol content in the beer, based on the original and final gravities entered.

The two remaining options on the main menu are for reference only. The brewing guide displays the complete general method for brewing a wet kit, which is the sort of kit available in most supermarkets in the form of a tin of liquid malt or barley, mixed with other

ingredients such as hop extract.

The brewing method is split into five concise, easy-to-follow stages and applies to virtually all wet kits. But always read the instructions on your tin, just in case they vary in some important detail.

The problem finder is for when your brew has failed, or developed problems. Selecting this option lists six possible symptoms, of which one or more should apply to all problems.

Press the key corresponding to a symptom which you have observed in your beer, and a short list of possible causes and remedies will appear.

That just about covers using the Beer Kit Handbook. It should prove helpful to most home brewers, and my recipe book has certainly found new life in its computerised form.

```
10 REM Beer Kit Handbook
20 REM By Chris Nixon
30 REM (C) Electron User
40 REM
50 ONERROR GOTO 930
60 *K.10 CLOSE=0M
70 MODE4:PROCsetup:REPEAT
:CLOSE=0
80 PROCmenu:UNTIL0
90 DEFPROCsetup:DIMmenu$(1,2),ing$(7),meth$(11):FORXX
=0TO1:FORY%=0TO2:READmenu$(X%,Y%):NEXT:NEXT:ENDPROC
100 DEFPROCmenu:CLS:PROCcs
r$(0):COLOUR129:COLOUR0:FORYX
=0TO4:PRINTTAB(10,YX)STRINGS
(21,":NEXT:PRINTTAB(12,1)
'The ELECTRON USER TAB(12,3)
'Beer Kit Handbook':COLOUR12
8:COLOUR1
110 PRINTTAB(13,6)'By Chri
s Nixon':PROCs
can(0):ON Y%G0
T0120,130,140
120 PROCre
cipe:ENDPROC
130 OSCLI'FX21':PROCguide:
ENDPROC
140 OSCLI'FX21':PROChelp:E
NDPROC
150 DEFPROCscan(N%):MOVE28
8,256:DRAW1024,256:DRAW1024,
642:DRAW288,642:DRAW288,256:
COLOUR128:COLOUR1:FORYZ=0TO2
:PRINTTAB(10,Y%*3+14)STRS(Y%
+1);":menu$(N%,Y%):NEXT:Y
%=0
160 COLOUR129:COLOUR0:PRIN
TTAB(13,Y%*3+14)menu$(N%,YX)
:TIME=0:REPEAT:UNTILTIME>700
RNOTINKEY(-99):REPEAT:IX=INK
EY(-99):JX=INKEY(-74):UNTIL
% OR JX:IF JX YX=YX+1:COLOUR
128:COLOUR1:ENDPROC
```

COMPUTING IN ACTION

```

170 COLOUR128:COLOUR1:PRIN
TTAB(13,Y%*3+14)menu$(N%,Y%)
:Y%+1:IFY%>3 Y%=
180 GOTO160
190 DEFPROCrecip:CLS:PROC
csr(0):PROChader("Beer Reci
pe Book"):PROCScan(1):ONLYGO
TO200,210,220
200 PROCfind:ENDPROC
210 PROCadd:ENDPROC
220 PROCprint:ENDPROC
230 DATA"Recipe book",Bre
wing guide",Problem Finder"
,"Find a recipe",Add a reci
pe",Print a recipe"
240 DEFPROChader(A$):COLO
UR129:COLOUR0:L%>19-LENAS/2:
FORY%>BT02:PRINTTAB(L%,Y%)ST
RINGS(LENAS+2, "):NEXT:PRIN
TTAB(L%+1,1)AS:COLOUR128:COL
OUR1:ENDPROC
250 DEFPROCfind:CLS:PROCs
r(1):PROChader("Find a Reci
pe"):#FX21
260 INPUT"Beer type ",t
$:INPUT"Beer name ",n$:PRI
NT"Please wait...";;
270 CH%>OPENUP'RECIPES":RE
PEAT:REPEAT:PROCget:UNTIL(ty
pe$=t$ AND name$=n$)OR EOF#C
H%
280 IF NOT(type$=t$ AND na
me$=n$) UNTILEOF#CH%:CLOSE#=0
:VDU7:ENDPROC
290 PROCdisplay(0):#FX21
300 REPEAT:UNTILINKEY(-99)
:UNTILEOF#CH%:CLOSE#=CH%:ENDP
ROC
310 DEFPROCget:INPUT#CH%,t
ype$:INPUT#CH%,name$:INPUT#C
H%,og$:INPUT#CH%,fg$:INPUT#C
H%,vol%:FORLX=BT07:INPUT#CH%
,ing$(L%):NEXT:FORLX=BT011:I
NPUT#CH%,meth$(L%):NEXT:ENDP
ROC
320 DEFPROCread:INPUT#CH%,
d$:INPUT#CH%,d$:INPUT#CH%,d%
:INPUT#CH%,d%:INPUT#CH%,d%:F
ORLX=BT019:INPUT#CH%,d%:NEXT
:ENDPROC
330 DEFPROCadd:CLS:PROCs
r(1):PROChader("Add a recipe
"):#FX21
340 INPUT"Beer type ",t
ype$:INPUT"Beer name ",name$:
INPUT"Original gravity ",og%
:INPUT"Final gravity ",fg%:
vol%=(og%-fg%)/7
350 PRINT"Now enter 8 lin
es of ingredients"
360 FORLX=BT07:PROCosword:
ing$(L%)=AS:NEXT
370 PRINT"Now enter 12 li
nes of method"
380 FORLX=BT011:PROCosword:
meth$(L%)=AS:NEXT
390 CH%>OPENUP'RECIPES":IF
CHX=0 PROCcreate:PROCput:CL
OSE:#:ENDPROC
400 REPEAT:PROCread:UNTIL
#CH%:PROCput:CLOSE#=0:ENDP
ROC
410 DEFPROCosword:!*C00=8C

```

```

80:!*C00=40:!*C03=32:!*C04=1
27:AX=0:XY=0:Y%=&C:CALL&FFF1
:AS=$&C80:ENDPROC
420 DEFPROCput:PRINT#CH%,t
ype$:PRINT#CH%,name$:PRINT#C
H%,og$:PRINT#CH%,fg%:PRINT#C
H%,vol%:FORLX=BT07:PRINT#CH%
,ing$(L%):NEXT:FORLX=BT011:P
RINT#CH%,meth$(L%):NEXT:ENDP
ROC
430 DEFPROCs(r(1)):VDU23,1
,CX;0;0;0;:ENDPROC
440 DEFPROChelp:CLS:PROCs
r(1):PROChader("Beer Kit Pr
oblem Finder"):VDU28,0,31,39
,4
450 PRINT"HAS:":1) B
eer stopped fermenting"
460 PRINT"2) Beer envelope
d sour taste"
470 PRINT"3) Beer envelope
d yeasty taste"
480 PRINT"4) Beer become t
oo gassy"
490 PRINT"5) Beer become t
oo flat"
500 PRINT"6) Beer stayed t
oo cloudy"
510 COLOUR129:COLOUR0:PRIN
TTAB(13,24)"Press 1-6...":C
OLOUR128:COLOUR1

```

This is one of hundreds of programs now available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs will also run on the Electron.

```

520 REPEAT:GX=GET-48:UNTIL
GX>0 AND GX<7:ONGNGOTO530,59
0,650,700,730,830
530 CLS:PRINT"Fermentati
on has ceased because either
:"
540 PRINT"1) The bin temp.
has risen above 26 C"
550 PRINT"2) The bin temp.
has fallen below 20 C"
560 PRINT"3) Insufficient
yeast was used"
570 PRINT"4) The sugar qty
is less than 1KG/40pts"
580 PROCpause:ENDPROC
590 CLS:PRINT"The beer t
astes sour because either"
600 PRINT"1) Scum was left
to collect on bin froth"
610 PRINT"2) Equipment was
not thoroughly sterile"
620 PRINT"3) The ave. bin
temp. rose above 26 C"
630 PRINT"4) Seddy in bin
or bottles was disturbed"
640 PROCpause:ENDPROC
650 CLS:PRINT"The beer t
astes yeasty because either"
660 PRINT"1) The final gra
vity was above 1010"
670 PRINT"2) Not enough pr
iming sugar used"

```

```

680 PRINT"3) Too much yeas
t used"
690 PROCpause:ENDPROC
700 CLS:PRINT"The beer i
s too flat because"
710 PRINT"1) Too much prim
ing sugar used"
720 PROCpause:ENDPROC
730 CLS:PRINT"The beer i
s too flat because either"
740 PRINT"1) Not enough pr
iming sugar used"
750 PRINT"2) Not enough ye
ast added to wort"
760 PRINT"3) Yeast under-f
ermented"
770 PRINT"4) Av. bin temp.
allowed to drop too far"
780 PROCpause:ENDPROC
790 CLS:PRINT"The beer i
s too cloudy because either"
800 PRINT"1) Bin not stood
before bottling"
810 PRINT"2) Sediment in b
in or bottle disturbed"
820 PRINT"3) Beer is natur
ally cloudy - use fining"
830 PROCpause:ENDPROC
840 DEFPROCput:COLOUR129
:COLOUR0:PRINTTAB(12,24)"Pre
ss space bar";:COLOUR128:COL
OUR1:REPEATUNTILINKEY(-99):V
DU28,0,31,39,0:ENDPROC
850 DEFPROGguide:CLS:PROCs
r(0):PROChader("Quick WET
KIT Brewing Guide")
860 PRINT"1) Sterilise A
LL equipment thoroughly. U
nless stated otherwise, empt
y tin into 5 pint saucepan
and add 4 pints of "boilin
g water. Bring to boil and a
dd 1KGgranulated sugar. Boil
for 15 minutes & tip into
bin."
870 PRINT"2) Top bin up to 5
gallons"with cold tap wat
er. Stir in yeast"
880 PRINT"3) Place bin to
stand for 14 days. Everyday
take hydrometer readings, an
d lift"any brown scum from
beer head."
890 PRINT"4) When fermenta
tion has finished, placebin
to stand on a cold floor for
2 days. This ensures the sed
iment settles."
900 PRINT"5) Lay bottles o
ut on table, adding halfa te
aspoon of sugar to each bott
le. If"this proves tricky,
mix 20 spoonfuls in"ajug
with some of the beer, then
add unequal amount to each
bottle."
910 PRINT"6) Fill each bot
tle slowly and cap each"on
e firmly. Stand bottles for
2 - 5 daysin warm cupboard f
or secondary"fermentation.

```



```

920 COLOUR129:COLOUR0:PRIN
TTAB(12,31)"Press space bar"
;:COLOUR128:COLOUR1:REPEATUN
TILINKEY(-99):ENDPROC
930 IF ERR=17 THEN RUN
940 VDU7:PRINT"Recipe fi
le not created.":PROCpause:R
UN

```

```

950 DEFPROGcreate:VDU7:PRI
NT"Creating new Recipe Fil
e...";:CH%>OPENOUT'REcipes":E
NDPROC
960 DEFPROCprint:CLS:PROCs
r(1):PROChader("Print a Re
cipe"):#FX21

```

```

970 INPUT"Beer type ",t
$:INPUT"Beer name ",n$:PRI
NT"Please wait...";;
980 CH%>OPENUP'RECIPES":RE
PEAT:REPEAT:PROCget:UNTIL(ty
pe$=t$ AND name$=n$)OR EOF#C
H%

```

```

990 IF NOT(type$=t$ AND na
me$=n$) UNTILEOF#CH%:CLOSE#=0
:VDU7:ENDPROC
1000 VDU2:PROCdisplay(1):CL
S:VDU3:#FX21
1010 REPEAT:UNTILINKEY(-99)
:UNTILEOF#CH%:CLOSE#=CH%:ENDP
ROC

```

```

1020 DEFPROCdisplay(N%):IF
N%>0 CLS:PROCs(r(0):PROChad
er(name$+" "+type$) ELSE PRI
NTname$+" "+type$":PRINTSTRIN
GS(LENname$+1+LENtype$,"-")
1030 PRINT"OG: ";og%:TAB(16):FG:
;"fg%:TAB(32):VOL:
";vol%
1040 PRINT"TAB(14);:COLOUR
129:COLOUR0:PRINTINGREDIEN
T$":COLOUR128:COLOUR1
1050 FORLX=BT07:PRINTING$(L
%):NEXT
1060 PRINT"TAB(17);:COLOUR
129:COLOUR0:PRINTMETHOD":COL
OUR128:COLOUR1
1070 FORLX=BT011:PRINTmeth
$(L%):NEXT
1080 ENDPROC

```

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

SO far in this series (which started in the January 1987 issue of *Electron User*) we have seen how to enter, compile and run simple Pascal programs.

This month we will look in more detail at the structure of a Pascal program, input and output, some new data types, how strings are used in standard Pascal and some simple text file handling.

The first topic we will discuss is scope. This simply refers to how much of the program knows about any particular variable, function or procedure.

You'll know from last month that a program consists of an initial statement, followed by CONST, TYPE, VAR, various data, function and procedure declarations and then a series of statements surrounded by BEGIN and END.

Each function and procedure can also have the same structure except the initial statement is the function or procedure declaration. Look at Program I.

```
PROGRAM test (output);
CONST len = 10;
VAR x,y : INTEGER;

PROCEDURE proc1;
CONST len = 15;
VAR y : INTEGER;

PROCEDURE proc2;
CONST len = 20;
BEGIN
  x:=len;
  writeln('Proc 2 ',x,y)
END;

BEGIN
  y:=1;
  proc2;
  x:=len;
  writeln('Proc 1 ',x,y)
END;

BEGIN
  y:=-1;
  proc1;
  x:=len;
  writeln('Main ',x,y)
END.
```

Program I

When you compile and run this you will see that the integer *num* is set to the value of the constant *len* which is most local to it.

Strings and things

Part 3 of MIKE PLUMMER's series on Pascal examines input and output

Also the procedure *proc2* is only known to *proc1* as it is contained within it, and it would be an error to refer to it in the main program.

You can nest procedures or functions like this to a level determined by the version of Pascal you are using. Also, the integer *x* is the same variable in both procedures.

The main program and the integer *y* – declared within *proc1* – is only recognised by *proc1* and *proc2*, whereas *y*, declared in the main data, is only recognised by the main program.

If you find this all rather confusing, think of it as like defining a local variable within a Basic procedure.

This can be summed up simply by saying that any item you use in Pascal must be declared first, and the latest declaration is the one that is used at any time.

Once the block containing the declared variables is left, that variable is removed from the program, like a Basic local variable.

Also important in Pascal is the block structure and compound statements. Anyone familiar with Basic will recognise:

```
IF num<0.0 PRINT 'Negative':n
num=0 ELSE num=SQR(num)
```

The equivalent in Pascal is shown in Listing I.

This can also be written on one line if you like, but is much clearer when split over several. If more than

```
IF num<0.0 THEN
BEGIN
  WRITELN('Negative');
  num:=0.0
END
ELSE
  num:=sqrt(num);
```

Listing I

parameter passing you have seen so far are the same as this.

This is usually an advantage, but if you think for a minute, how would you write a procedure to read the length of three sides of a triangle and return them to the main program?

If there was only one side you could use a function to return its length, but what about three sides? The answer to this is shown in Program II.

By using the VAR before the parameters *s1,s2,s3* in the declaration of procedure *rd* they are said to be passed by *reference*. This means that any changes made to them within the procedure are passed back to the calling program.

This is achieved by effectively passing the address of the variable rather than its value, although the programmer does not need to know about that.

The final listing – Program III – shows how this facility is used in the function *readbuf*.

Program II also introduces several other items of interest. This is the first time we have come across the REAL data type.

As in Basic, a real number is represented by five bytes and can take a value of between -1.7E38 and +1.7E38, whereas integers are represented by four bytes and take values

between -2147483648 and 2147483647.

We have already seen WRITE and WRITELN before, and in many ways they are similar to the Basic command PRINT.

Unfortunately there is no space to describe them in much detail - this is done very well in the manuals and I would only be repeating them. However, you can see how the output is formatted from the examples here.

You may have already noticed in last month's issue how to specify the number of digits and spaces required when outputting integers, by following the variable name with a colon and the number of characters required.

For real numbers, a second colon and number sets the number of decimal places printed.

There are default values for all of the field widths, and you do not have to follow a variable name by a formatting field if you don't want to.

Formatting only applies to output to TEXT files, and we will see some other types of file next month.

One other feature of the above program are the functions READ and READLN. These are Pascal's equivalent of Basic's INPUT or GET\$.

READ, when applied to a text file and the default input channel (the keyboard) can

```

PROGRAM WORDS (input,output,wordfile);
(* This programs read the text in a
text file and prints out the number
of characters, words and lines.

M.J.Plummer (c) Electron User *)
CONST
  longline = 255;
  namelen = 80;(* Change for nonADFS *)
  dispLen = 40;

TYPE
  llen = 1..longline;
  LineBuff = PACKED ARRAY [llen] OF CHAR;
  VAR
    buffer : LineBuff;
    filename : LineBuff;
    linelen : llen;
    wordfile : TEXT;
    cc,wc,lc : INTEGER;

(* Function which reads in a string
from the given input and returns
the number of characters read *)

FUNCTION readbuf (VAR infile : TEXT ;
  VAR buf : LineBuff) : INTEGER;

  VAR
    length : INTEGER;

  BEGIN
    FOR length:=1 TO longline DO
      buf[length]:= ' ';
    length:=1;
    WHILE (length<longline) AND
      NOT EOLN(infile) DO
      BEGIN
        READ(infile,buf[length]);
        length:=length+1
      END;
    readbuf:=length;
    READLN(infile)
  END;

(* Function which analyses a line and
calculates how many words in it *)

FUNCTION analyse(buf:LineBuff;
  num:llen) : INTEGER;

```

```

  VAR
    ptr,count : INTEGER;

  BEGIN
    IF num<longline THEN
      num:=num+1;
    count:=0;ptr:=1;
    WHILE ptr<num DO
      BEGIN
        WHILE (buf[ptr] IN [CHR(9), ' '])
          AND (ptr<num) DO
          ptr:=ptr+1;
        IF ptr<num THEN
          count:=count+1;
        WHILE (NOT (buf[ptr] IN [CHR(9), ' ']))
          AND (ptr<num) DO
          ptr:=ptr+1
      END;
    analyse:=count
  END;

  (***** Main Program *****)

  BEGIN
    MODE(6);
    wc:=0; lc:=0; cc:=0;
    WRITELN; WRITELN;
    WRITELN('Word Counter');
    WRITELN('=====');
    WRITELN;

    WRITE('File : ');
    IF readbuf(input,filename)>namelen THEN
      WRITELN ('Filename is too long')
    ELSE
      BEGIN
        RESET (wordfile,filename);
        WHILE NOT EOF(wordfile) DO
          BEGIN
            linelen:=readbuf(wordfile,buffer);
            cc:=cc+linelen;
            wc:=wc+analyse(buffer,linelen);
            lc:=lc+1;
            WRITE('.')
          END;
        WRITELN; WRITELN;
        WRITELN('Characters = ',cc:5);
        WRITELN('Words = ',wc:5);
        WRITELN('Lines = ',lc:5)
      END;
  END.

```

Program III

```

PROGRAM sides(input,output);
  VAR side1,side2,side3 : REAL;

  PROCEDURE rd ( VAR s1,s2,s3 : REAL );
  BEGIN
    WRITE ('Enter 3 lengths :');
    READLN (s1,s2,s3)
  END;

  BEGIN
    rd(side1,side2,side3);
    WRITELN('Sides are ',side1:5:2,' : ');
    WRITE(side2:5:2,' : ',side3:5:2)
  END.

```

read in numbers in Ascii digits and convert them to actual numbers, and can also read characters.

READ expects the numbers input to be separated by commas or placed on a new line.

READLN will read as much of the input as will satisfy the parameters and ignore the rest on that line. It must also be called to clear the end of the line.

Note that you cannot check for the Return key pressed, but must use the function eoln(input) instead. A similar check is used for

end of lines in a disc or tape file.

The function eoln is of a new type called Boolean, and can only return the values TRUE or FALSE.

Files are opened for reading using RESET and for writing using REWRITE, as can be seen in the final listing.

Note that a file variable must be the first parameter in a READ or WRITE statement, and if there is none, then input from the keyboard and output to the

Turn to Page 58 ▶

Programming

From Page 57

screen are assumed respectively.

Finally, we come to string handling in Pascal. In ISO Pascal level zero, which is the version in the Acornsoft rom, can only be described as painful.

You have already seen string constants in the examples surrounded by single quotes. String variables in their simplest form are declared as follows:

```
TYPE string=PACKED ARRAY  
[1..8]  
      OF CHAR;  
VAR name : string;
```

This brings up several issues. Firstly, arrays are declared as shown, with the subrange after the declaration showing the size.

The first value in this range need not be one, but can be zero, -1 or any

integer you like. Obviously, the final value must be greater than the first. The PACKED keyword tells the compiler to optimise the memory space used, even at the expense of processing speed. Strings must be PACKED ARRAYS.

You can set a string variable to a constant value as in Basic's

```
name$='Fred'
```

However, in level zero Pascal, you cannot say:

```
name:='Fred';
```

because name is an array of dimension eight and Fred is a constant of dimension four. The correct way to write this is:

```
name:='Fred';  
(TT)* Four spaces *
```

Similarly, you cannot say:

```
IF name='Fred' THEN ...
```

- you must say:

```
IF name='Fred' THEN ...
```

Also, when you pass strings as a parameter to a procedure it must be of the correct dimension and subrange.

You cannot return strings from a function in standard Pascal, and so you have to pass the string parameter by reference.

You will be pleased to know however, that almost every other version of Pascal, as well as having these facilities, has much better string types and functions.

These are not standard, and so you must learn the string handling for each version.

Now look at the final listing, Program III. This will read text from a disc or tape

file (if you do not have View, you can use the Pascal editor to generate a file) and count the characters, words and lines within that text file.

It uses all of the concepts we have already discussed, the only extra thing being the EOF function, which is the same as the Basic EOF#, except that it is a Boolean function and returns values of TRUE and FALSE.

Note that the TEXT file variable is also declared in the PROGRAM statement, as well as in the VAR section.

● Next month we will look at structured data types and some more features of file handling, along with some other important ideas. As an example, I'll list a program which will allow you to maintain a record of the weather.

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Programming

HAVE you ever been lost and stopped to ask a passer-by how to get to your destination? If so, no doubt you'll have been told the way, with the addition of "But I wouldn't start from here".

Well assembly language is a bit like that. There's no obvious place to start.

Not that it's difficult. It isn't. It's just that before you can use it properly, there seem to be a lot of things that you have to know... Binary and hexadecimal, obscure operating system calls, memory maps, registers, interrupts...

There's a bewildering list of things that can creep into discussions of assembly language. To the novice it can seem overwhelming.

It needn't be. You don't have to be a genius to learn assembly programming — look at some of the half-wits who do it (I'll send a signed photo on receipt of an SAE).

All you have to do is to take it bit by bit and don't be diverted by the obscurities you'll come across from time to time.

Take them on trust and come back to them later when you're more at home with things. Just concern yourself with the essentials and you'll realise how easy assembly language is.

Silicon heart

You're already familiar with some of the basic concepts you'll need, even if you don't realise it.

You know that your Electron has 64k of memory. You also know it's got a silicon chip at the heart of things, the 6502 (politely known as the Central Processing Unit or CPU). This is the brains of the micro.

With these two concepts you can get to grips with assembly language.

The classic model of a

computer's memory is as a series of pigeon holes — locations — which are used to store things. A more accurate description is as an ordered collection of one byte locations, each identified by its own unique address.

Locations

If you've done a bit of Basic programming then you can look on the memory as a one-dimensional array of one byte elements, with the array index being the location's address.

The Electron has 65,536 of these locations which is an awfully big array or a huge flock of pigeons depending how you look at it.

So what, you might ask, is in these memory locations? That's the fundamental question. As you delve further into machine code you'll seem to spend your life wondering just what is in a location and how it got there.

At its simplest, all that can go into a location is a number. And this number can only take values between zero and 255. A machine code program consists of a whole set of these numbers one after the other in memory.

When it's given the electronic equivalent of a kick

start, the CPU takes a peek at the first location it's pointed at and starts to run the program.

To be precise, it drags the contents of that location from memory and puts it in one of its registers (a sort of electronic notepad) while it tries to figure out what it's supposed to do next.

This number is an instruction, a code that gets the 6502 chip to do something. In fact almost everything that your Electron does is the result of obeying instructions taken from memory.

Actually most instructions need something else as well. Suppose I instructed you to add. You'd probably ask "add what to what?".

The facts, man

The 6502 is just the same. Most of its instructions need data to act on and this data is stored as numbers in memory. When the chip decodes an instruction it looks in the memory for any data it needs and brings it into its registers to work on.

Obviously there's a lot more to it than that, but if you grasp the fact that a machine code program consists of a series of numbers tucked away in a series of memory locations, with some of these numbers

being instructions and others being data, then you're well away.

Now these numbers aren't stored in our everyday decimal format. The micro uses binary, which looks like a lot of zeros and ones all strung together.

To make things easier for themselves, machine code programmers decided to write down the numbers in hexadecimal notation.

These op codes, as they are known, are still conver-

Turn to Page 60 ▶

ASSEMBLY OR MACHINE CODE

To be pedantic, machine code is the binary representation of a program's instructions and data, the actual raw material the CPU processes.

An assembly language program is a program written entirely in mnemonics. This is translated into machine code by way of an assembler program.

The assembly program is known as the source code, with the assembled machine code being called the object code. In practice, the term machine code is used loosely for both.

MACHINE CODE

Begin learning how to program the 6502 with Part 1 of PETE BIBBY's easy guide to assembly language

Programming

From Page 59

ted to binary (or rather, its electronic representation) for use by the micro, hexadecimal just being used to make things easier for the programmer. After all:

4A 19 28

which is hexadecimal, is a lot easier to handle than the binary:

01001010 00011001 00101000

even if you don't know what it means in either case.

It gets even simpler if you replace the hexadecimal with assembly language mnemonics. These are easier to use than spell. They're shorthand terms for the instructions.

Allegedly more meaningful and so more memorable, they stand for the op

Why program in assembly language?

- It's a lot faster.
- It takes less memory.
- Some functions are easier to use from machine code.
- It's sexier.
- It's a status symbol.
- You can baffle and amaze all your friends.

codes. Even though you know nothing about assembly language you should be able to grasp that:

ADD 25,48

means that 25 and 48 (in decimal) are to be added. It's a lot better than the hexadecimal and binary equivalents we just met.

In fact all machine code programs are written in

assembly language and then translated into hexadecimal values which computers store as binary numbers. (Incidentally, I made the earlier ones up, no CPU will run them).

At first, programmers used to use tables to translate the mnemonics into hex values and then, believe it or not, flick switches to set each byte in memory manually.

It didn't take long before it dawned on someone to write a program to do it for them. Hence the first assembler was born.

An assembler is a program that takes a listing written in those helpful mnemonics (easy for humans to grasp) and converts it into binary (which the computer can understand), storing it in memory, ready to run.

You start the assembler,

give it your assembly language program (the mnemonics) and you get machine code in return.

Assemblers do a whole lot more as well, and it often seems that you have to spend more time learning the ins and outs of your assembler than you do to learn assembly language programming itself.

Having said that, the joy of the Electron is that Basic has a built-in assembler which makes things much easier.

Again, you're best advised to stick to the basics (which is not the same as sticking to Basic!) and leave the complications for later.

• Which is almost where we came in. If I were you, I'd start from here. Next month in Part 2, we'll start assembly language programming.



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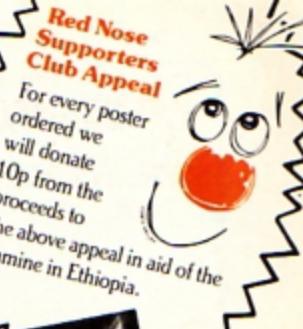
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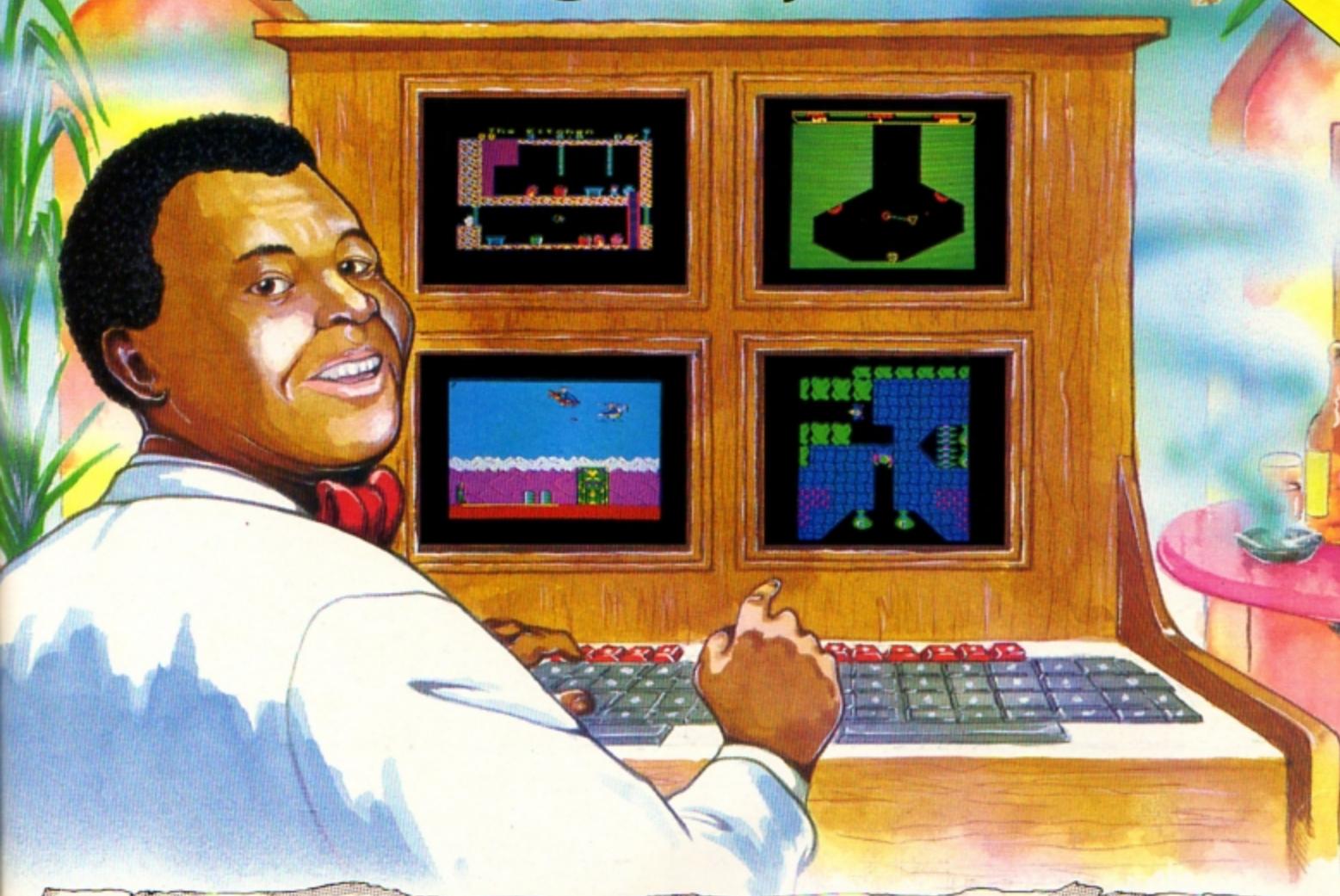
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