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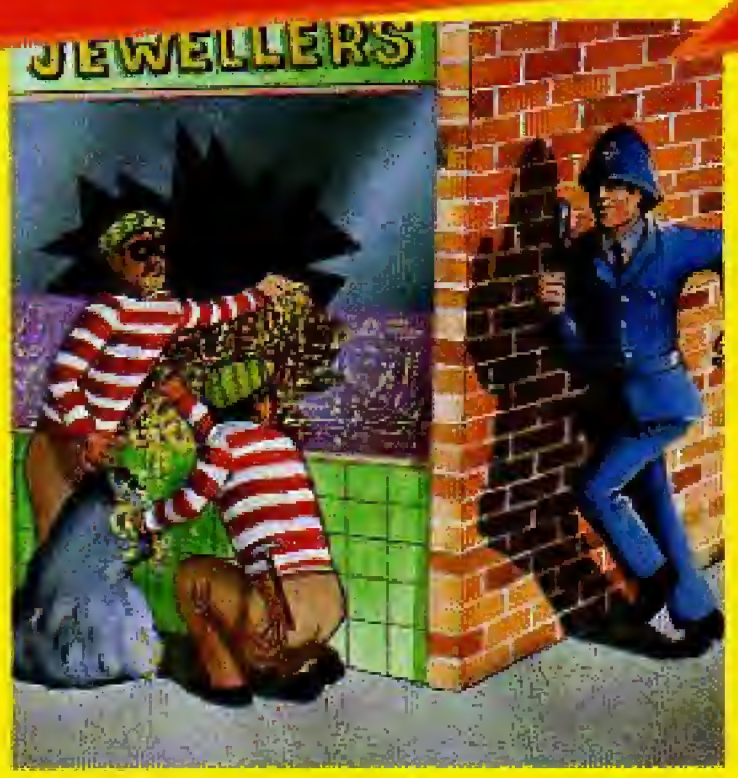

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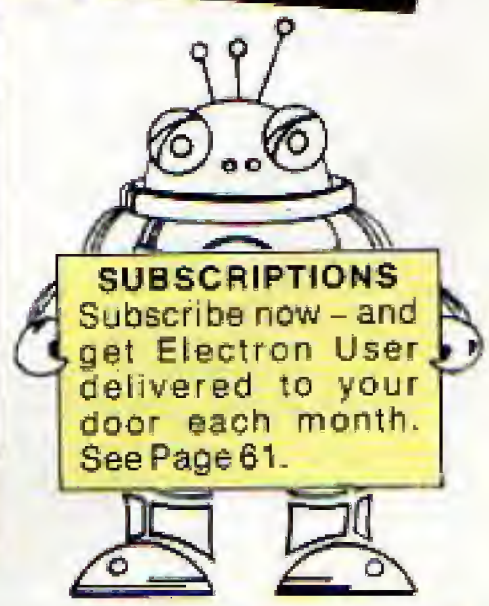

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Published by Database Publications Ltd

Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Telephone: 061-456 8835 (Editorial) 061-456 8383 (Administration) 061-456 8500 (Advertising)
Subscriptions: 061-480 0171. Telex: 667664 SHARET G. Prestel: 614568383.

Subscription rates for 12 issues, post free:

£12 UK
£13 Eire (IR £16)
£20 Europe
£30 Rest of world (surface)
£40 Rest of world (airmail)

News trade distribution: Europress Sales and Distribution Limited, 11 Brighton Road, Crawley, West Sussex RH10 6AF. Circulation 0293 27053.

Electron User is an independent publication. Acorn Computers Ltd, manufacturers of the Electron, are not responsible for any of the articles in this issue or for any of the opinions expressed.

Electron User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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NOW it's cheaper than ever to add the power of discs to your Electron Plus 1 – with the Cumana floppy disc system.

Easy to fit and simple to use, the Cumana system has the latest and most flexible DFS for the Electron – and much more besides.

It consists of an interface, electronics and software in a cartridge, a single 5¼in disc drive with lead and a utilities disc.

The interface slots into the Plus 1's cartridge port. Up to two 3½in or 5¼in disc drives can be attached. The result is a whole new dimension of speed and reliability!

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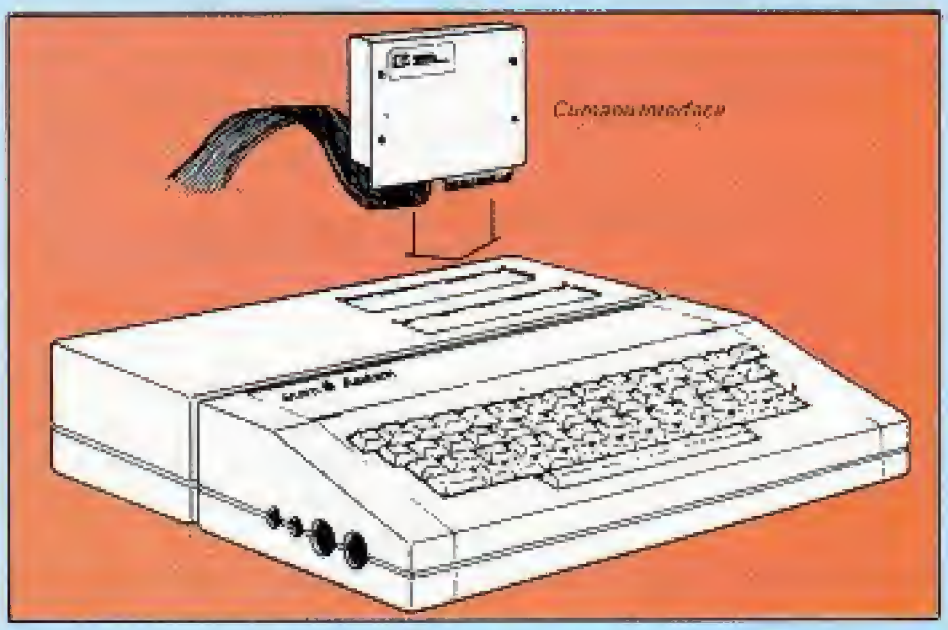

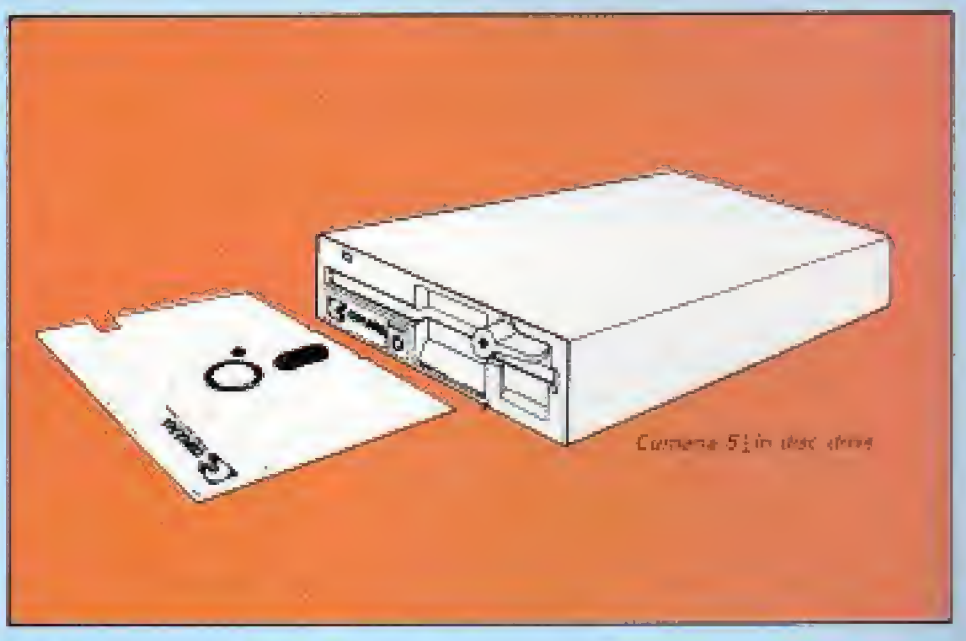

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electron user NEWS

Educational software galore for Electron

A NATIONWIDE investigation by Acorn has revealed that there are up to 1,000 educational software titles currently available for the Electron.

The study was launched in the wake of mounting criticism from concerned parents who have been unable to locate suitable scholastic programs for their children.

After the problem was first highlighted in *Electron User*, Acorn decided to crack the case of the missing software.

Within only 10 days the company had come up with a list of almost 250 titles – and it has already been suggested that this may be just a quarter of those on the market.

"In all, there could be up to 1,000 titles out there", said Gareth Williams, the Acorn marketing consultant in charge of the project.

"While we knew there was a lot available, I was surprised to find out just how much and that the quality of most is so good".

Breakdown

Gareth Williams is now collating the Electron list – the first ever – which gives a complete breakdown of each program.

Apart from the title, the name of the software publishers and the price, it provides details of the type of subject covered, whether tape or disc and if any printed text is available with the program.

"What we have found to date is that the software covers across the range, without shortfalls in any one area", says Gareth Williams.

Availability

However, as comprehensive as the Electron list will prove to be, it does not in itself solve the basic availability problem.

"This can only be achieved by persuading the dealers to stock educational software", admits the Acorn man.

"Up to now their objection to this is that it is too slow moving in comparison to games. And as a result, takes up too much of their valuable shelf space.

"However, I think they are going to miss out if they don't. After all, it's the parents who shell out the money for the computers hoping it will help them with their education.

"So if this situation carries on they may simply decide it isn't worthwhile to buy one. If this happens then everyone is in trouble – including the dealer".

Special supplement

ACORN'S unique list of educational software available for the Electron is to be published as a special supplement with the next issue of *Electron User*.

This will be undertaken as part of the magazine's ongoing commitment to the campaign to make a wide range of scholastic programs readily available to readers.

"Once Electron users have seen what is available, they will at least know what to order from their dealers", says Derek Meakin, the managing editor of *Electron User*.

"In this way, it will demonstrate to retailers just how large the demand is for these products.

"And from there on they will hopefully realise the undoubted potential in carrying a range of educational software. In this way, the entire problem could be solved".

NEW BRIDGE 'CONTRACT'

AN improved version of Contract Bridge has been released by Alligata Software.

The firm is offering owners of the original version a "new for old" deal costing £1 for cassette exchange and £3 for cassette to disc upgrade.

Retail training aid

MINI Office, the chart topping software package for the Electron from Database Software, is being used as a teaching aid by leading UK computer retailers, W.H. Smith.

Shortlisted for two major categories in the 1985 British Microcomputing Awards, Mini Office has been selected to bring the message home to W.H. Smith staff that home computers have a serious application.

The company is currently using the program in its mobile training classroom, which is on a nationwide tour.

Capable

"We have a lot of staff and we want them to know what the goods are capable of which they are selling," said a training spokesman.

W.H. Smith chose Mini Office because its four programs – word processing, database, spreadsheet and graphics – emphasise how easily a computer can be turned into an inexpensive office tool.

"At its revolutionary low price of £5.95, Mini Office is a truly cost effective way of introducing the business concept of computers to our staff", said the man from W.H. Smith.

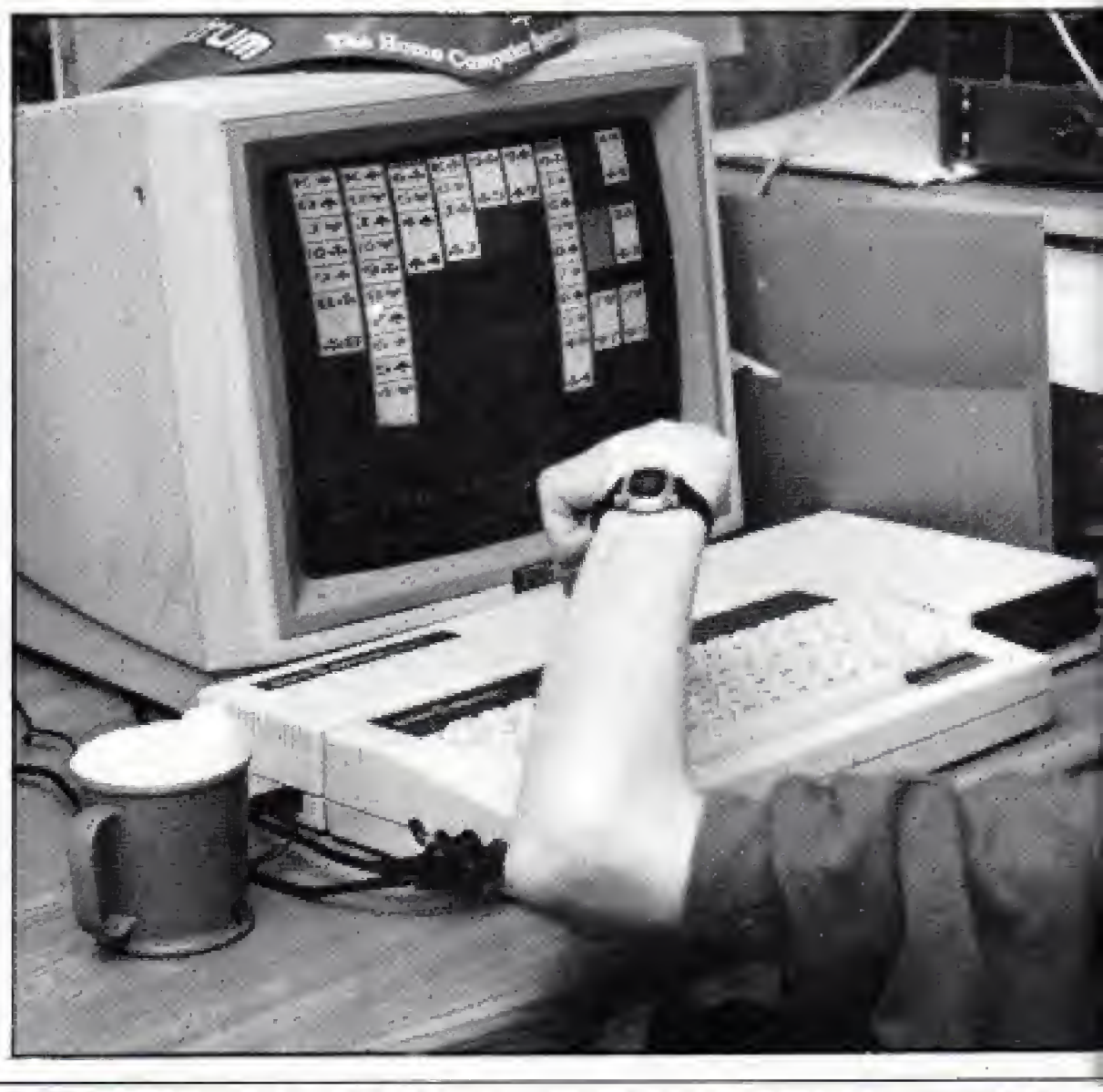
NEW BOBBY DAZZLER

FORMER England and Manchester United star Bobby Charlton is the inspiration behind a new Electron football simulation game.

Using Charlton's knowledge of the game, simulation specialists DACC have come up with Bobby Charlton Soccer.

The program includes a management module, enabling the player to master team building skills, a match play module, plus voice instructions and play hints from the great soccer maestro himself.

Available soon will be the extra World Cup and Canon League modules. Prices range from £11.95.



ELITE CHAMPIONSHIPS FOR THE BIG SHOW

THE National Elite Championships are to be a major attraction at the first of this year's Electron & BBC Micro User Shows.

Six finalists, from an entry of 5,000, have the chance of winning equipment and software to the value of £1,000.

Forming the last stage of the competition – the world's first championship for the best-selling "cult" space game – is a two-day Elite-athlon to be held at the Show on the Saturday and Sunday.

Finalists will be called on to play a new, second processor version of the all-colour game now with faster graphics. It will be the first public showing of this version.

Elite has sold more than 100,000 copies since its launch.

Its success has prompted Acornsoft to sign a licensing agreement for Commodore and Spectrum versions.

"Naturally we are very pleased they have chosen our show as the venue for the final", says Derek Meakin, head of Database, the show's organisers.

"It will certainly be a major attraction at an event which will once again prove to be the launching pad for all that's new in the world of the Electron".

Playing the game

FOR the first two days of the Electron & BBC Micro User Show the Elite stand will be open to the general public. Visitors will get the chance to see and play the sophisticated 6502 second processor version of the top selling game.

The stand will be open all day Thursday May 9 and Friday May 10 and also on Saturday May 11 after the first Elite-athlon session finishes at 3pm.

Radio boost

THE school radio series "Maths with a Story" has been augmented by two software packs for the Electron, designed for home users as well as teachers.

Written by former maths teacher Peter Smith, the programmes, aimed at the primary age group, have been given extensive trials in schools.

The BBC Publications software is being published in two cassette packs costing £10.95 each – the first now, the second in September.

The second of the maths radio series is being repeated this summer and autumn.

Sports quiz released

THE third in the Kosmos Software series of Answer Back quiz programs for the Electron has been released.

Answer Back Sport combines tennis and football games with a series of quizzes on sporting subjects.

The games can be run separately or in conjunction with the quizzes, but either way the objective is to beat the Kosmos team.

A master control program is first loaded into the Electron, allowing any of 26 quiz topics to be selected. Subjects covered range from athletics to water sports.

As with the other titles in the series, Answer Back Sport includes the facilities to enable the user to create, edit and save an unlimited number of new, multiple-choice quizzes.

Price is £9.95.

Electrons brought in to train handicapped

SEVERELY handicapped and disabled residents of Cheshire Homes are using Electrons to entertain, educate and train themselves for jobs.

With backing from the Manpower Services Commission, Robin Nixon and Steve Ludlow have set up extensive computer facilities at two Cheshire Homes – Seven Springs and Heatherley – using Electrons.

To "interface" a resident to a micro may need individual input controls, and these are produced in workshops at each Home.

The computer software may also need to be modified, and this too is done on the premises, with the new versions being made available to other Cheshire Homes.

Experience to date has been highly encouraging, say those involved in the scheme.

Computers have helped people with poor control to write perfect letters and produce geometric computer graphics.

The games that are often the start of computer interest have helped them develop control and dexterity.

Worthwhile jobs can be performed by residents – helping with the accounts, for example, or organising fund-raising projects.

Favourite

They are better able to follow educational courses, both in mathematical subjects and the arts, including languages. Spanish is a favourite course for use on holidays.

There are, of course, residents who are not at all interested in computers and are happy to leave new technology to others. This is accepted and respected.

But, for many, computers like the Electron are proving valuable and adaptable communications devices, and a means to pursue other interests.

A programme called COMPAID – Computer Aid for Speech-Impaired and Disabled People – was started by Lorna Ridgway, then chairman of management, at Seven Springs early in 1982.

Robin Nixon told *Electron User:* "We were mainly concerned with solving the communication difficulties of some of our more-severely-disabled residents, using customised input devices and software.

Converted

"To get the project under way, we converted an old storage room into a computer room and took on eight previously unemployed trainees on a part-time basis under the Opportunities for Volunteering scheme".

Under the supervision of Stuart McKears, the computer tutor, the trainees' tasks were to learn the basics of programming and computer use, and in turn pass these on to the residents.

The scheme struggled at first because there was only one readily-available program, but the situation eased with the advent of the Electron and BBC micros with their extensive software range.

One of the first projects of COMPAID was a large-letter word-processor program to help visually-impaired people to read. This was followed by a two-switch-operated drawing program called Rainbow.

As well as communication and graphic design software, games such as Patience (see picture) were created to amuse and stimulate the residents.

Says Nixon: "Many commercially available games are designed with keyboard or joystick input in mind and, being in machine code, are hard to adapt.

"Having ascertained that two switches were the maximum that our most severely disabled residents could easily use, we set about writing some games to help with the assessment and improvement of coordination".

One such game is Lunar Run, a machine code arcade-style action game which can be played using the joystick fire buttons or the Space and Return keys.

Other projects tackled included a portable Morse communicator for Mark, a resident who has lost virtually all sight and hearing.

Amplifier

Text typed in at the keyboard was converted into Morse Code, which was then output via the cassette interface to a high powered amplifier.

The Morse can then be felt – not heard – through a set of headphones.

Using this system, Mark won an essay competition on how best to spend £650 for a career.

The cash was spent on adapting a hand-held computer as a Morse communicator, so he no longer needs to come to the computer room when he wants to have a chat.

For the past 18 months COMPAID has been funded by the Manpower Services Commission Community Programme. There are four full-time computer trainees, eight part-time trainees and three workshop trainees.

Quicker thinking

AN enhanced version of the challenging mental arithmetic program Quick Thinking has been produced for the Electron by Mirrorsoft.

Quick Thinking Plus comes in two parts and costs £6.95. New-for-old upgrades cost £2.50.

Multivaders puts the player in charge of a robot invasion prevention force. Addition, subtraction, multiplication and division tasks have to be completed successfully within prespecified time limits.

Levels of play can be set so that children can play against adults without being at a disadvantage.

In Robot Tables the aim is to perform speedy mental multiplication to make robots good enough to pass the critical eye of the quality controller.

For stargazing Electron owners, Mirrorsoft has brought out Star Seeker on cassette for £9.95.

It allows the user to follow planets, track stars and discover constellations – and trace the path of Halley's Comet as it passes the Earth.

LOGO PACKAGE

A COMPLETE schools and home Logo package for the Electron has been launched by Honeyfold Software.

It consists partly of a set of classroom lessons presented in a format designed for the primary school.

They are supplemented by a set of work cards which integrate with the text. A companion guide assists the teacher in putting over its contents and explains the major teaching points.

Reflecting the needs of the older reader, "A Guide to Logo for Parents and Teachers" is also provided.

Honeylogo on tape or disc with the parent-teacher guide costs £16.

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There are no bad GOTOs – only bad programmers

Part 17 of PETE BIBBY's introduction to the art of programming

THIS month we'll be leaving our ANDs, ORs and ELSEs and moving onto the Basic keyword GOTO.

Simple to grasp but complicated in action, GOTO is one of the most powerful commands at the disposal of Basic programmers. With it you can do all sort of interesting things, sending the program here, there and everywhere as need be.

The trouble is that like all powerful things it can be misused, and it often is. Because of this GOTO is frowned upon in polite programming society.

In Electron Basic there are other ways of achieving the same results as a GOTO and it's usually better to use them.

However you have to learn what GOTOs are all about before you can really understand the value of these other methods. And, used sensibly, they're not as awful as some people make out.

In fact I could go as far as to say that there are no bad GOTOs, just bad programmers.

Anyway, those are my excuses for teaching you about GOTOs and I'm sticking to them. Please note that although I'm showing you how to use them, that doesn't mean I want you to use them. And, if you do (as you will), don't tell anyone that I told you to.

After all that preamble, let's see the beast in action. Try Program I and, when the thrill wears off, press Escape to bring it to a halt.

```
10 REM PROGRAM I
20 PRINT "HELLO"
30 GOTO 20
```

Program I

Line 10 is just the REM that gives the program a title, while line 20 prints the friendly message. The GOTO rears its head in line 30.

What it does is to tell the program that it is to go to the line number following the aptly named GOTO and carry on from there. In this case the GOTO of line 30 tells the Electron to go back to line 20 of the program.

It duly does this, printing out the message and then comes to line 30. Here the GOTO again sends the micro back to process line 20, the message is printed, it goes onto line 30 and the whole thing starts over again.

As there is no end to the way lines 20 and 30 cycle, it's called an infinite loop. In this case I meant it to be an infinite loop, but usually they crop up by accident, causing programs to "hang".

Even though the above example is fairly simple, you can see the power unleashed by a GOTO. We have a three line program producing thousands of HELLOs.

To be a little bit theoretical for a moment, this has been done by altering the flow of control of the program. This is simply the order in which the micro processes the program's lines. The program controls the micro, the lines that it consists of telling the Electron what to do.

Up until now all our programs, except for one case, have started at the lowest line number and worked relentlessly through lines of ascending numbers. Line 10 was processed, then line 20, then 30 and so on. The flow of control was simple and straightforward.

When we came to conditionals we found out how IFs and THENs could decide if all or part of a program line was processed, but still control passed from one line to the line with the next highest number.

Only with the FOR . . . NEXT loops did we come across a case where the program jumped backwards. The linear flow of control we were used to was changed into a loop (we'll deal with this next month.)

As you can see, using GOTO has a profound effect on the flow of control. Have a look at its use in Program II:

```
10 REM PROGRAM II
20 PRINT "HELLO"
30 GOTO 10
```

Program II

Here the Electron starts at line 10 and then goes on to lines 20 and 30 as normal. Line 30, however, contains a GOTO which sends the Electron back to line 10.

Here it carries on as usual, working through the program line by line, until it hits the GOTO again and control of the Electron passes to line 10.

Try changing line 30 to:

```
30 GOTO 30
```

Can you explain what is happening? It's another infinite loop.

Let's leave GOTO for a moment and look at Program III:

```
10 REM PROGRAM III
20 INPUT "Number",number
30 IF number>20 THEN PRI
NT number" is greater than
20"
```

Program III

If you've been following the series so far this should cause you no difficulties.

Line 20 asks for a number and if the number is greater than 20, line 30 tells you so.

Now suppose, for reasons best known to yourself, that you wanted the message to be on a separate line.

You might think that you could put the message in line 40 and get to it via a GOTO after the condition of line 30. Program IV shows what I mean.

It looks fairly convincing

```
10 REM PROGRAM IV
20 INPUT "Number",number
30 IF number>20 THEN GOT
O 40
40 PRINT number" is grea
ter than 20"
```

Program IV

From Page 9

doesn't it? All that we've done is to move the message of line 30 to line 40 and "glue" the two together with a GOTO. The trouble is, it doesn't work.

The program is fine so long as the numbers you enter are above 20, but look what happens when you type in a number like 12.

You get told:

```
12 is greater than 20
```

Can you figure out why this has happened? Let's take the case where you enter a number that is greater than 20, say 100.

The Electron comes to line 30 of Program IV and checks the condition after the IF.

As 100 is greater than 20 the condition is true and the micro goes on to perform whatever comes after the THEN.

Here it finds a GOTO and, ever obedient, it goes to line 40 and prints out the message. So far, so good.

Suppose, however, that you had entered 5, which is obviously not greater than 20. Now the condition of line 30 is false, so the Electron ignores everything after the THEN and goes on to the next line as normal.

Line 40 tells it to print out a message, and so it does.

Never mind the fact that the message is wrong, the Electron just does what it's told. Line 40 says print a message, there's nothing to stop the program reaching line 40, so the message gets printed.

As you can see, using a GOTO can have unexpected consequences. Line 40 is printed in either case.

When the number is greater than 20 the GOTO ensures that line 40 is obeyed. In the other case, the program carries on to line 40 just by doing what it does normally, going from one line to the next.

The remedy is simple. What we really meant at line 30 was that the Electron was to print the message if the condition was true or else to stop there. Program V shows how this is achieved.

Here the END after the

```
   10 REM PROGRAM V
   20 INPUT "Number",number
   30 IF number>20 THEN GOT
O 40 ELSE END
   40 PRINT number" is grea
ter than 20"
```

Program V

ELSE of line 30 does just that. If the condition is false the micro goes to the part after the ELSE; finds the END there and halts. Line 40 doesn't get processed.

From this you should see that using GOTO thoughtlessly can cause all sorts of problems. In this case it was easy to find where the fault lay, but in long complicated programs it can be very hard to spot the error. Usually it's come from an ill advised GOTO.

What makes things worse is the way that the bugs can hide, only coming out to play at odd times.

After all, if we hadn't have tested Program IV with numbers less than or equal to 20, we'd have never noticed the bug.

Of course, if we'd have shown our masterpiece to our friends they'd find the values that trigger the error straight away!

Program VI shows an attempt to make Program V print a message if the number input is less than or equal to 20. Before you type it in and run it have a look at it and see if you can see any flaws.

Line 30 looks fairly convincing. If *number* is greater than 20 the condition is true and the GOTO after the THEN sends the Electron to the appropriate message at line 40. If it isn't the case, the GOTO after the ELSE is obeyed and line 50 produces its message.

Try it and see.

Have a look at the condition of line 30. Make sure that you test the program with values that make it both true and false so you can find out what happens in every eventuality.

As you'll find, the program works well enough if the numbers are less than or equal to 20. The trouble is that when you give *number* a value above 20 you get both messages instead of just the one you

```
   10 REM PROGRAM VI
   20 INPUT "Number",number
   30 IF number>20 THEN GOT
O 40 ELSE GOTO 50
   40 PRINT number" is grea
ter than 20"
   50 PRINT number" is less
 than or equal to 20"
```

Program VI

wanted. It's exactly the same problem as before.

When the condition of line 30 is false then control immediately goes to line 50 and the message is correct. However, when the condition is fulfilled with a value of *number* such as 25, then things go wrong.

The GOTO after the IF sends control to line 40, which the Electron then obeys. This would be fine if things stopped there, but then control goes to line 50 – why shouldn't it? There's nothing to stop it.

Now you get the second, erroneous message. The program has crashed into a line you didn't want to be obeyed in those circumstances.

Program VII shows how things can be improved with the appropriate ENDs to bring things to a halt:

```
   10 REM PROGRAM VII
   20 INPUT "Number",number
   30 IF number>20 THEN GOT
O 40 ELSE GOTO 50
   40 PRINT number" is grea
ter than 20":END
   50 PRINT number" is less
 than or equal to 20":END
```

Program VII

One thing you might have noticed is that there is no real reason for using GOTOs at all in the above example. The program could be written without them using simple IFs.

This is true of many of the times that GOTO is used. Often there's a simpler way of doing things, less fraught with difficulties than using GOTO.

The trouble is that it's often easier to slap in a quick GOTO with all its dangers than to think of the simpler method.

There's no surer sign of a poor programmer than a listing filled with GOTOs. They have a sort of "if in doubt, use a GOTO" mentality which makes programs almost unintelligible.

What can make things worse is when they discover that you don't always have to put in the GOTOs. Program

```
   10 REM PROGRAM VIII
   20 INPUT "Number",number
   30 IF number>20 THEN  40
ELSE 50
   40 PRINT number" is grea
ter than 20":END
   50 PRINT number" is less
 than or equal to 20"
```

Program VIII

VIII shows what I mean.

While line 30 isn't all that difficult to understand, when you get a lot of them together listings become almost impossible to follow. Notice also that in line 50 I've left off the END.

The point I've been trying to make is that GOTOs are easy to understand but complicated to use. When you start using them they have all sorts of unexpected side effects.

Suppose we wanted to add a final message to Program VII. You might think that all we had to do was add a line like line 60 in Program IX.

```
  10 REM PROGRAM IX
  20 INPUT "Number",number
  30 IF number>20 THEN GOT
O 40 ELSE GOTO 50
  40 PRINT number" is grea
ter than 20":END
  50 PRINT number" is less
 than or equal to 20":END
  60 PRINT "That's all fol
ks!"
```

Program IX

Try it and see what happens. There's no final message because of the ENDs of lines 40 and 50. And you can't solve the problem by just leaving them out.

Again, try it and see what happens. What you have to do is shown in Program X.

Here the ENDs have been replaced by GOTOs pointing to the final message. Whichever path through the program the Electron takes after line 30, it still ends up printing the message of line 60.

Notice that once you start using GOTOs you've got to use them all over the place to "leap over" bits of code you don't want.

Suppose that *number* was 5 in the last program. Then the flow of control would go from line 30 to line 50 (avoiding line 40) and on to line 60. On the other hand, if *number* was greater than 20 the program would go from 30 to 40 and then on to 60, avoiding line 50.

As the number of GOTOs in a program mounts, so the number of leaps grows, as do

```
  10 REM PROGRAM X
  20 INPUT "Number",number
  30 IF number>20 THEN GOT
O 40 ELSE GOTO 50
  40 PRINT number" is grea
ter than 20":GOTO 60
  50 PRINT number" is less
 than or equal to 20":GOTO
60
  60 PRINT "That's all fol
ks!"
```

Program X

the chances of landing in the wrong place.

Remember that if it can go wrong it will, and the more GOTOs you use the more things will go wrong and the harder it will be to sort them out.

If you want to see a real horror, take a look at Program XI.

```
 10 REM PROGRAM XI
 20 GOTO 40
 30 GOTO 50
 40 GOTO 60
 50 GOTO 80
 60 GOTO 30
 70 PRINT "MADE IT":END
 80 GOTO 70
```

Program XI

I leave it to you to figure out what's happening. The flow of control is all over the place, leaping from line to line in gay abandon.

You'd be surprised at the number of people who write programs like this and then wonder why things go wrong!

Figure I is an attempt to show what is happening. From it you should be able to see why programming using lots of GOTOs is called spaghetti programming.

Before you leave Program XI, try renumbering it with:

```
RENUMBER 100
```

or

```
RENUMBER 5
```

Not only will your Electron renumber the lines, it will also deal with the line numbers after the GOTOs.

Now after all my warnings against the use of GOTO I'll give you an example of when I think it is justified, in the form of Program XII.

This is what is known as a mugtrap. It is designed to avoid people putting in erroneous inputs to your programs.

Bibby's first law of programming states that if you ask someone to input in a number between 1 and 10 they will enter 11 or −1 or anything but what you ask.

Mugtrapping deals with this by ignoring any input not in the required range.

Line 30 does the work. If *number* isn't in the required range then the GOTO sends the program back to line 20 and lets the mug have another go. The program won't proceed to line 40 until *number* is in range.

This is one area where I

```
  10 REM PROGRAM XII
  20 INPUT "Number in rang
e 1-10"'number
  30 IF number<1 OR number
>10 THEN GOTO 20
  40 PRINT number " is in
range"
```

Program XII

think using GOTO is allowable. After all, I can't see anything that complicated in just going to the previous line.

However, there are some who would still frown on this and go to ridiculous lengths to avoid it. So if you use a GOTO in a mugtrap you didn't get the idea from me.

If you want a bit of fun, try altering Program XII so that it allows the user three goes and then prints out a rude message if he still doesn't get it right.

Program XIII is a variant of Program XIII. Here I've stored the line number in the variable *notinrange*. This may seem a little strange, but notice how line 40 seems to make a lot more sense.

If I have to use a GOTO I much prefer to use it this way, as when things go wrong I find it easier to understand something like:

```
200 GOTO explosion
```

rather than the anonymous:

```
200 GOTO 900
```

The only drawback to this method is that RENUMBER can't be used. Try:

```
RENUMBER 15
```

on Program XIII, run it and you'll see why.

```
  10 REM PROGRAM XIII
  20 notinrange=30
  30 INPUT "Number in rang
e 1-10"'number
  40 IF number<1 OR number
>10 THEN GOTO notinrange
  50 PRINT number " is in
range"
```

And that's about it for this month. A whole article telling you about something that I'd advise you not to use! Such is the strange world of computer programming.

Having said that, have a go at using GOTO in your programs. You'll find that as the programs increase in length and GOTOs, so the errors multiply. Finally, take a look at Program XIV:

```
  10 REM PROGRAM XIV
  20 LET variable=1
  30 PRINT variable
  40 LET variable=variable
+1
  50 IF variable <=10 THEN
 GOTO 30
```

Does this remind you of anything? If it does, then go to the top of the class.

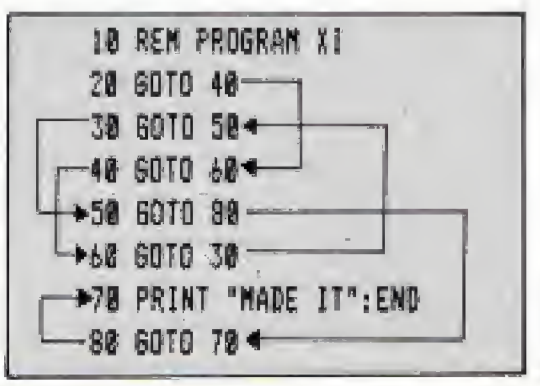


Figure I: Spaghetti programming

Notebook Part 17

Trevor Roberts

Branching out

THIS month I thought we'd have a look at the use of recursion in pattern drawing with Trees.

This program defines a procedure to draw two branches of a tree. The procedure then calls itself over and over from within the procedure to form the final pattern.

```
10 REM TREES
20 REM TREVOR ROBERTS
30 MODE 1
40 PROCtree(600,100,0,10
0,100)
50 END
60 DEF PROCtree(seedx,se
edy,level, offsetx,offsety)
70 MOVE seedx, seedy
80 DRAW seedx-offsetx,se
edy+offsety
90 MOVE seedx, seedy
100 DRAW seedx+offsetx,se
edy+offsety
110 REM Calculates left c
oordinates
120 sxl=seedx-offsetx:syl
=seedy+offsety:lvl=level+1
130 IF lvl<6 THEN PROCtre
e(sxl,syl,lvl,100,100)
140 REM Calculates right
coordinates
150 sxr=seedx+offsetx:syr
=seedy+offsety:lvl=level+1
160 IF lvl<6 THEN PROCtre
e(sxr,syr,lvl,100,100)
170 ENDPROC
```

Initially calls procedure

Moves graphics cursor to base point

Draws left branch

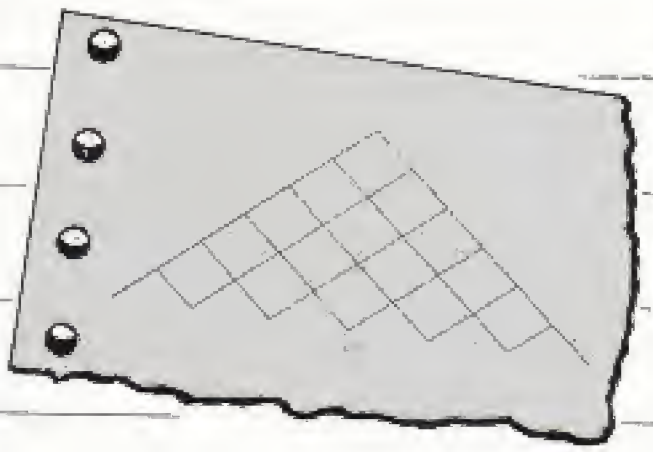
Draws right branch

Calculates co-ordinates of lefthand point

Uses left point as base for a new pair of branches

Calculates coordinates of righthand point

Uses righthand point in procedure call



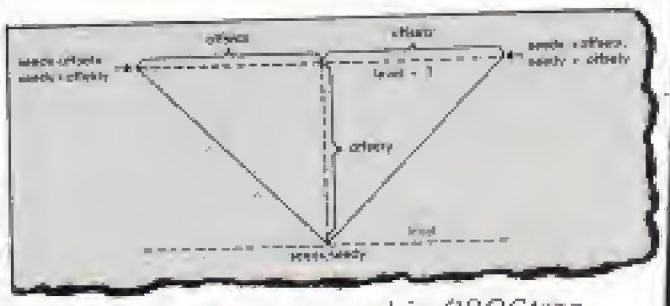


Figure 1: Parameters used in PROCtree

PROGRAM EXPLANATION

10,20 The usual REMs explaining what's going on.

30 Puts the Electron in Mode 1. Try the other graphics modes.

40 This calls PROCtree, the parameters in the brackets telling the micro that the pattern is to start at point 600,100. The level is to be called level 0 and the X and Y offsets are both to be 100. Again, try other values and see what happens.

50 Stops the program crashing into the procedure definition.

60-170 Form the definition of PROCtree. It's here the Electron will look when the procedure is called from the main program. Figure 1 shows how the parameters in the brackets correspond to the two branches drawn by PROCtree.

70 Moves the graphics cursor to the initial point.

80 Draws the branch to the left by joining the previous point to one calculated using the offsets.

90 The graphics cursor goes back to the initial point, ready to draw the second branch.

100 Now the branch to the right is drawn.

120 This line isolates the coordinates of the lefthand point of the initial branch, storing them in *sxl* and *syl*. These will be used as the initial point for another pair of branches. *lvl* takes account of the fact that the level these new branches start at will be one higher.

130 Recursion in action. PROCtree is called again, this time using the end point of the previously drawn lefthand branch as the starting point. It is the coordinates of this point, along with the adjusted level and the standard offsets, that are passed to the procedure. This happens until the sixth level is reached.

150,160 These lines again call the procedure repeatedly until the sixth level is reached. Each time the procedure is called another pair of branches will eventually be drawn. This time it uses the righthand points of previous branches as the starting points of the new branches drawn with PROCtree.

170 Ends the procedure definition.

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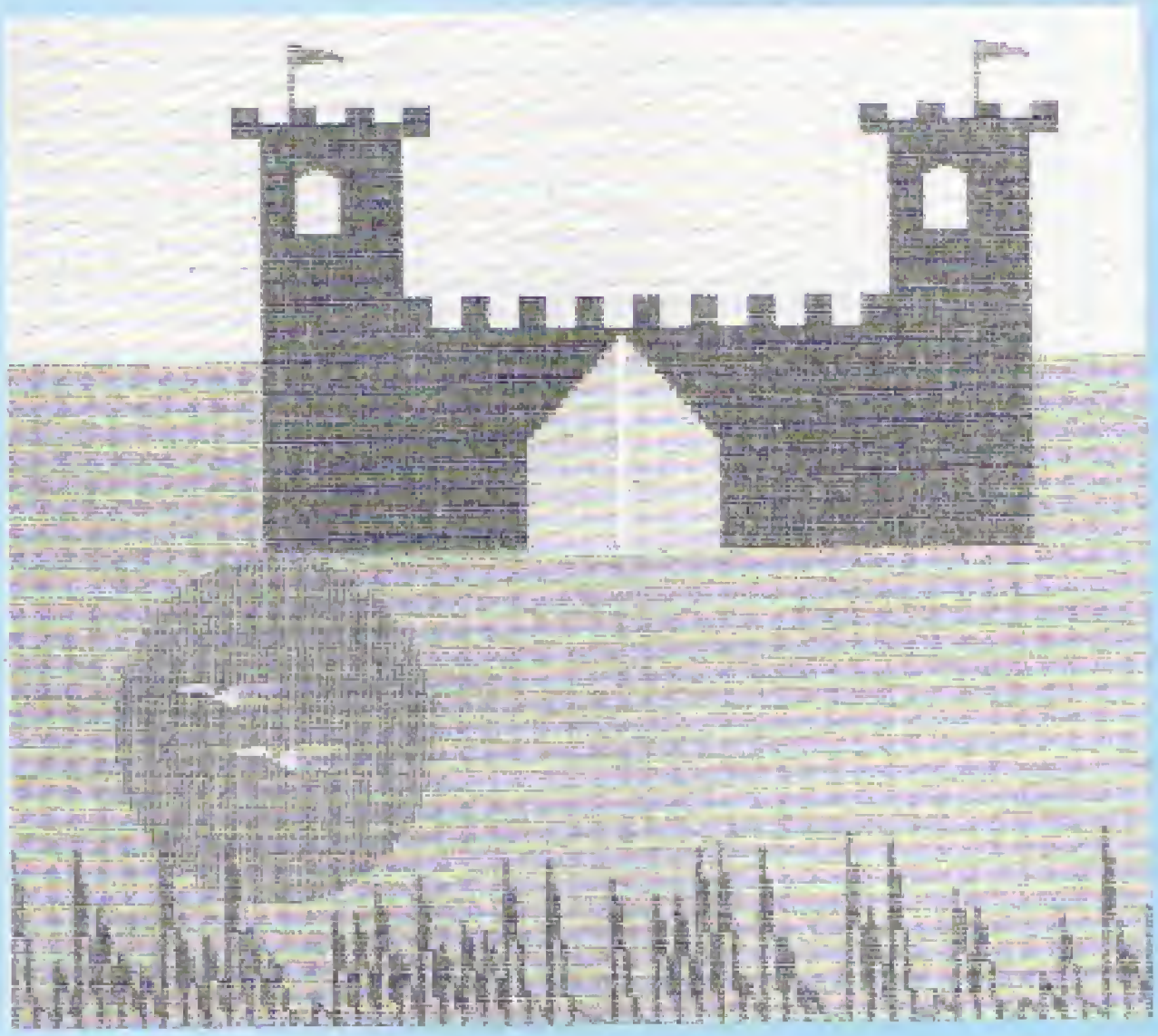

The Micro Gallery

Works of art on the Electron

CASTLE, an elegant and well-structured program by ADAM WORTLEY, shows what can be done with Electron graphics and a little imagination. The only things lacking are the princess and the frog!

```
 10 REM CASTLE
 20 REM by Adam Wortley
 30 REM (C) ELECTRON USER
 60 REM
 70 MODE2
 90 VDU 23,0,8202;0;0;0;
 98 PROCinit
100 PROCsky
110 PROCpool(300,300,175)
120 PROCgrass
130 PROCcastle
140 REPEAT:UNTIL FALSE
150 END
160 DEFPROCsky
170 COLOUR132
180 CLS
190 VDU 28,0,31,19,1
200 COLOUR 130
210 CLS
220 VDU 26
230 ENDPROC
240 DEFPROCpool(X,Y,R)
250 GCOL 0,6
260 LOCALI,J
270 FOR I=Y+R TO Y-R STEP
-4
280 J=SQR(ABS(R*R-(I-Y)*(
I-Y)))
290 MOVE X-J,I
300 DRAW X+J,I
310 NEXT
320 MOVE X,Y
330 ENDPROC
340 DEFPROCgrass
350 MOVE0,0
360 GCOL 0,3
370 FOR M=0TO1279 STEP 24
380 DRAW M,0
390 DRAW M,RND(200)
400 NEXT
410 ENDPROC
420 DEFPROCcastle
430 COLOUR 3:COLOUR 132
440 VDU 28,4,20,19,0
450 LET A$=STRING$(8," ")
460 LET B$=STRING$(8,CHR$
225)
470 LET C$=CHR$226+STRING
$(13,CHR$229)
480 LET D$=" "+CHR$ 230+A
$+"   "+CHR$ 230
490 LET E$=" "+CHR$ 231+A
$+"   "+CHR$ 231
500 LET F$=CHR$224+CHR$22
4+CHR$224+CHR$225+"      "
+CHR$224+CHR$224+CHR$224+CH
R$225
510 LET G$=CHR$226+CHR$22
9+CHR$229+A$+CHR$226+CHR$22
9+CHR$229
520 LET H$=CHR$226+CHR$22
7+CHR$229+A$+CHR$226+CHR$22
7+CHR$229
530 LET I$=CHR$226+CHR$22
8+CHR$229+A$+CHR$226+CHR$22
8+CHR$229
540 LET J$=CHR$226+CHR$22
9+CHR$229+B$+CHR$229+CHR$22
9+CHR$229
550 COLOUR 5:PRINT'D$:PRI
NT E$:COLOUR 3:PRINTF$:PRIN
TG$:PRINTH$:PRINTI$:PRINTG$
:PRINTG$:PRINTJ$:PRINTC$
560 COLOUR 130
570 FOR A=0TO5
580 PRINTC$
590 NEXT
600 GCOL 0,1
610 FOR N=590TO695 STEP 4
620 MOVE N,476
630 DRAW N,N
640NEXT
650 LET X=695
660 FOR P=695 TO 800 STEP 4
670 LETX=X-4
680 MOVE P,476
690 DRAW P,X
700 NEXT
710 GCOL 0,0
720 MOVE 695,476
730 DRAW 695,690
740 VDU26
750 PRINT TAB(3,21);:COLO
UR 134:PROCDUCK
760 PRINT TAB(4,23);:COLO
UR 134:PROCDUCK
770 ENDPROC
780 DEFPROCDUCK
790 COLOUR 4:VDU 232
800 COLOUR 2:VDU 233
810 ENDPROC
820 DEFPROCinit
830 VDU 23,224,240,240,24
0,240,255,255,255,255
840 VDU 23,225,240,240,24
0,240,240,240,240,240
850 VDU 23,226,15,15,15,1
5,15,15,15,15
860 VDU 23,227,231,195,12
9,129,129,129,129,129
870 VDU 23,228,129,129,12
9,129,129,129,129,129
880 VDU 23,229,255,255,25
5,255,255,255,255,255
890 VDU 23,230,192,248,25
4,255,249,192,128,128
900 VDU 23,231,128,128,12
8,128,128,128,128,128
910 VDU 23,232,0,48,241,1
1,7,3,1,0
920 VDU 23,233,0,126,252,
248,224,240,248,36
930 LET X=1380
940 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

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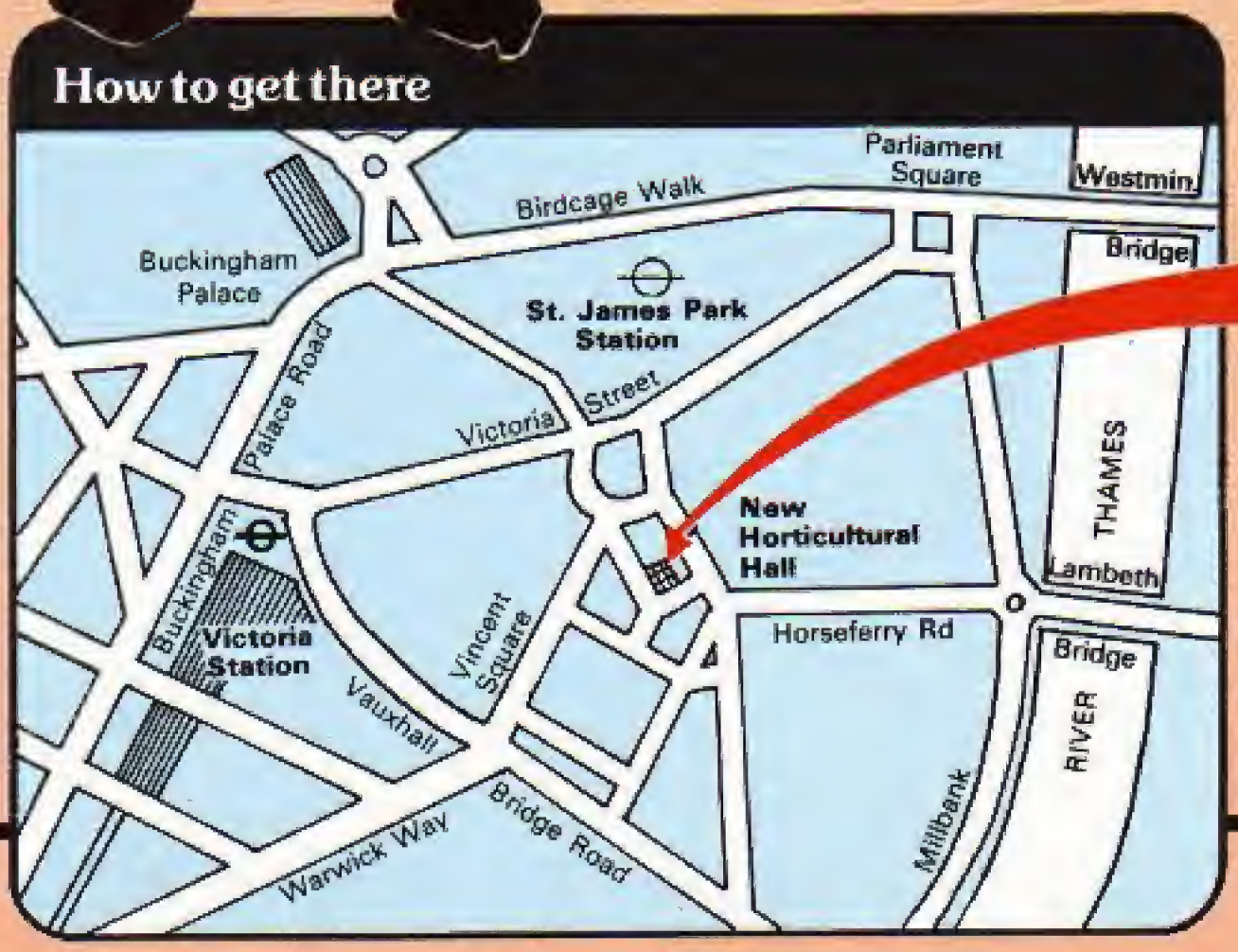

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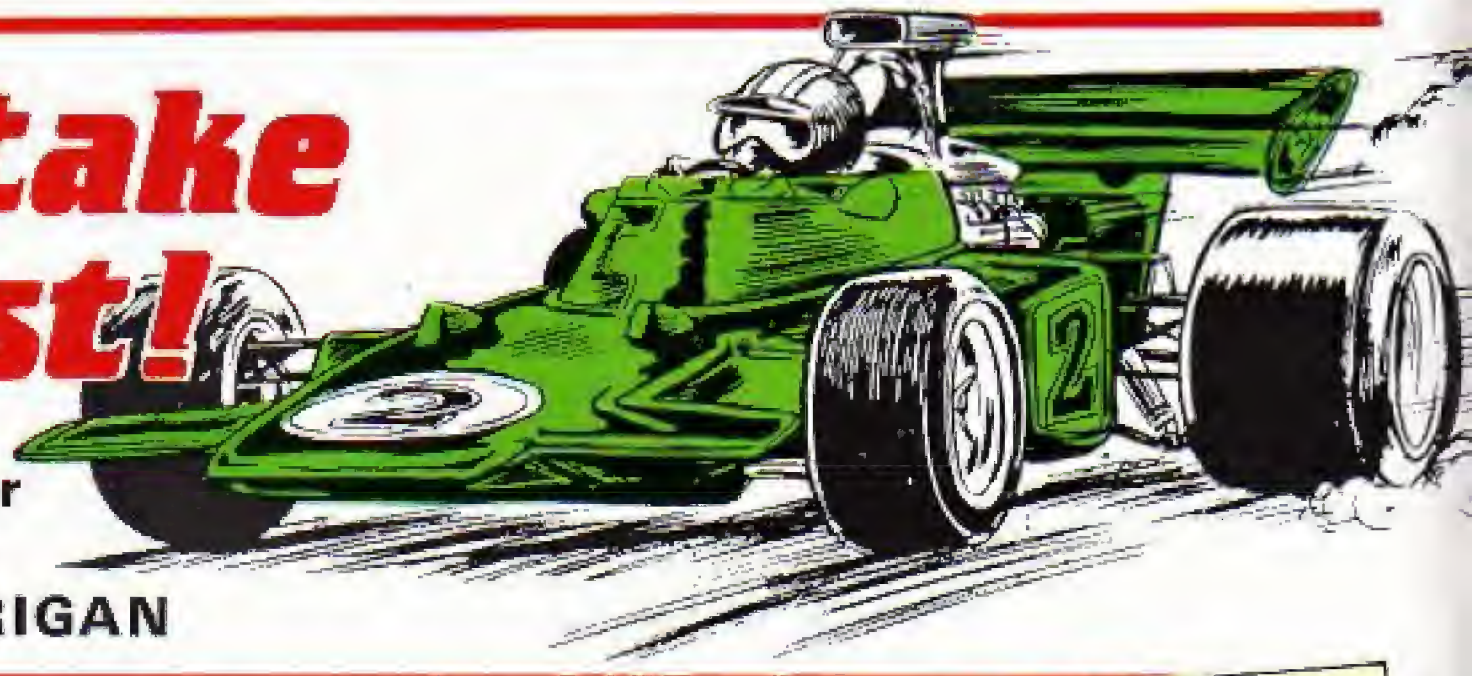

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PROCEDURES

PROCvar	Sets the variables, envelopes and characters.
PROCdown	Moves opposing cars.
PROCmove_man	Moves your car.
PROCrnd	Chooses three random numbers and places them in arrays.
PROCsetup	Draws screen.
PROCch	Prints score.
PROCdead	Ends game.
PROCbonus	Changes screen display and chooses number of rows.
PROCins	Prints instructions.
PROCHI_SC	Prints high score table.

VARIABLES

ac%, UP%	Position of your car.
SC%	Score.
X%, Z%, Q%	Position of opposing cars.
HI$, HI%	High score.
E%( ), W%( )	Random numbers.

```
   10  REM DODGE
   20  REM BY STEPHEN MERRI
GAN
   30  REM (C) ELECTRON USE
R 1985
   40  ON ERROR GOTO 1290
   50  MODE6:VDU23,1,0;0;0;
0:PROCins
   60  MODE5
   70  PROCvar
   80  VDU23,1,0;0;0;0
   90  VDU20
  100  DIM WX(6):DIM SX(6):
DIM EX(6):DIM HIX(7): DIM H
I$(7):FOR I=5TO1STEP-1:HIX(
I)=10:HI$(I)="STEVIE":NEXTI

  110  PROCrnd
  120  PROCsetup
  130  REPEAT:PROCdown:PROC
move_man:UNTIL WEX=1
  140  MODE6:IF SC%>HIX(5)
PROCHI
  150  PROCHI_SC:MODE5:PROC
var:VDU23,1,0;0;0;0:VDU20:P
ROCrnd:PROCsetup:GOTO130
  160 DEF PROCvar
  170XX=5:acX=2:UPX=24:ZX=0
:STEVIEX=100:SC%=0:CX=10:CC
X=0:QX=10:ERX=11:A$="     "
:UYX=0:LIX=3:WEX=0:JJX=0
  180  RESTORE1580
  190  FORA=224 TO235
  200  READQ,W,E,R,T,Y,U,I
  210  VDU23,A,Q,W,E,R,T,Y,
U,I
  220  NEXTA
  230  ENVELOPE1,2,-12,8,16
,32,64,1,-40,-10,18,-126,12
6,126
  240  ENVELOPE2,1,-10,-5,-
3,5,7,10,127,0,0,-126,126,1
26
  250ENDPROC
  260  DEF PROCdown
  270  ZX=ZX+1:XX=XX+1:IF C
CX=1QX=QX+1
  280  PRINTTAB(2,ZX-1);A$;
TAB(2,XX-1);A$:IF CCX=1 PRI
NTTAB(2,QX-1);A$
  290  COLOUR1
  300  IF CCX=1 PRINTTAB(2,
QX);B$
  310  PRINTTAB(2,ZX);C$;TA
B(2,XX);D$
  320  IF XX=UPX AND AX=acX
 THEN PROCch
  330  IF ZX=UPX AND BX=acX
 THEN PROCch
  340  IF CCX=1 AND QX=UPX:
IF VVX=acX THEN PROCch
  350  IF XX=UPX AND AX<>ac
X THEN PROCdead
  360  IF ZX=UPX AND BX<>ac
X THEN PROCdead
  370  IF CCX=1 AND QX=UPX:
IF VVX<>acX THEN PROCdead
  380  IF ZX>UPXTHEN PROCrn
d
  390  IF ZX>UPXTHENZX=0
  400  IF XX>UPX+5THENXX=5

  410  IF QX>UPX+10THENQX=1
0
  420  FOR ANYX=1TOSTEVIEX:
NEXTANYX
```

```
  430  ENDPROC
  440  DEF PROCmove_man
  450  COLOUR0
  460  IF INKEY(-67)THENacX
=acX+1:PRINTTAB(acX-1,UPX);
" ":GOTO480
  470  IF INKEY(-98)THENacX
=acX-1:PRINTTAB(acX+1,UPX);
" "
  480  IF acX>6THENacX=6
  490  IF acX<2THENacX=2
  500  PRINTTAB(acX,UPX);CH
R$225
  510  ENDPROC
  520  DEF PROCrnd
  530  PRINTTAB(2,UPX+1);A$
;TAB(2,UPX+6);A$:IF CCX=1 P
RINTTAB(2,UPX+11);A$
  540  YUX=INT(UYX/20)
  550
  560  GOSUB 690
  570  FORIX=2 TO 6:WX(IX)=
224:SX(IX)=224:EX(IX)=224:N
EXTIX
  580  BX=RND(5)+1:WX(BX)=2
26
  590  AX=RND(5)+1:SX(AX)=2
26
  600  IF CCX=1 VVX=RND(5)+
1:EX(VVX)=226
  610  IF CCX=1 B$=CHR$EX(2
)+CHR$EX(3)+CHR$EX(4)+CHR$E
X(5)+CHR$EX(6)
  620  C$=CHR$WX(2)+CHR$WX(
3)+CHR$WX(4)+CHR$WX(5)+CHR$
WX(6)
  630  D$=CHR$SX(2)+CHR$SX(
3)+CHR$SX(4)+CHR$SX(5)+CHR$
 SX(6)
  640  UPX=UPX-1
  650  IF UPX<ERX  THENUPX=
ERX
  660
  670  IF STEVIEX>0 STEVIEX
=STEVIEX-2:UYX=UYX+2
  680  ENDPROC
  690  COLOUR130:COLOUR0:PR
INTTAB(10,11);"          ":E$
=LEFT$(CHR$227+CHR$227+CHR$
227+CHR$227+CHR$227,YUX):PR
INTTAB(10,11);CHR$228+CHR$2
29+CHR$226+E$+CHR$226:COLOU
R131:RETURN
  700  DEF PROCsetup
  710  VDU20:COLOUR131:COLO
UR0:CLS:R=0
  720  COLOUR129:FORI=1TO7:
PRINTTAB(9,9+I);"
":NEXTI:COLOUR130
  730  GOSUB690
  740  COLOUR130:PRINTTAB(1
0,13);CHR$232+CHR$233;"
  ":COLOUR129:COLOUR3:PRINT
TAB(12,15);CHR$224+CHR$224+
CHR$224;TAB(16,10);CHR$234+
CHR$235
  750  COLOUR2:COLOUR131
  760  FORI=1TO29:PRINTTAB(
1,I);CHR$(230+R)+"      "+CH
R$(230+R)
  770  IF R=1 R=0 ELSE R=1
  780  SOUND0,-15,1,1:NEXT
  790  ENDPROC
  800  DEF PROCch
  810  SCX=SCX+CX:SOUND1,-1
5,50,1
  820  IF SCX=300 OR SCX=90
0  OR SCX=1600 OR SCX=2200
 PRINTTAB(2,QX);A$;TAB(2,IX
);A$;TAB(2,XX);A$:PROCbonus
  830  COLOUR0:COLOUR130:PR
INTTAB(13,13);SCX:COLOUR131
  840  ENDPROC
  850  DEF PROCdead
  860  LIX=LIX-1
  870  FOR IX=15TO1 STEP-1:
SOUND1,1,IX,1:SOUND1,1,IX*5
,1:PRINTTAB(acX,UPX);"X":NE
XTIX
  880  IF LIX-1<>-1 COLOUR3
:COLOUR129:PRINTTAB(13,15);
LEFT$(CHR$224+CHR$224+CHR$2
24,LIX-1);"   ":COLOUR131
  890  PRINTTAB(2,QX);A$;TAB
(2,IX);A$;TAB(2,XX);A$
  900  QX=10:XX=5:IX=0
  910  *FX15,1
  920  KEY=INKEY(100)
  930  IF CX=0 UPX=17ELSEUP
X=19
  940  IF LIX=0 NEX=1
  950  PROCrnd
  960  ENDPROC
  970  ENDPROC
  980  DEF  PROCbonus
  990  COLOUR0
 1000  STEVIEX=STEVIEX+5
 1010  PRINT TAB(8,8)"B O N
 U S"
 1020  FORSX=1TO5STEP1:SOUN
D1,1,SX*5,1:SOUND1,1,100,1:
NEXTSX:FORSX=15TO1STEP-2:SO
UND1,1,50,1:SOUND1,1,SX*5,2
:NEXTSX
 1030  FORI=1 TO600:NEXT
 1040  PRINTTAB(8,8);"
    "
 1050  SCX=SCX+50
 1060  *FX15,1
 1070  SOUND1,-15,50,2
 1080  KEY=INKEY(50):SOUND1
,-15,50,1
 1090  VDU19,3,2;0;0;0
 1100  KEY=INKEY(50):SOUND1
,-15,100,2
 1110  VDU19,1,4;0;0;0
 1120  KEY=INKEY(50):SOUND1
,-15,150,3
 1130  IF CCX=0 GOSUB1150 E
LSE GOSUB 1170
 1140  ENDPROC
 1150  JJX=JJX+8:IF JJX>58
JJX=59
 1160  STEVIEX=(58-JJX):UYX
=(42+JJX):ZX=0:XX=5:QX=10:C
CX=1:UPX=19:ERX=16:PROCrnd:
RETURN
 1170  JJX=JJX+8:IF JJX>58J
JX=58
 1180  STEVIEX=(58-JJX):UYX
=(42+JJX):ZX=0:XX=5:QX=10:C
CX=0:UPX=24:ERX=11:PROCrnd:
RETURN
 1190  DEF PROCHI
 1200  INPUTTAB(8,5);"YOU A
RE IN THE TOP 5";TAB(8,6);"
                    "''''SP
C(7);"Please enter your nam
e";TAB(13,13);"----------";
TAB(13,12)S$:S$=LEFT$(S$,10
):HI$(7)=S$:HIX(7)=SCX
 1210  FOR I=5 TO1STEP-1
 1220  IF HIX(7)>HIX(I) PRO
Cswap
 1230  NEXTI
 1240  ENDPROC
 1250  DEF PROCswap
 1260  HIX(I+1)=HIX(I):HI$(
I+1)=HI$(I)
 1270  HIX(I)=HIX(7):HI$(I)
=HI$(7)
 1280  ENDPROC
 1290  MODE6:SOUND1,-15,100
,1::REPORT:PRINT" at line "
;ERL:END
 1300  DEF PROCins
 1310  CLS
 1320  PRINT'SPC(12);"INSTR
UCTIONS"
 1330  PRINTSPC(12);"------
------"
 1340  PRINT"You are in a r
acing car on a busy track."
 1350  PRINT"Two rows of op
posing cars will come"''"str
aight for you. This will in
crease"''"to three and as th
e game progresses"''"will re
turn to two,but this time t
he"''"speed will be increase
d."
 1360  PRINT''"Each time you
 pass the rows of cars"''"yo
u will move up the track,th
us"''"reducing your time to
react."
 1370  PRINT''"As you play,t
he screen display changes."
 1380  PRINT' SPC(12);"Your
 keys are:"
 1390  PRINT'SPC(14);"I- LE
FT"
 1400  PRINT'SPC(14);"X- RI
GHT"
 1410  PRINT'SPC(12);"PRESS
 SPACE"
 1420  REPEAT UNTIL GET$="
"
 1430  ENDPROC
 1440  DEF PROCHI_SC
 1450  CLS
 1460  PRINTTAB(7,4);"*****
******************"
 1470  FOR I=1 TO 7
 1480  PRINTSPC(7);"*
                *"
 1490  NEXT
 1500  PRINTSPC(7);"*******
****************"
 1510  FOR I=1TO5
 1520  PRINTTAB(9,5+I);I;"
";HI$(I);TAB(22,5+I);HIX(I)
 1530  NEXTI
 1540  PRINT''''''SPC(5);"D
O YOU WANT INSTRUCTIONS (Y/
N)"
 1550  REPEAT:BB$=GET$:UNTI
L BB$="Y" OR BB$="N"
 1560  IF BB$="Y"CLS:PROCin
s
 1570  ENDPROC
 1580  DATA24,90,126,90,24,
90,126,90,24,189,255,189,60
,189,255,153,0,0,0,0,0,0,0,
0,0,0,255,255,255,255,0,0,0
,221,149,221,81,209,0,0,0,1
83,37,181,37,183,0,0,0,0,16
,16,32,32,32,32,32,32,16,16
,8,8,8,8,0,219,146,219,82,2
19,0,0
 1590  DATA0,187,170,179,17
0,171,0,0,0,87,117,87,85,85
,85,0,0,80,80,32,80,80,84,0
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

GOSUB – for those routine tasks

ROGER FROST explains this powerful structure which can help make your programming much more efficient

IT must be the dream of every programmer to get the maximum happening in a program from the minimum amount of typing in.

If, at the same time, it's possible to make the program more understandable and run more quickly then that would be wonderful.

This article shows one way in which such a seemingly optimistic dream can come true.

It's amazing how often you need to use the same piece of code over and over again.

There seem to be lots of occasions when it's all too easy to repeat yourself and this can make your listing remarkably long.

The first example, Program I, which doesn't do anything very special, shows what I mean.

```
10 REM PROGRAM I
20 PRINT"Title Page"
30 PRINT"Press space to
continue"
40 REPEAT UNTIL GET$=" "
50 CLS
60 PRINT"Instructions"
70 PRINT"Press space to
continue"
80 REPEAT UNTIL GET$=" "
90 CLS
100 PRINT"Play the game"
110 PRINT"Press space to
continue"
120 REPEAT UNTIL GET$=" "
130 CLS
140 RUN
```

Program I

It's a very silly program in which lines 20 60 and 100 represent whole chunks of code.

Now consider lines 30, 40 and 50. Lines like these are frequently needed in programs. They hold things up until the Space bar is pressed and then clear the screen before moving on to the next section of the program.

You'll notice that lines 70, 80 and 90 are just the same as 30, 40 and 50, and so are lines 110, 120 and 130.

Wouldn't it be nice if there was some way of avoiding this? Well, there is a structure available to do this job. It's called the subroutine.

A subroutine is a chunk of code that can be accessed (or used) from any point in a program by the Basic keyword GOSUB.

When the program reaches a GOSUB statement it jumps to a separate section of code (the subroutine) and processes it.

At the end of the subroutine another Basic keyword, RETURN, is found. This shouldn't be confused with the Return key on the Electron.

When the RETURN statement is reached the computer goes back to the main program immediately after the GOSUB command. Figure I shows what's happening.

Normally the Electron deals with one line after another, 10 then 20, then 30. As you can see from Figure I, GOSUB changes all this.

When it comes to line 30 the Electron shoots off to the subroutine at 100. Here it obeys the following lines until it comes across a RETURN which sends it back to the line after the original GOSUB. It then carries on as normal.

You may want to use lots of subroutines in your program so, to avoid confusion, each one is labelled with the line number it begins at.

To call up a subroutine starting at line 500 you type in GOSUB 500. Figure II shows a program route with two subroutines.

Program II is a rewrite of Program I, but using a subroutine to replace those repeated lines.

As you can see, that's cut down on the repetition of lines. In fact one of the main uses of subroutines is to make the computer carry out a task more than once with just one piece of code.

At first sight Program II seems to offer little advantage over Program I. It's only one line shorter, but for each additional occasion you wanted the subroutine, extra lines would be saved.

Apart from saving on typing time, you also use less of your precious RAM. This could be very important if you were writing a long program, particularly in a memory-munching mode.

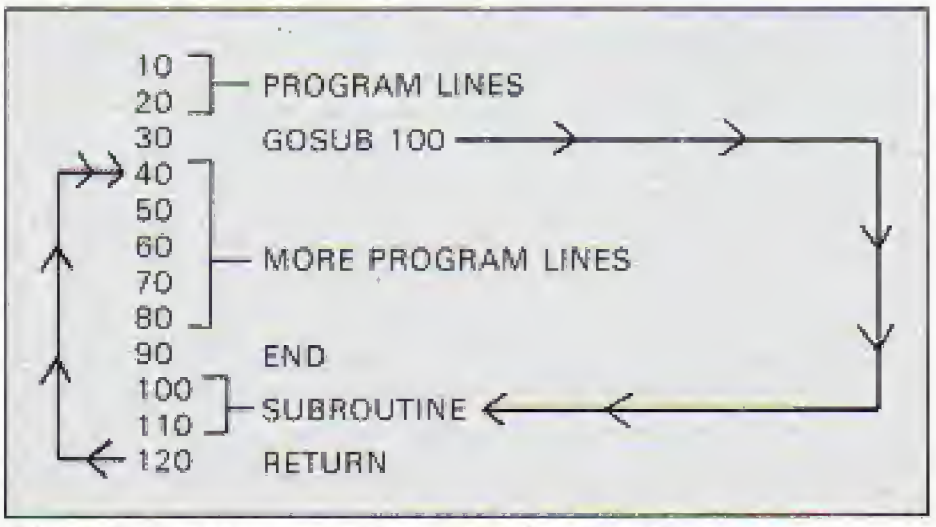


Figure I: Program control for a single subroutine

```
10 REM PROGRAM II
20 PRINT"Title Page"
30 GOSUB90
40 PRINT"Instructions"
50 GOSUB90
60 PRINT"Play the game"
70 GOSUB90
80 RUN
90 REM Subroutine for mo
ving to next stage of progr
am
100 PRINT"Press space to
continue"
110 REPEAT UNTIL GET$=" "
120 CLS
130 RETURN
```

Program II

You may notice that an extra REM statement has come in at line 90. It really is worth labelling subroutines in that way so that if you have several you can quickly tell what each one is for.

If you find you have to use the RENUMBER command when programming, you need have no fears regarding GOSUBs with a line number. Your clever Electron will automatically adjust the GOSUB line numbers for you.

Try adding this extra line to Program II:

```
15 PRINT"Author - Fred
Bloggs"
```

Now RENUMBER it (Func B will do the job.) You will find

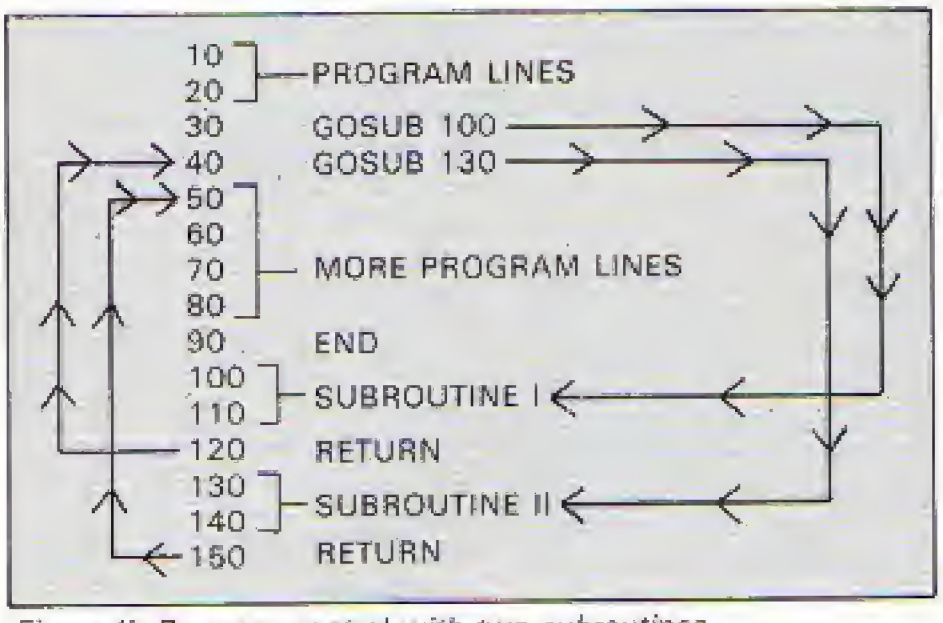


Figure II: Program control with two subroutines

that the subroutine now starts at line 100 and all the GOSUB statements have changed to GOSUB 100. Clever, isn't it?

It is, however, quite a good idea to use a standard numbering system. Subroutines could start at lines 1000, 2000, 3000 etc. This helps to make the program easier to follow, but it needs forward planning to avoid having to renumber.

Using subroutines can aid your programming in that each subroutine can be devoted to a single task.

Large programs are more manageable when they are broken down into smaller sections. It's a very good example of divide and conquer!

If you look at the listings for many programs, particularly those originally written for other computers, you might see a start something like this:

```
10 GOSUB 500
20 GOSUB 1000
30 GOSUB 3000
40 GOSUB 5000
```

Each subroutine will be devoted to a specific task and may even be an off-the-peg routine that the programmer had stored away ready to use.

In Program II the GOSUB statement had an actual line number after it. If you want to live dangerously you can use a variable instead of a line number.

Program III shows what I mean.

This little program just calls three subroutines at lines 100, 200 and 300. This could be a very snappy start to a program, but great care and forethought are needed because this

```
 10 REM PROGRAM III
 20 FOR X=100 TO 300 STEP
100
 30 GOSUB X
 40 NEXT X
 50 END
100 PRINT"SUBROUTINE 1"
110 RETURN
200 PRINT"SUBROUTINE 2"
210 RETURN
300 PRINT"SUBROUTINE 3"
310 RETURN
```

Program III

cannot be renumbered successfully.

If you were to use the RENUMBER command on Program III you'd get an error message "Failed at line number" whatever. This happens because, clever though your Electron is, it does not know the value of X until you run the program.

However this is a minor drawback compared with the effect using variables in subroutine calls can have on a program's readability. After all,

```
GOSUB instructions
```

makes a lot more sense than

```
GOSUB 12345
```

While we're talking about line numbers, you may like to know that it's possible to GOSUB to a calculated line number that's calculated while the program is actually running.

You could use this technique within a game to jump to a random routine. Program IV shows a safe, slow way of selecting one out of three routines.

This could be replaced by Program V, making use of an expression to calculate which number to jump to for the subroutine.

Not only has this saved three lines of code, but it's

```
 10 REM PROGRAM IV
 20 X=RND(3)
 30 IF X=1 THEN GOSUB100
 40 IF X=2 THEN GOSUB200
 50 IF X=3 THEN GOSUB300
 60 END
100 PRINT"X=1"
110 RETURN
200 PRINT"X=2"
210 RETURN
300 PRINT"X=3"
310 RETURN
```

Program IV

speeded things up, as the computer no longer has to work through the IF statements.

In fact, to repeat Program IV 100 times takes 1.85 seconds while Program V does the same job in 1.48 seconds. Mind you, while Program IV will happily renumber, Program V will not.

Don't expect either of them to do anything wonderful as they stand. Remember that the subroutines in them represent a chunk of code with a specific task.

One of the most powerful features of GOSUB occurs

```
 10 REM PROGRAM V
 20 GOSUB(100*RND(3))
 30 END
100 PRINT"X=1"
110 RETURN
200 PRINT"X=2"
210 RETURN
300 PRINT"X=3"
310 RETURN
```

Program V

when it is used with the keyword ON. This can allow you to overcome some of the problems with both Programs IV and V.

Listing I shows how it can be used.

```
10 REM Listing I
20 N=RND(4)
30 ON N GOSUB
100,250,560,780
```

Listing I

You could invent your own subroutines to go at lines 100, 250, 560 and 780.

Notice that using this technique allows you to pick on any line number, and not just those which can be calculated easily.

If *N* is 1 then the subroutine starting at line 100 would be used. For *N* equal to 2 the

From Page 23

program jumps to line 250, while if *N* is 3 the jump is to line 560, and so on.

Of course the 100, 250, 560 and 780 are just examples.

This technique can greatly help with a mammoth task like writing an adventure program.

Having said that, care must be taken to ensure that there are enough lines to GOSUB to. If line 30 was just:

```
30 ON N GOSUB 100,250,560
```

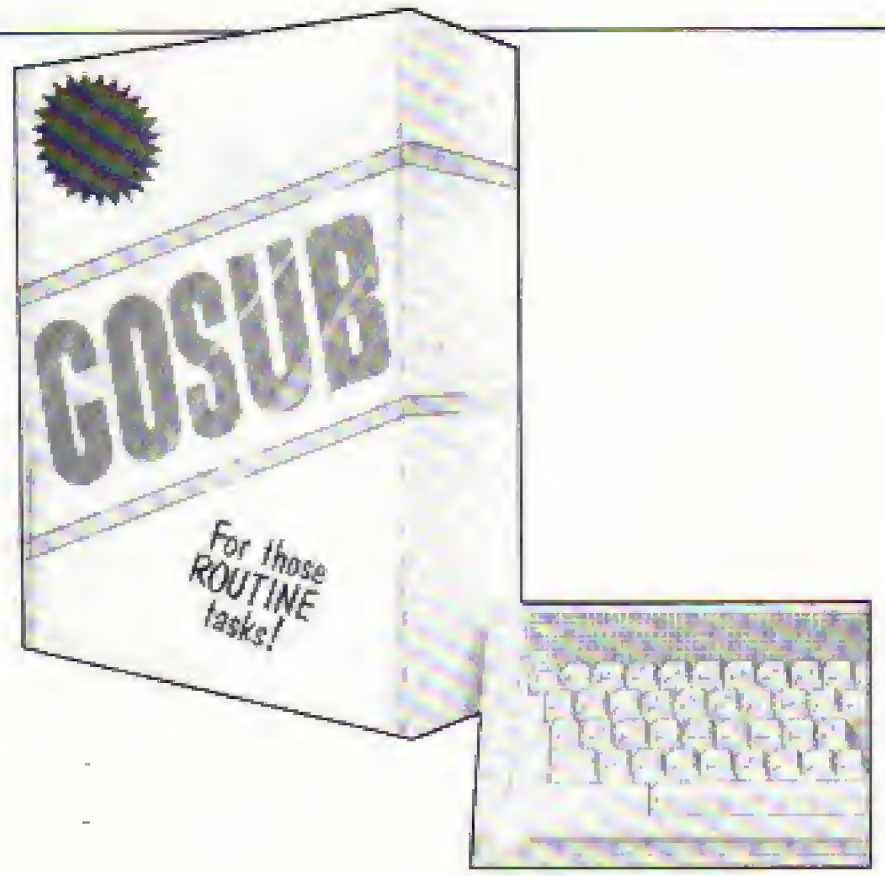
your program would crash if *N* became 4. The error message would be "ON range at line 30".

If you wanted, it's perfectly in order to have the same line more than once. Line 30 could become:

```
30 ON N GOSUB
100,250,560,250
```

The RETURN command will still take you back where you started from.

Now you may have heard some people talk about structured programming. Such people are not very fond of subroutines, and will shake their heads in sorrow if they see one in a program, muttering words like "untidy" or "spaghetti".



They don't like the way subroutines can jump all over the program. Poor programmers tend to use them to get out of tight corners, with almost inevitable incomprehensibility and disaster.

However many home micros have nothing better than GOSUBs, so if you want to write code for different computers you need to get used to the subroutine.

One point in favour of the humble subroutine is that it's possible to transfer subroutines from one program to another. This can really speed up programming.

Also a program that is broken up into sections is more easily understood by other people (such as the editor). Remember that meaningful variable names will help other people as well.

If you look through the listings printed in *Electron User* you won't find too many GOSUBs or RETURNs. This is because there is a better, and usually faster structure available in BBC Basic called the procedure.

These are a sort of super subroutine, and they will form the basis for a future article.

Finally, despite the dreadful mutterings of its detractors, the subroutine is a powerful structure which can allow you to break your program down into manageable sections.

You could find this advantageous both at the writing and de-bugging stages.

Carefully used, GOSUB can shorten a program, simplify it and make it run faster.

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Software Surgery

THE COLUMN THAT TAKES A LOOK INSIDE THE LATEST RELEASES

Addcomm
Vine Micros

You get a better bit of Basic with Addcomm

AS the name indicates this is a utility program which adds commands to your Electron, giving you, in effect, an even more extended Basic.

It is stored on a ROM chip and to be able to use it you must have a ROM card or box such as the Slogger ROM Box.

The added commands fall into four categories:

- Graphics.
- Logo graphics.
- Toolkit commands.
- Miscellaneous.

Electron graphics are already superb, but the Addcomm commands make them even better. There are, for example, commands for creating circles and ellipses. They are really easy to use.

For instance:

```
10 MODE5
20 CIRCLE640,512,400
```

will draw a circle of radius 400 screen units with its centre at the centre of the screen. If you don't like your screen being 1280 units across and 1024 units up, you can scale it.

```
SCALE0,10,0,10
```

will make the screen 10 units across and 10 units down. To get a similar circle you need:

```
CIRCLE5,5,4.
```

On the scaled screen you cannot use MOVE, DRAW or PLOT but you can use SMOVE, SDRAW and SPLOT.

Any line in a program can mix Basic and Addcomm statements or variables. So:

```
CIRCLEX,Y,RND(500)
```

is quite acceptable. Extra parameters give arcs.

If you've ever envied the colour fill routines you see in commercial programs it's easy with Addcomm. The statement FILL with X and Y coordinates will fill from the point specified to the edge of the screen or to a non-background colour.

This will fill any shape, however complex, even through text. If you fancy patterned filling, CFILL allows you to specify a mix of colours for individual pixels.

It's even possible to have a non-upright screen by using ROTATE, or to shift the whole thing up or to the side with the TRANS command.

Logo graphics give you the chance to create displays with minimal use of coordinates. It's rather more like using a pen.

First you decide where to start on the screen (LMOVE). This sets the position of the Logo cursor.

You choose your PEN (dots, lines or fills) and then the ANGLE to draw and the distance to ADVANCE.

If you prefer relative rather than absolute angles, TURN can be used to rotate a specified number of degrees. LCIRCLE and LELLIPSE draw circles/ellipses or arcs around the Logo cursor.

The Toolkit commands offer a mix of useful and informative commands.

MEM displays in decimal and hex how much memory your program takes and what is spare. This is based on your current mode, so put yourself into the correct mode when using it.

CHAR is a superb command enabling you to design/edit VDU23 characters. There are dozens of programs which do this, but this one can be used while you're actually writing your program.

GOODPROG attempts to mend a Bad Program, while FKEYS displays on screen the contents of your function keys. Both work well, and, because Addcomm becomes a part of your computer they sit there waiting to be used in crisis situations.

The same applies to LVAR, which lists all the variable names you've used. This can really help to avoid a muddle.

VERIFY is a facility that was missed out on the Electron. It checks that what has been saved on tape exactly matches the same program in memory.

LLIST is a line listing command. Unlike ordinary LIST, LLIST can be included in a program. Silly? Not at all. My error routine, when debugging programs is now:

```
ON ERROR
MODE6:REPORT:PRINT"at
line";ERL:LLIST ERL:END
```

This tells me the error and displays the problem line.

Using FIND it is possible to list the whole program, including the possibility of different list formats such as multi-statement lines broken up.

Whenever I program I like to use meaningful variable names. It makes life easier for me, but the computer can handle the resident integer

→

```
10REM POOLS SELECTOR
20REM By Rog Frost
30REM
40REM
50MODE1
60rnd=RND(-TIME)
70VDU19;4;0;
80PRINTTAB(1,10)"Auto se
lection of twenty four numb
ers"TAB(10,13)"for football
 pools"TAB(4,20)"Press spac
e bar to get numbers"
90REPEATUNTILGET=32:CLS
100DIM choice%(55)
110FORselection%=1TO24
120number%=RND(55)
130IFchoice%(number%)<>0
THEN120
140choice%(number%)=numbe
r%
150NEXT
160PRINT'
170FORprintout%=1TO55
180IF choice%(printout%)(
)0 PRINT printout%
190NEXT
```

Program I: Long pools selector

```
10MODE1:R%=RND(-TIME):VD
U19;4;0;:PRINTTAB(1,10)"Aut
o selection of twenty four
numbers"TAB(10,13)"for foot
ball pools"TAB(4,20)"Press
space bar to get numbers"1R
EPEATUNTILGET=32:CLS
20DIM C%(55):FORS%=1TO24
30N%=RND(55):IFC%(N%)<>0
THEN30
40C%(N%)=N%:NEXT:PRINT':
FORP%=1TO55:IF C%(P%)<>0 PR
INT P%
50NEXT
```

Program II: Compacted

From Page 25

variables *(A%–Z%)* more quickly and efficiently.

Using the Addcomm command GREPL I can ask for a variable such as *pos_of_frog* and change it right through the program to *F%*.

SREPL finds each variable you might want to change and then gives you the option to change it or not.

I can now use variables that I understand and when the program is fully de-bugged change to short fast variables.

Not only that, I can use KILLREM to remove all REM lines and then the superb COMPACT to combine lines, thus saving more memory and processing time.

Programs of mine that I have put through the processes save about one third of the original memory – and run more quickly in to the bargain.

Programs I and II are identical in what they do (selecting football pool numbers) but Program II has had its variables changed and its REMs removed.

It has then been compacted and renumbered. Table I shows the differences, which are quite dramatic. Imagine the effects on long programs.

So far all has been very good, but three of the miscellaneous commands are dreadful. POPGOS, POPREP and POPFOR allow you to jump out of subroutines, REPEAT/UNTIL loops and FOR/NEXT loops.

All of these make for very bad programming and should be avoided.

Another command, LGOTO, is like GOTO but instead of jumping to a specified line number you jump to a label.

It works fine, but so far I've had no particular use for it. SETWIN allows you to predefine seven text windows which can then be called with the WIN command. It's easier than VDU 28.

The last miscellaneous command is SORT. This can be used to sort string arrays into alphabetical order.

In truth, it actually produces Ascii order with upper case letters before lower case. It's a very fast sort taking just 0.75 seconds to sort 100 words into order.

To sum up, Addcomm is brilliant, particularly the graphics and the toolkit, but there is a small price to pay in terms of memory.

It requires 256 bytes of RAM for its own use and so it pushes page up to &F00. If you are going to load a long commerical program it's as well to turn Addcomm off. To do this type ADDCOMM and then hit the Break key. *FX163 will turn it on again.

Firmware like Addcomm requires good documentation, and Vine Micros has achieved a winner here. The 72 page manual is clear, concise and simple giving full syntax and examples for each of the forty commands.

Addcomm is the most valuable piece of software I've got. Every Electron owner who does some programming should consider getting it. It's easily worth the £28.

Rog Frost

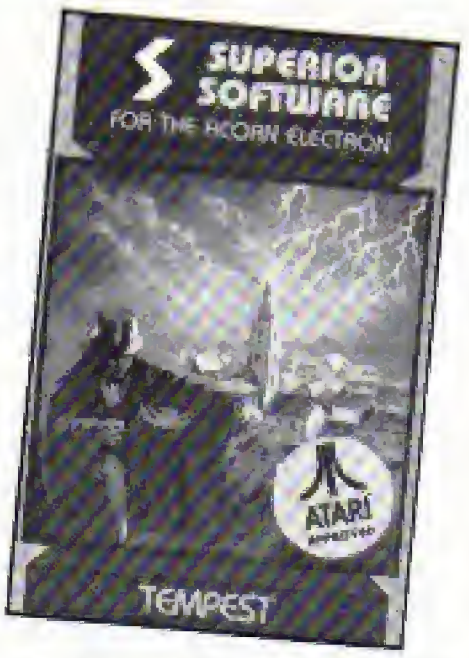
	Program I	Program II
Time taken	2.1 seconds	1.9 seconds
Program length	394 bytes	246 bytes
Variable storage	291 bytes	232 bytes
Spare memory	7763 bytes	7970 bytes

Table I: Addcomm advantages

Storm in a micro

Tempest
Superior Software

YES, this is the superb arcade game of the same name, converted by Superior Software for the Electron, and released with the full approval



of Atari who created the original.

It involves protecting the universe from aliens who are swarming through the star gates.

Your ship, armed with a blaster and super zapper, can skip round the rim of the star gate in clockwise or anti clockwise directions.

As the flippers, spikers, flipper tankers, fuseballs and pulsars emerge they can be destroyed with a quick spray of missiles from your blaster – well, theoretically anyway, it's not quite so easy in practice.

The aliens are semi-intelligent and tend to move in your general direction if they can, so you have to watch out for any that make it through the star gate.

If you get in a really tight spot you can use your super zapper which destroys all the aliens in the gate. However it can only be used once per screen.

When most of the aliens have been destroyed your ship enters the star gate to proceed to the next. At this point there may well be several spikers left which must be avoided by blasting a clear route when the message "Avoid Spikes" appears.

There are eight star gate patterns and 255 levels of play. At the start of each game there is the option of one or two players and any odd numbered star gate can be selected.

The sound and graphics are excellent and it's quite an exciting game to play. Also it is quite an original idea.

My only criticism is that there isn't a high score table or a joystick option – but it is compatible with both Plus 1 and 3.

Arcade fans will thoroughly enjoy this classic.

Roland Waddilove

Don't mind if I do...

The Complete Cocktail Maker
Acornsoft

ONE of the main uses of home computers, apart from alien zapping, is the storage and retrieval of information in databases.

These can be based on any topic and The Complete Cocktail Maker is a database concerned with that complex set of drinks.

It contains information on over 300 with details of how much of each ingredient is needed.

Not only that, but it tells you how to mix them and what type of glass to serve them in.

On loading you are presented with the command menu which gives you four options.

Browse allows you to look through all the recipes in alphabetical order. For each drink you are given the liqueur flavour needed, the spirit required as well as any other ingredients.

The recipe also suggests what decorations to use and the mixing method. A picture is drawn of the type of glass to use which also gives some idea of the final colour of the drink.

Option two is A Drink Containing. You specify which ingredients you want, chosen from four different lists. Any cocktail containing your specified substances is then displayed on the screen.

In the event of none being found the program reverts to Browse mode.

A Drink Made Using sounds

almost identical, but in fact means that not all of the ingredients have to be used in the cocktails.

You could enter the entire stock of your drinks cabinet and find all the cocktails you could make.

The final option allows you to enter the name of a cocktail and the computer will display its recipe. It you enter part of the name all drinks containing the letters you entered will be found.

The program comes with a 12 page booket which explains clearly how to use the program. The whole package is well produced and, if you are into cocktails, it's very useful.

The trouble is, it contains no samples.

Rog Frost

Grovel before go

Twin Kingdom Valley
Bug-Byte

THIS graphical adventure combines some of the better elements of monster-bashing with the puzzles usually associated with text-only adventures.

There are 175 "pictures" in the adventure and since you can "look" at some of the objects within the locations this leads me to assume there are about 160 actual locations.

You play the typical greedy adventurer and the object of your quest is to collect all the treasure you can find and deposit it safely. When you've scored the maximum points of 1024 you will find that you have a further problem. What to do next.

The program loads in several parts and full instructions are given during loading.

When the adventure starts you're asked to choose one of six options. These determine whether you have the graphics displayed or not and the type of messages you want about your location.

You can alter these during the course of the game by typing OPTION. As soon as you have made your choice the adventure proper begins.

You find yourself on a road outside a cabin. Inside the cabin are three objects that will come in handy.

At this point I would suggest you save the game, as should you die the program simply ends.

If you have a game saved you can restart by using *LOAD, otherwise you have to load the game back in from the start.

I think it quite inexcusable for Bug-Byte not to have given you the option of playing another game. On saving the game, using *SAVE, you will see that you're in fact saving three programs, one of which is 24 blocks long.

Anyway, back to the game. You'll find that over 100 locations are readily accessible and are generally logical.

For example, moving North and then South brings you back to the location you started from. However, this isn't always the case, especially when underground, so making a map is a must.

You will meet various characters most of whom, if armed, will attack you on sight.

An elf will carry things for you, but is sometimes reluctant to let you have them back. This same elf is also a positive nuisance when mapping underground – he kept picking up the objects I was dropping in order to make my map!

It is possible to frighten off or kill the characters you meet but you need to be at maximum strength (190 points) and armed with a better weapon than them.

This is also a good way of obtaining any treasure they may be carrying since they quite often drop them if you are winning.

Watch out for your strength points after doing battle, they will be very low and any further combat will probably finish you off.

A good tip if your strength is low is to WAIT for a bit since every command you give builds up your strength. If you are near Watersmeet a quick dip will work wonders.

On the subject of strength points, don't drink too much ale in the local inn – it's definitely not good for you.

The graphics are excellent and quickly drawn but tend to slow the game down a lot, so doubtless you'll do the same as me and use the Option command to turn them off.

I've mapped about 140 locations and collected a few treasures but frankly, I don't think I'm nearer to finishing than when I started.

I've tried giving the crystal ball to the castle witch but keep getting killed.

I've tried throwing water, oil and everything else at the dragon but still can't get the master key.

I'm afraid that the adventure doesn't generate enough atmosphere for me to want to persevere with it.

Having said that, if anyone has completed it and would like to send me a map of it I will mention them in my bedtime prayers.

Overall, Twin Kingdom Valley is impressive. It is extremely well programmed and packaged. However, the save game facility and the abrupt ending, along with the characters in the program, who are more of an impediment than a problem, tend to make me reluctant to recommend it.

Yet the mail I've received about it tends to indicate that a lot of people do like it. My advice therefore, is to go to your friendly computer dealer, grovel and try before you buy!

Merlin

Deft fingers the key in Free Fall

Free Fall
Acornsoft

THE story line goes "When the Alphoid battleship attacked Deep Space Station Coriolis and Alphoid life forms injected the air supplies with their own cyanide-based atmosphere, only one crew member managed to don his space suit in time.

"Unable to reach the armoury, he must face the Alphoid warriors barehanded to defend not only his own life but also the vital computer records which the Space Station contains".

The object of Free Fall is to control that sole crewman to help him survive as long as possible and to kill as many Alphoids as he can. It sounds easy.

However there are a few nasty creatures lurking around bent on getting our lone spaceman – the Craboids, Lobstoids, Batoids and Waspoids.

Craboids are pleasant little creatures that will bite through a space suit and poison the occupant with a nerve toxin. As you might guess, this causes our spaceman to lose all control and to thrash about with convulsions.

As light relief, Lobstoids breathe fire and use up the oxygen supply. They also burn whoever comes in range.

The Batoids are nice fellows who fly around catching and throwing bombs.

Last, but far from least, the deadliest of them all are the Waspoids. "They have a sting which is worse than the bite of a Craboid, they can breathe fire like the Lobstoid and they can fly as well as a Batoid".

To control the spaceman requires dexterity of three fingers on each hand and a thumb for the space bar.

Catching a bomb requires another finger. This might sound a bit difficult, but the keys are well positioned and control is soon gained.

Several features are so good that, hopefully, they'll become standard on all games.

There are two panic buttons that can be operated at any time. (I did. Often!) The Escape key causes the game to be aborted and the program restarted, while the Copy key is used to hold the game. This can be for an indefinite time, the Delete key being used to restart the action.

Sound can be switched on or switched off at any stage.

One excellent aspect of this program is the screen display. Not only are the characters and their movement of a high standard but there are also displays showing heart rate, air supply, high score and present score.

I thoroughly enjoyed getting to grips with this value for money package. Recommended.

John Woollard

BOOK SHELF

How Basic really works

Basic Rom User Guide for the BBC Microcomputer and the Acorn Electron, by Mark Plumbley (Adder Publishing, Cambridge)

THE Basic ROM User Guide is designed to cover one area of computer technology that is frequently ignored – the Basic ROM. This book is therefore extremely useful if you want to find out how your computer really works.

You may not know it, but Basic is a computer program. Its purpose in life is to convert the programs you write into machine code. Basic is stored in a ROM chip so that it is available as soon as you switch on your machine.

It is an extremely complex program and includes all of the functions, statements, error handling routines and commands that you can use in your programs.

This book succeeds in describing that complex process in clearly-explained units. It begins with a brief introduction to machine code programming and a description of the 6502 microprocessor.

This section includes an outline of the instruction set and registers.

The Guide then moves straight into the task of explaining the structure of the Basic program, which is treated as a system.

The comprehensive glossary of terms at the back of the book is extremely useful. In addition there is an extensive index so cross-referencing and finding one's way around the book is relatively easy.

As I read further and further into the book I became more and more tempted to try things out. It certainly does encourage exploration and self-awareness – there are a lot of examples and programs to illustrate the text.

I kept discovering new and useful short-cuts to my programming and techniques to improve my old programs.

However, there is one serious drawback to using the facilities of the Basic ROM directly and not through the usual *FX calls – the programs may not be transferable from one machine to another.

The book does list the differences between BBC Basic I, BBC Basic II and Electron Basic.

If you are writing for your machine only, then there is no problem. But, if the program is to be transferred to another machine, then problems may easily arise.

This text provides a very useful handbook for the advanced programmer and a useful guide to those who wish to find out more about their computer.

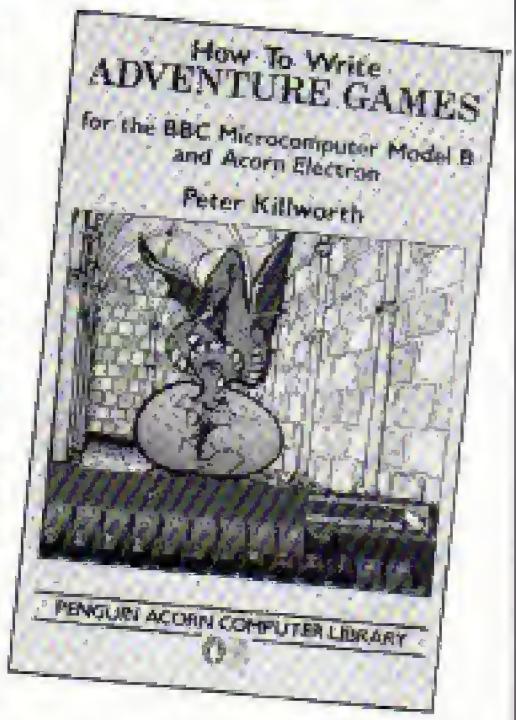
It contains listings for a complete disassembler and a very useful routine for recovering "bad programs". The section on error analysis and recovery after an error is most enlightening.

In all, this book fills a gap left by many user guides and texts on the Acorn range of computers.

John Woollard

INSIDE ADVENTURES

How to Write Adventure Games for the BBC Micro and Electron, by Peter Killworth (Penguin Acorn Computer Library)



AS you sit at your micro in the early hours of the morning, puzzling over some tricky problem in the latest adventure from your favourite software house, do you ever wonder what is going on in the mind of the programmer?

Well, here's a book written by Acornsoft's top adventure writer, Peter Killworth.

After a brief introduction to adventuring, the author starts with a discussion of how the games are written.

The best way to explain any problem is by example, so three adventures are created and their development discussed in detail.

"Caves" involves exploring a random network of caves and passages, searching for treasure. "Mini" is an adventure with only four rooms and is surprisingly complex. "Roman" is a larger, more-involved adventure, set in Ancient Rome.

The reader is taken through each stage, step by step. First the plot needs to be outlined, then the game logic worked out before any code is written.

The most complicated and difficult part of the program is the database for storing the location of the objects, rooms and occupants.

A great deal of time is spent looking at this to try to find the most efficient way of storing the data.

I had to read through the text several times before I even remotely understood how the author was storing and retrieving the information.

It's amazing how much information Mr Killworth can cram into a few simple variables. Every bit is significant and often shows whether something exists, or is possible, or present, and so on.

"Mini" is an adventure with only four locations, but is packed full of puzzles, messages, objects and magic words.

This is an excellent, typical adventure. Don't be put off by the number of rooms, this is irrelevent. It's the structure that is important.

Chapter five describes how an advanced database is constructed and a program which can be used by the reader to construct a database for his own adventures is presented.

The program enables you to enter the objects, rooms and vocabulary for the adventure and then stores it in the most efficient way.

The following chapter develops routines for extracting the information from the database, using "Roman" as an example.

Finally there is a complete listing of the adventure "Roman".

This is an excellent book from a superb programmer which gives an insight into how adventures are constructed. It's not an easy text to follow, so I can only recommend it to advanced programmers or those wanting an intellectual challenge.

If you have written a few simple adventures and want to know how the professionals do it, then this book is definitely for you.

Roland Waddilove

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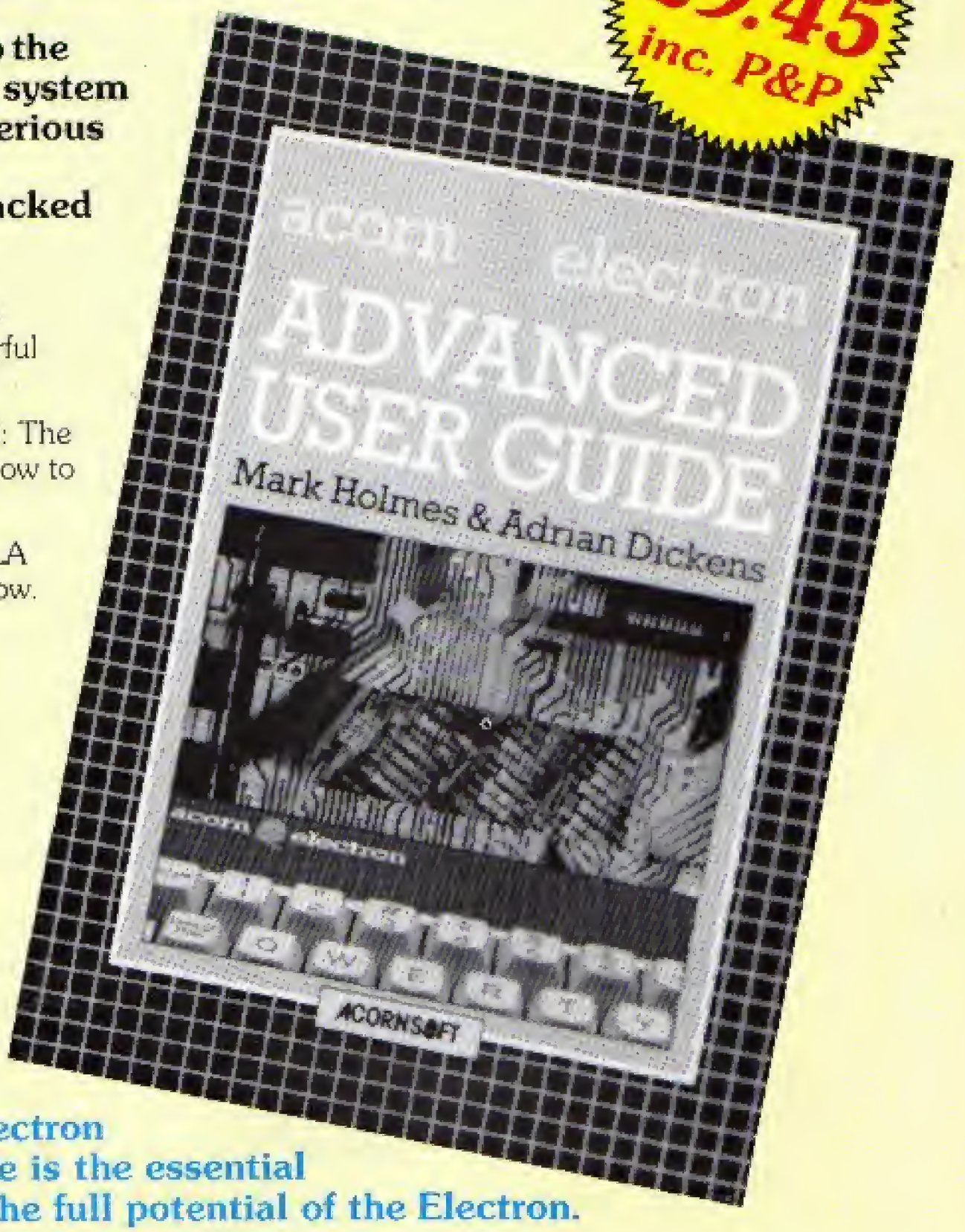

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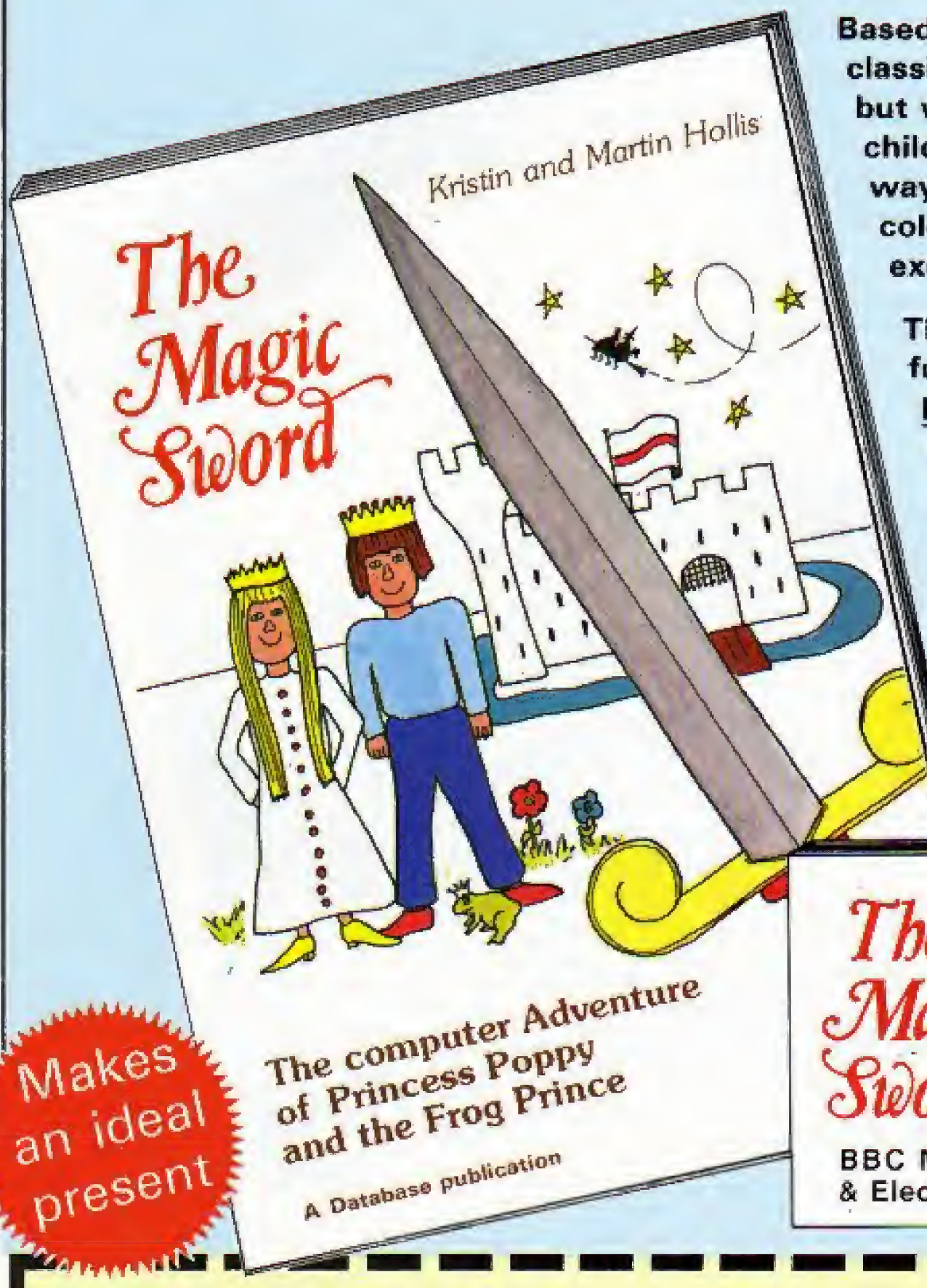

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EU/6

STRINGALONGASCROLLA

STEPHEN MARTIN shows how string manipulation can be made much easier – and at the same time much more efficient

IT would seem from previous editions of *Electron User* that text scrolling programs are very popular. Two have been published, both written in Basic.

This however is a major drawback, for string manipulation in Basic is a cumbersome process.

To illustrate my point take a look at Program I. Its objective

```
   10 REM PROGRAM I
   20 REM BASIC STRING HAND
LING
   30 MODE6
   40 A$="ELECTRON USER"
   50 PRINTTAB(10,10);A$
   60 A$=LEFT$(A$,3)+CHR$32
+RIGHT$(A$,9)
   70 PRINTTAB(10,11);A$
```

Program I

is simple, to take a string and replace its third character with a space.

Just look at line 60. As well as cumbersome this process is slow.

What is needed is an easy way to manipulate strings.

A better approach is to find an alternative way of storing the string in memory which will allow us to manipulate it in such a way that we can examine and change individual characters within it.

```
   10 REM PROGRAM II
   20 REM ALTERNATIVE STRIN
G STORAGE
   30 MODE6
   40 DIM string% 13
   50 $string%="ELECTRON US
ER"
   60 PRINTTAB(10,10);$stri
ng%
   70 string%?3=32
   80 PRINTTAB(10,11);$stri
ng%
```

Program II

This is easily accomplished as Program II shows. It works like this:

Line 40 reserves space in memory for string. It has to be the exact length of the string.

Line 50 places the string in memory and line 60 prints it.

Line 70 places CHR$32 at position 3 in the string.

This program produces exactly the same effect as Program I but it is simpler and much faster.

We can now construct a program using this technique which will scroll text across the screen. Look at Program III. Line 40 reserves space for the string and 50 puts the string in memory.

```
   10 REM PROGRAM III
   20 REM TEXT SCROLLER
   30 MODE6
   35 VDU23,1,0;0;0;0;
   40 DIM string% 14
   50 $string%=" ELECTRON U
SER"
   60 PRINTTAB(10,10);$stri
ng%
   70 TEMP=string%?0
   80 FORT=0TO13
   90 string%?T=string%?(T+
1)
  100 NEXT
  110 string%?13=TEMP
  120 GOTO60
```

Program III

Line 70 stores the first character and 80, 90 and 100 swap memory locations to produce scroll.

Line 110 puts the stored character at the end of the string to produce the wrap around.

Program III is probably the most efficient you can make it using Basic.

For even greater speed you need to use machine code. Fortunately this type of string storage and manipulation requiring repeated swopping and changing of memory locations is ideal for programming in machine code.

Program IV shows you how. It also demonstrates how to display part of the string so you can have a string of 100 characters long displaying 10 characters at a time on the screen.

```
   10REM PROGRAM IV
   20REM MACHINE CODE SCROL
LER
   30MODE6
   40*KEY10O.|MRUN|M
   50VDU23,1;0;0;0;0;
   60DIM string% 40
   70$string%=" MACHINE COD
E SCROLLER BY STEPHEN MARTI
N"
   80new=string%
   90start=string%+1
  100num=40
  110PROCasseable
  120CLS
  130PRINTTAB(9,5)"MACHINE
 CODE SCROLLER"
  140PRINTTAB(14,10)"WHICH
 DEMO?"
  150PRINTTAB(16,12)"1 OR 2
"
  160REPEAT:A$=GET$
  170UNTIL A$="1" OR A$="2"
  180IFA$="1"PROCdemo1 ELSE
 PROCdemo2
  190DEFPROCdemo1
  200CLS
  210PRINTTAB(15,20)"FAST E
H!"
  220PRINTTAB(15,22)"IT SAY
S"
  230PRINTTAB(9,6)"PRESS BR
EAK FOR MENU"
  240PRINTTAB(0,24);$string
%
  250PRINTTAB(0,10);$string
%
  260CALL Q%
  270GOTO250
  280DEFPROCdemo2
  290CLS
  300PRINTTAB(10,6)"PRESS B
REAK FOR MENU"
  310PRINTTAB(13,15)"THE AB
ILITY TO"
  320PRINTTAB(13,17)"SHOW O
NLY PART"
  330PRINTTAB(13,19)"OF THE
 MESSAGE"
  340PRINTTAB(13,21)" AT A
TIME IS"
  350PRINTTAB(13,23)"  AVAI
LABLE"
  360FORT=10TO30
  370PRINTTAB(0+T,10);CHR$(
string%?T)
  380NEXT
  390CALL Q%
  400GOTO360
  410DEFPROCasseable
  420DIM Q% 50
  430P%=Q%
  440[
  450LDX#0
  460LDA new
  470STA&70
  480.LOOP
  490LDA start,X
  500STA new,X
  510INX
  520CPX#num
  530BNE LOOP
  540LDA&70
  550STA string%+num-1
  560RTS
  570]
  580ENDPROC
```

Program IV

This listing is included in this month's cassette tape offer. See order form on Page 61.

QUASIMODO

By MARK JOHNSON

ESMERALDER, the cook's help, has been the baron's favourite for a long time, but after her latest lunchtime offering of a burnt boiled egg she is out of favour.

The wicked baron has punished her by locking her in the tower.

She is destined to be there for a long time, so undaunted you have scaled the castle wall in order to reach her and carry her away to safety.

You must now get to the tower. But it isn't quite that easy.

The ramparts on their own shouldn't pose too much of a problem as you complete the first screen. But the baron is a devious old codger.

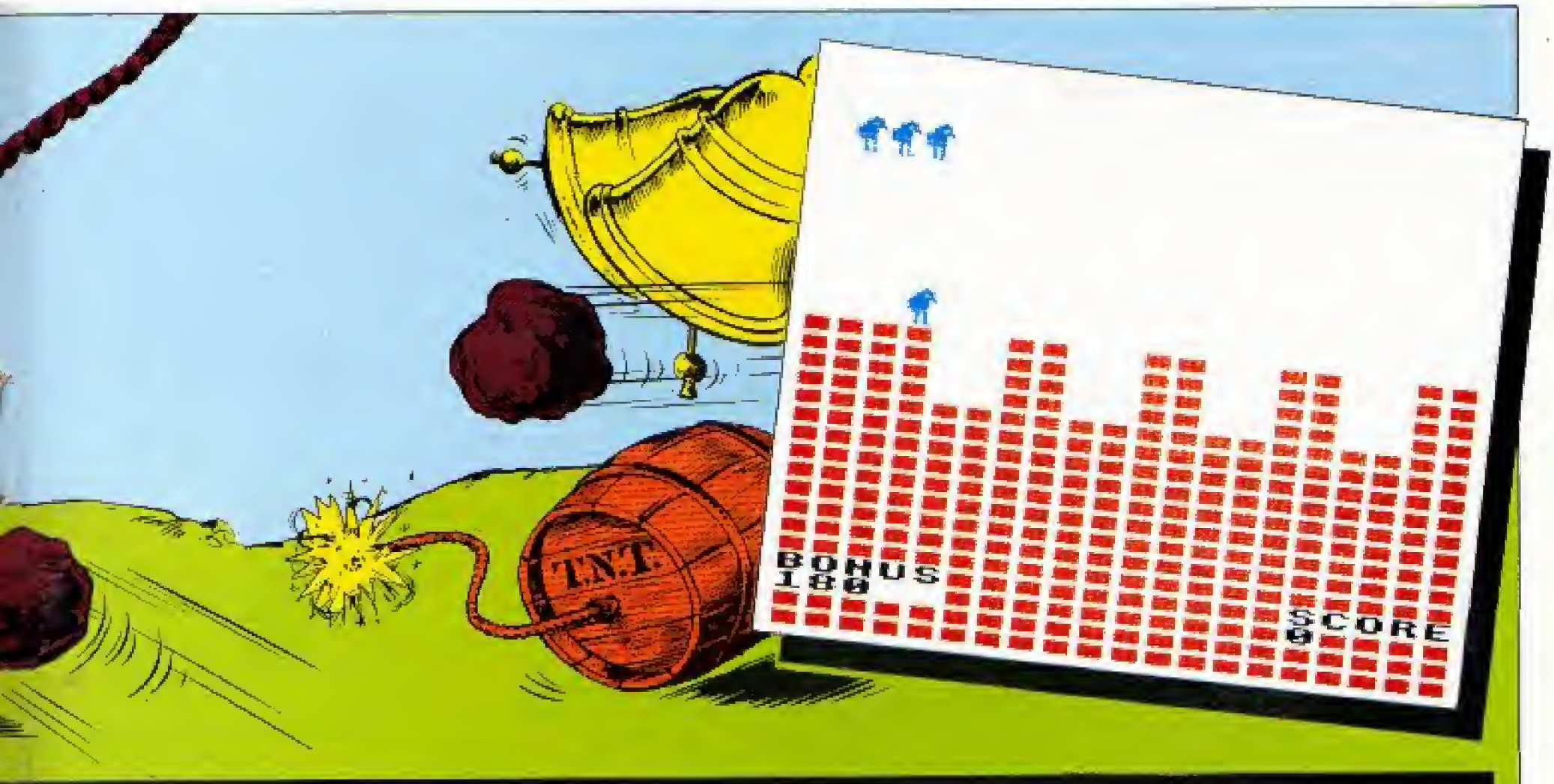
On later screens, to add to your troubles, he starts chucking boulders and firing arrows at you in an attempt to see you off (his soldiers are none too friendly either).

Use the Z and X keys to move left and right and the Shift key to jump.

Quasimodo listing

```
  4 REM QUASIMODO
  5 REM (C) Electron User
  6 REM BY MARK JOHNSON
 10 HSC=1000
 20 ONERROR GOTO30
 30 MODE1:VDU23,1;0;0;0;0
 40 COLOUR131:CLS
 50 COLOUR1:PRINTTAB(15,2
)"QUASIMODO"
 60 PRINTTAB(15,3)"^^^^^^^
^^^^"
 70 COLOUR0:PRINT''"You mu
st jump the ramparts ,guard
s,rocksand arrows to rescue
 Esmeralder!"
 80 PRINT''SPC5"KEYS.."''
SPC15"Z..LEFT"''SPC15"X..RI
GHT"'''SPC12"SHIFT...TO JUM
P "
 90 PRINTTAB(5,22)"WRITTE
N BY..  MARK JOHNSON"
 100 VDU4:COLOUR1:PRINTTAB
(8,26)"CHOOSE WHICH SCREEN.
"
 110 PRINTTAB(9,28)"1..EAS
Y TO 3..HARD"
 120 PRINTTAB(14,30)"SCREE
N?":REPEAT UNTIL GET<>FALSE
:IF GET<49 OR GET>51 GOTO 1
20 ELSE SCN=GET-48:COLOUR0
 130 MODE5:COLOUR131:COLOU
R0:CLS:VDU23,1;0;0;0;0:PRIN
TTAB(4,15)"GET READY!!!"
 140 FOR W=0 TO 2000:NEXT:
PROCTUNE:CLS
 150 PROCINITIAL
 160 PROCSCREEN
 170 REPEAT
 180 IF INKEY(-98)AND X>0
THEN SOUND0,-15,50,1:COLOUR
0:PRINTTAB(X,Y)SPACE$:X=X-1
:PRINTTAB(X,Y);MAN2$
 190 IF INKEY(-1)AND RIGHT
=TRUE AND X<17 THEN COLOUR0
:PROCMANJUMPRIGHT ELSE IF I
NKEY(-1) AND Y=13 AND RIGHT
=FALSE THEN SOUND1,1,20,5:C
OLOUR0:PROCJUMP
 200 IF INKEY(-67) AND X<1
9 THEN SOUND0,-15,50,1:COLO
UR0:PRINTTAB(X,Y)SPACE$:X=X
+1:PRINTTAB(X,Y)MAN2$:RIGHT
=TRUE ELSE RIGHT=FALSE
 210 FOR V=0 TO LEVEL*2:NE
XTV
 220 IF ARW1=TRUE THEN PRO
CARWMOVE
 230 IF ARW=TRUE AND RND(L
EVEL*4)=1 AND ARW1<>TRUE TH
EN ARW1=TRUE:SOUND0,1,80,3
 240 IF SCN>1 AND RND(LEVE
L*4)=1 AND ROCK<>TRUE THEN
ROCK=TRUE:SOUND0,1,200,3
 250 IF ROCK=TRUE THEN PRI
NTTAB(ROK,11);ROK$:ROK=ROK+
1
 260 IF ROK=18 THEN PRINTT
AB(ROK,11);"  ":ROK=0:ROCK=
FALSE
 270 IF X=ROK+1 AND Y<>13
THEN PRINTTAB(ROK,10)"  ":P
ROCDEAD
 280 IF X=19 THEN SCN=SCN+
1:X=0:SC=SC+BONUS:PROCSCREE
N
 290 IF GUARDS=TRUE THEN P
ROCGUARDS
 300 COLOUR0:PRINTTAB(X,Y)
;MAN$
 310 IF X=4 OR X=5 OR X=8
OR X=9 OR X=12 OR X=13 OR X
=16 OR X=17 AND Y=13 THEN P
ROCDEAD
 320 IF LIVES<1 THEN GOTO8
90
 330 IF Y<13THEN PRINTTAB(
X,Y)SPACE$:Y=Y+1
 340 IF Y=13 AND A=X THEN
PRINTTAB(X,Y)SPACE$:PROCDEA
D
 350 IF BONUS<10 THEN BONU
S=SCN*400:PROCDEAD
 360 BONUS=BONUS-10
 370 COLOUR0:PRINTTAB(0,27
)"BONUS":PRINTTAB(0,28);BON
US;"  "
 380 COLOUR0:PRINTTAB(15,2
7)"SCORE":PRINTTAB(15,28);S
C;
 390 FOR F=1TOLIVES:COLOUR
0:PRINTTAB(F,4)MAN$;CHR$10;
SPACE$:NEXT
 400 UNTIL FALSE
 410 DEFPROCINITIAL
 420 *FX11,4
 430 VDU23,1,0;0;0;
 440 VDU19,2,6;0;
 450 VDU19,0,4;0;
 460 ENVELOPE1,0,1,-1,0,20
,20,0,126,0,0,-126,126,126
 470 ENVELOPE2,1,0,0,0,50,
25,25,127,-1,-1,-1,126,90
 480 LEVEL=6:ROK=0:ROCK=FA
LSE:GUP=TRUE:LIVES=3:X=0:Y=
13:A=16:G=13:SC=0
 490 RIGHT=FALSE:ARW1=FALS
E:GUARDS=FALSE:HIT=FALSE:AR
N=FALSE:BELL=TRUE:ESM=FALSE
 500 MAN$=CHR$17+CHR$1+CHR
$145+CHR$11+CHR$8+CHR$17+CH
R$8+CHR$144
 510 MAN2$=CHR$17+CHR$1+CH
R$152+CHR$11+CHR$8+CHR$17+C
HR$8+CHR$144
 520 BRD$=CHR$147+CHR$11+C
HR$8+CHR$146
 530 ESM$=CHR$149+CHR$11+C
HR$8+CHR$148
 540 BEL$=CHR$150
 550 ARW$=CHR$151+CHR$32+C
HR$32
 560 ROK$=CHR$32+CHR$154

 570 SPACE$=CHR$32+CHR$11+
CHR$8+CHR$32
 580 VDU23,144,8,28,60,52,
126,250,248,248
 590 VDU23,145,248,248,120
,40,40,40,40,60
 600 VDU23,146,24,60,126,1
02,66,66,255,255
 610 VDU23,147,255,255,255
,126,126,102,102,231
 620 VDU23,148,0,60,60,108
```




```
,60,28,28,30
  630 VDU23,149,56,248,56,5
6,124,254,254,68
  640 VDU23,150,16,56,56,56
,124,254,254,16
  650 VDU23,151,0,1,66,255,
66,1,0,0
  660 VDU23,152,248,248,126
,34,34,34,67,64
  670 VDU23,153,255,129,129
,129,129,129,129,255
  680 VDU23,154,0,60,126,25
5,255,126,60,0
  690 ENDPROC
  700 DEFPROCSCREEN
  710 IF SCN=2 OR SCN=3 THE
N SOUND1,2,140,8:SOUND1,2,1
50,4
  720 IF SCN=4 THEN PROCESM
TUNE:FOR J=0TO2000:NEXT
  730 CLS
  740 COLOUR3:COLOUR129:PRI
NTTAB(0,15);:FOR F=0 TO 339
:VDU153:NEXT
  750 FOR N=14TO17:FOR F=4
TO17STEP4:COLOUR131:PRINTTA
B(F,N);"  ":NEXTF:NEXTN
  760 IF SCN<>4 THEN BONUS=
SCN*400
  770 IF SCN=1 THEN GOTO810
  780 IF SCN=2 THEN GUARDS=
TRUE:GOTO 810
  790 IF SCN=3 THEN GUARDS=
TRUE:BELL=FALSE:ARW=TRUE:ES
M=TRUE:GOTO820
  800 IF SCN=4 THEN SCN=1:A
RW=FALSE:GUARDS=FALSE:LEVEL
=LEVEL-1:BONUS=SCN*500:LIVE
S=LIVES+.5
  810 COLOUR2:PRINTTAB(19,1
0);BEL$:IF LEVEL<1 THEN LEV
EL=1:ENDPROC ELSE ENDPROC
  820  IF ESM=TRUE COLOUR2:
PRINTTAB(19,5);ESM$:COLOUR1
29:COLOUR3:PRINTTAB(18,6);C
HR$153+CHR$153+CHR$8+CHR$10
+CHR$153:COLOUR131
  830 ENDPROC
  840 DEFPROCMANJUMPRIGHT
  850 SOUND1,1,0,10
  860 PRINTTAB(X,Y);SPACE$:
Y=Y-1:PRINTTAB(X,Y);MAN2$:P
RINTTAB(X,Y);SPACE$:X=X+1:P
RINTTAB(X,Y)MAN$:PRINTTAB(X
,Y);SPACE$:X=X+1:PRINTTAB(X
,Y)MAN2$:PRINTTAB(X,Y);SPAC
E$
  870 IF SCN>1 AND X>4 AND
(G=Y OR G=Y+1 OR G=Y-1)THEN
 PROCDEAD
  880 ENDPROC
  890 PRINTTAB(2,10)"G A M
E  O V E R":FOR F=0 TO 2500
:NEXT
  900 COLOUR1:CLS:PRINT'''S
PC5"QUASIMODO"
  910 COLOUR0:PRINT''"H I G
 H  S C O R E S"
  920 IF SC>HSC THEN HSC=SC
  930 PRINT''SPC3"HIGH SCOR
E=";HSC
  940 PRINT''SPC3"YOUR SCOR
E=";SC
  950 PRINTTAB(5,30)"PRESS
SPACE"
  960 *FX15,0
  970 REPEAT UNTIL GET=32
  980 GOTO30
  990 DEFPROCGUARDS
 1000 PRINTTAB(4,G)SPACE$:P
RINTTAB(8,G)SPACE$:PRINTTAB
(12,G)SPACE$:PRINTTAB(16,G)
SPACE$
 1010 IF GUP=TRUE THEN G=G-
1
 1020 IF GUP=FALSE THEN G=G
+1
 1030 IF G=17THEN GUP=TRUE

 1040 IF G=11 THEN GUP=FALS
E
 1050 COLOUR5:PRINTTAB(4,G)
GRD$:PRINTTAB(8,G)GRD$:PRIN
TTAB(12,G)GRD$:PRINTTAB(16,
G)GRD$
 1060 ENDPROC
 1070 DEFPROCARWMOVE
 1080 PRINTTAB(A,13)ARW$
 1090 A=A-1
 1100 IF A=0 THEN PRINTTAB(
0,13)"  ":ARW=FALSE:A=17
 1110 ENDPROC
 1120 DEFPROCDEAD
 1130 LIVES=LIVES-1:FOR F=4
TO7:SOUND0,-15,F,2:NEXT:FOR
 F=0TO500:NEXT:PRINTTAB(X,Y
)SPACE$:X=0:Y=13:BONUS=SCN*
500
 1140 ENDPROC
 1150 DEFPROCJUMP
 1160 PRINTTAB(X,Y)SPACE$:Y
=Y-1:PRINTTAB(X,Y)MAN$:PRIN
TTAB(X,Y)SPACE$:Y=Y-1:PRINT
TAB(X,Y)MAN$:PRINTTAB(X,Y)S
PACE$:Y=Y-1:PRINTTAB(X,Y)MA
N$:PRINTTAB(X,Y)SPACE$:Y=Y-
1
 1170 IF Y<8 THEN Y=8
 1180 ENDPROC
 1190 DEFPROCESMTUNE:RESTOR
E1240
 1200 FOR Q=1 TO10:READAS,I
:SOUND1,-15,AS+20,I:NEXTQ:E
NDPROC
 1210 DEFPROCTUNE
 1220 RESTORE1230:FOR Q=1TO
14:READI,V:SOUND1,-15,I-30,
V:NEXTQ:ENDPROC
 1230 DATA40,3,44,3,48,3,52
,3,48,3,44,3,48,3,52,3,48,3
,44,3,48,3,52,3,48,8,34,7
 1240 DATA30,10,40,7,50,5,4
0,10,30,7,30,4,40,5,62,6,69
,4,62,6
 1250 IF ERR=17 THEN GOTO 4
0 ELSE MODE6:REPORT:PRINT E
RL:*FX12,0
```

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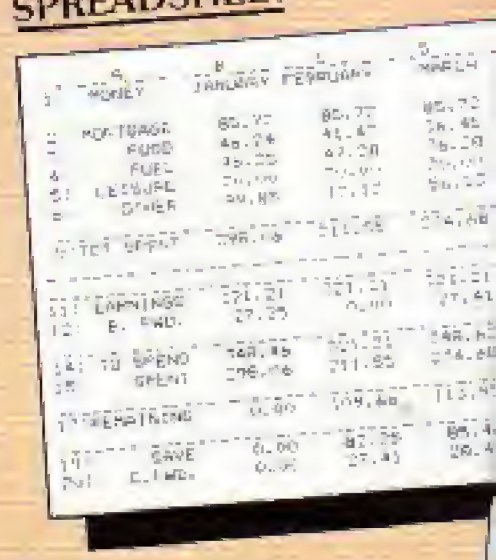

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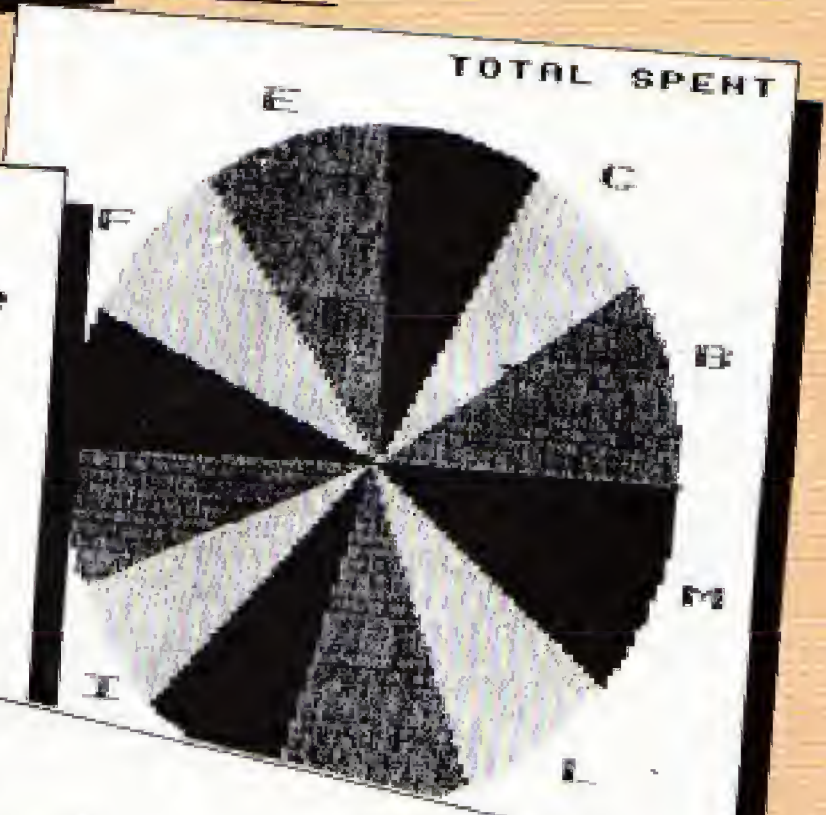

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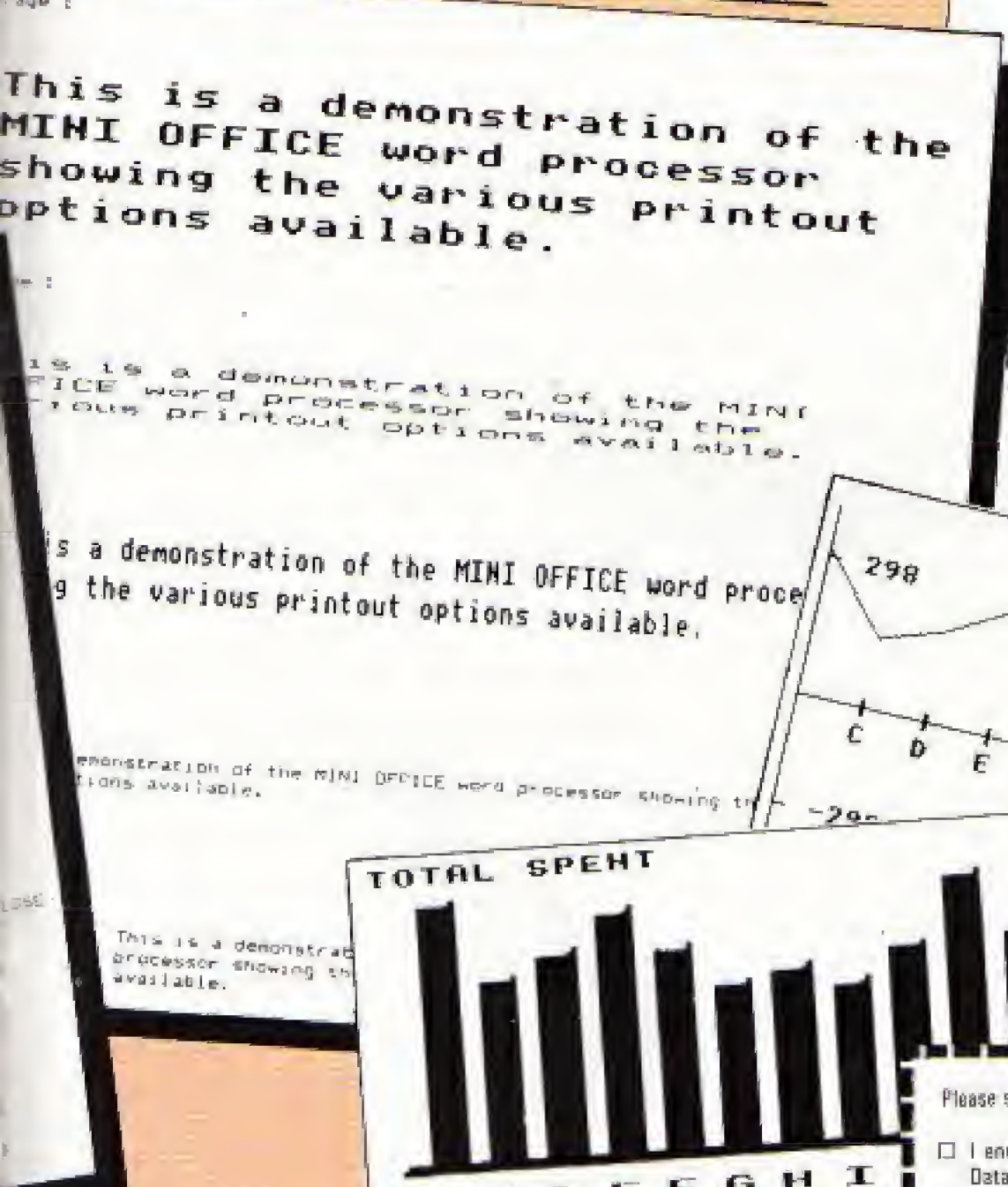

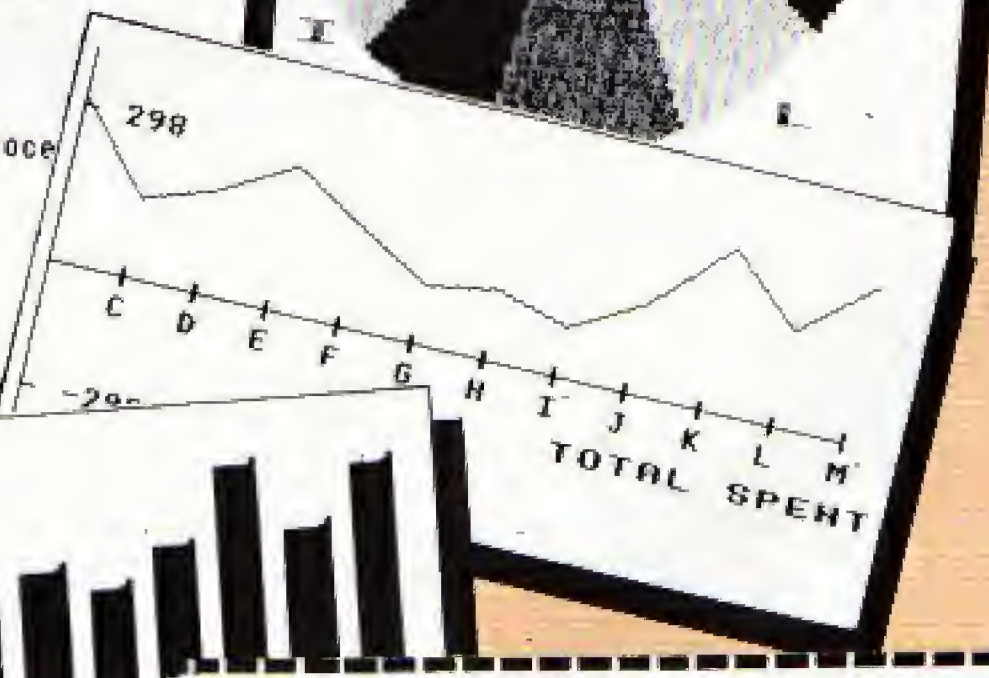

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E6

THERE'S a definite trend towards multiple statements and/or graphics in adventures these days.

Does anyone use multiple statements? Do graphics really promote an atmosphere or are they just a nuisance? Is it true that anything new has to be good? Who knows what can come out of it – From big Acorns do little Electrons grow and all that!

Personally I prefer to turn the graphics off when possible, once I've seen them. The game usually progresses faster and adventures without them are often better as they have to use the memory better. What do you think?

On to the adventure Top Ten. So far we have received marks from lots of people, but, amazingly, for only four different adventures.

Please give marks for them all, not just the ones you like best. If you think the program is dire, then mark it accordingly. So get your pen and paper out.

I'd like to thank everyone who wrote in with answers to last month's problems. In particular Mark Steadman and Phillip Cook. I would also like to thank Michael Dunlop and Katy King for their advice and opinions. It's nice to hear what you think about adventures as well as where they are causing you problems.

Andrew Dickman writes to say that he can't even get into the castle in ***Sadim Castle.*** I have to presume that he means the gates that you can see when the game starts.

These are the gates to the castle grounds, not the castle as such. Fix the farmer's roof and do a deal with the monk.

Brynn Edmondson is stuck in ***Eye of Zoltan.*** He wants to know what the password is for getting into the castle. Password IS the password!

HE is also stuck in ***The Incredible Hulk.*** He wants to know how to get rid of the bees and get the wax. One of the domes is worth EXAMining if you are a Scott Adams FAN!

John Miloren is having problems with ***Wheel of Fortune.*** Can you put things into the empty basket? No. Something will put itself in later.

How do you befriend the farmer, troll, spider and fly? Later. You can't. Bring it something it likes. You don't want to.

Go into the fly's cave and immediately out and into the spider's cave.

Can you stop the trapdoor from closing? No, no need to.

Where do the characters all go to when you come back up through the trapdoor? The policeman continues his beat on the other side of the canal and the tramp goes home for his tea.

How do you go down the well the second time? You don't. Try spinning something.

How do you get across the canal bridge? From the other side!

David Yates has written to say that if you type in EAT SPICES in ***Sphinx Adventure,*** the program crashes with a "BAD ARGUMENTS AT LINE 363" message. You have been warned.

Now some problems I need help with:

J.E. Squire wants to know what, if anything, can be done in the inner sanctum and what is the significance of DAVE KNEW in ***Sphinx Adventure.***

H. Bastein is having problems in ***Strange Odessey.*** How does he get to the Jovian Mine without getting squashed and into the Black Hole without getting ripped apart?

Terry Mealing wants to know where some of the jewels are in ***Crown Jewels*** – and I want to know who produces Crown Jewels, as I've never heard of it!

I have been taken to task by P. Eastwood for not finding the treasure in my review of ***Java Star.*** Apparently the treasure is easy to find and I must be stupid for missing it.

Some late news is that Epic has produced help sheets for all of its adventures and they are free to anyone sending an SAE – to Epic, NOT to me.

In view of the vast numbers of letters I am getting about ***Twin Kingdom Valley,*** I am going to do a special on it next month.

Yes, I finally dug my old maps out and went back and solved it. For those of you who are wondering what to do with your 1024 points, watch this space.

Now, let's get back to answering some more readers' questions:

C.F. Dodds can't get off the beach in Softek's ***Eye of Zoltan:*** If you have mapped everywhere, use your treasures before you STORE them.

Terry Mealing wants to know how to get both the sword and the key box in ***Stolen Lamp*** – DON'T.

Nicola King, Chris Wilson, R. Henderson and H. Bastien are all having problems with ***Twin Kingdom Valley.***

To kill the dragon, one of the things you find in the castle should be examined carefully – it looks deadly. To get out of the maze with the witch, you need to bribe a guard with a bag of gold.

The giant is in the desert king's dungeon and so is the princess. Get there from the cave near watersmeet.

You can't do anything with the secret of life until you have done everything else. To help the sick giant, take him to watersmeet.

The master key will open just about anything, but the door to the south turret in particular. The rod isn't that much use, although waving it will bridge a gap.

Gordon Hoy and David Yates are having fun with ***Sphinx Adventure.***

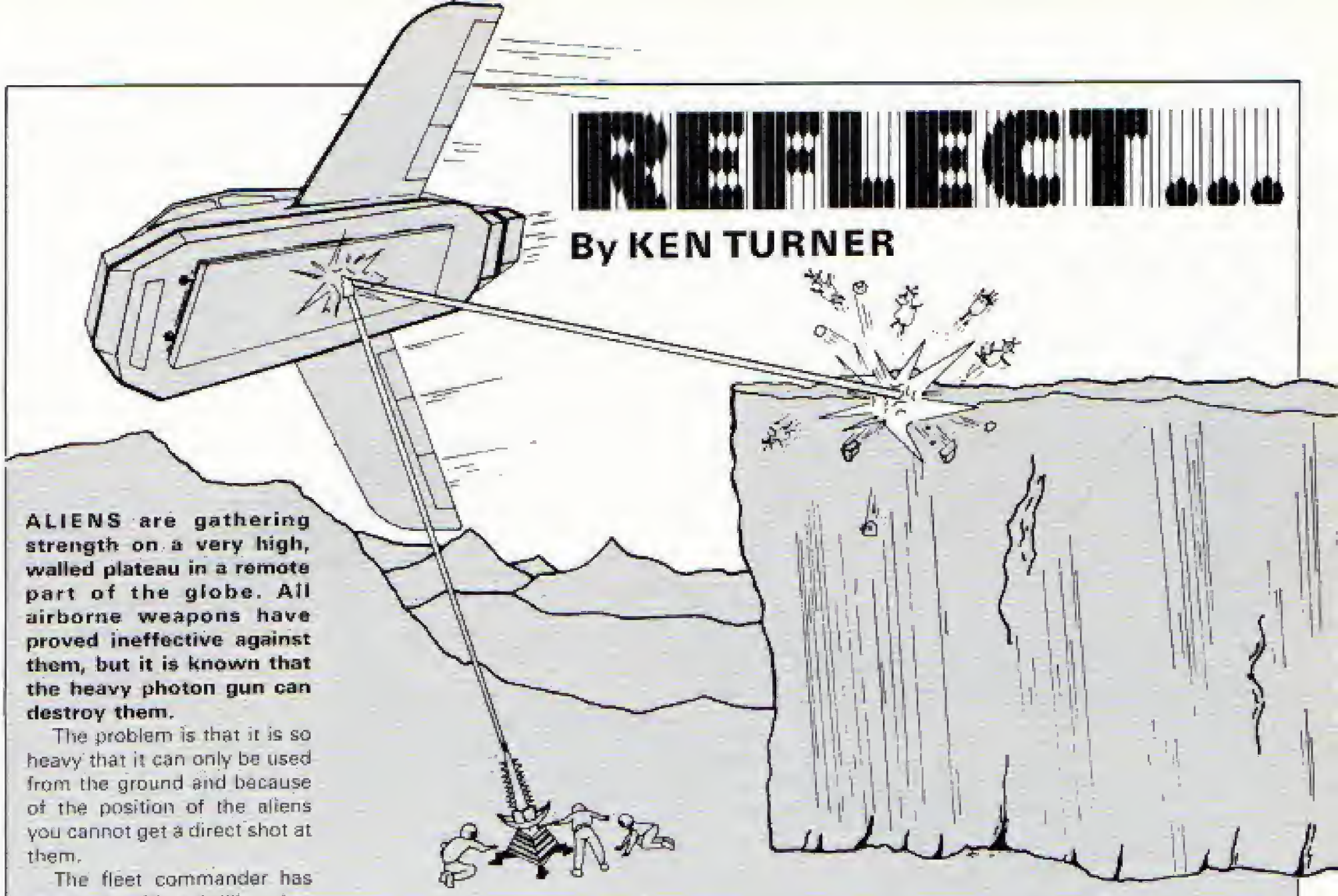
The mithril ring and stake are both across the everglades past the crocodile. If the sword breaks, then use your hands when trying to kill the dragon and the ogre.

The safe door doesn't need keys, only a magic word, and the boat and mouse are in the vampire's castle. You will need to map the maze of coloured rooms and metal passages and junctions. Sorry!

● **If you want Merlin's help write to:**
Merlin, Electron User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.
– and enclose an SAE if you would like a reply.

REFLECT

By KEN TURNER



ALIENS are gathering strength on a very high, walled plateau in a remote part of the globe. All airborne weapons have proved ineffective against them, but it is known that the heavy photon gun can destroy them.

The problem is that it is so heavy that it can only be used from the ground and because of the position of the aliens you cannot get a direct shot at them.

The fleet commander has come up with a brilliant but dangerous solution by fitting the remaining airships with reflective material on the base.

The brave pilots have put their lives on the line by flying back and forth over the alien's position to provide you with a mirror to fire at and thereby reflect your photons on to the aliens.

If you miss the mirror and hit the ship it will be destroyed – and you only have five of them.

Every now and then the aliens launch a bomb which bursts above you and showers you with high explosive mini-bombs.

While in flight this bomb also disables your gun – most frustrating, but this is what we learn to live with in computer-land!

In order to score you have to position your "sight" so that the photon hits the mirror on the airship and the reflected photons meet the alien.

The sight is a "+" at the top of the screen and is the point through which your photons will pass if not interrupted by the mirror.

Once fired, the photon's path is set and cannot be changed – it cannot be guided.

As both the ship and the alien are always moving a hit with every shot would be miraculous.

For this reason there are no levels, and the idea is to score more hits than anyone else before you are killed.

→

VARIABLES

XS%	X coordinate of sight.
XB%	X coordinate of base.
XP%	X coordinate of photon.
YP%	Y coordinate of photon.
Xbomb	X coordinate of bomb.
Ybomb	Y coordinate of bomb.
XSHIP	X coordinate of ship.
XBAD	X coordinate of alien.
BAD%	Movement rate of alien.
diffx	Horizontal movement rate of photon.
diffy	Vertical movement rate of photon.
SHIP%	Movement rate of ship.
score%	Current score.
lives%	Lives left.
time	Random time before bomb is launched.

FLAGS

launched	Has bomb been launched?
dead%	Is game finished?
photon	Has photon gun been fired?

ARRAYS

X(12),Y(12)	Coordinates for shower bombs.
name$(10)	Names on hi-score table.
score(10)	Their scores.

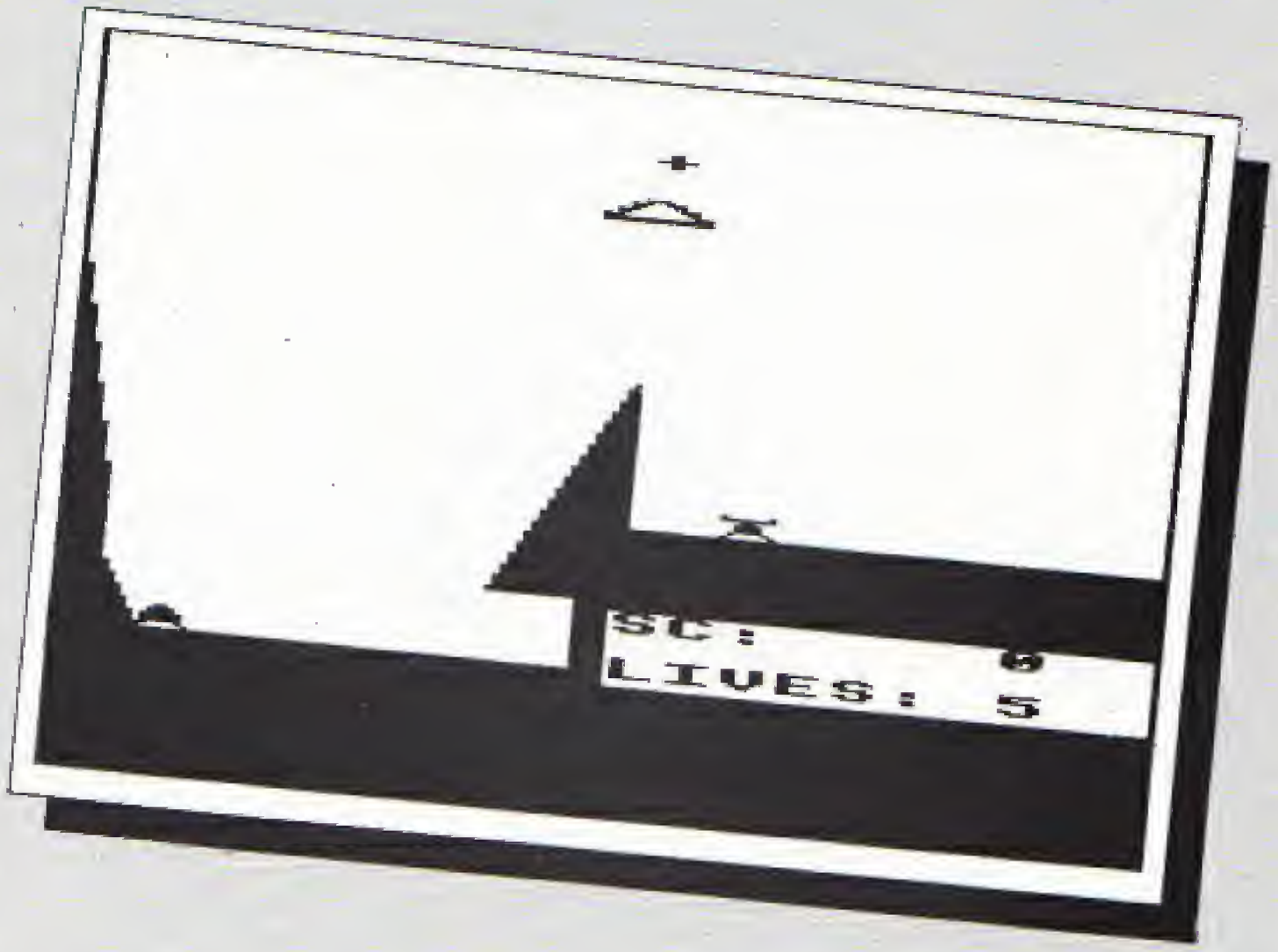
PROCEDURES

PROCscreen	Draws battle scene, score etc.
PROCinit	VDU 23s, initialises variables.
PROCship	Creates new ship.
PROCbaddy	Creates new alien.
PROCmoveship	Moves ship.
PROCmovebaddy	Moves alien.
PROCmovesight	Moves sight on your command.
PROCbase	Creates base.
PROCmovebase	Moves base on your command.
PROCphoton	Photon launched, sound, flight until result of shot.
PROCexpl	Rubs out what was hit and shows explosion.
PROCscore	Increments score.
PROCbomb	After random time, called to launch bomb.
PROCshower	Bomb bursts and showers down mini-bombs.
PROChiscore	Compares score with previous scores.
PROCtable	If hi-score asks for name and displays table.
PROCinstruct	Displays instructions.
PROCerror	Calls Mode 6 and reports error.

Reflect listing

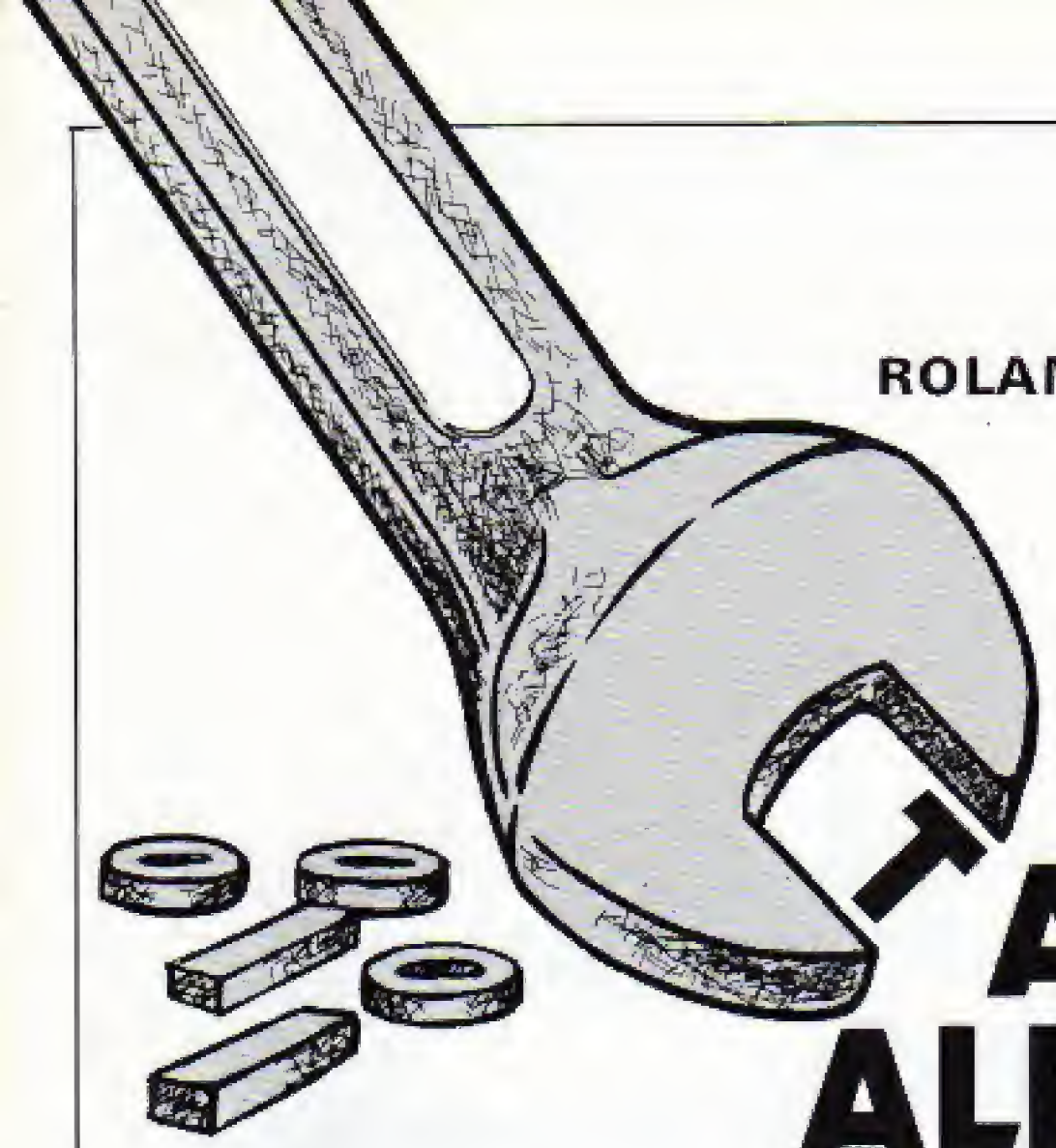
From Page 37

```
   10 REM REFLECT
   15 REM (C) Electron User
   20 REM By K.B.Turner
   25 ON ERROR:MODE 6:PROCe
rror:END
   30 DIM X(12),Y(12):Y(1)=
200
   40 DIM name$(10),score(1
0)
   45 ENVELOPE 1,1,5,5,5,12
,12,12,126,0,0,-126,126,126
   46 ENVELOPE 2,1,-5,-5,-5
,12,12,12,126,0,0,-126,126,
126
   50 FOR S=1 TO 10
   60 name$(S)="Electron":s
core(S)=0
   70 NEXT
   75 MODE 6:VDU 19,1,2;0;
   76 PROCinstruct
   77 MODE 5
   79 PROCinit
   80 VDU 23,1,0;0;0;0;
   90 VDU 5
  100 PROCscreen
  110 PROCship
  120 PROCbaddy
  130 PROCbase
  140 VDU 4:CLS
  150 MOVE 700,100:GCOL0,3:
FOR C=100 TO 180:PLOT77,700
,C:NEXT
  160 MOVE 636,180:GCOL0,1:
DRAW 1279,180:DRAW 1279,288
:DRAW 636,288:DRAW 636,180
  170 VDU 5
  180 MOVE 0,0:GCOL0,1:DRAW
 0,1023:DRAW 1279,1023:DRAW
 1279,0:DRAW 0,0
  185 PROCscore
  190 REPEAT
  200 PROCmovesight
  210 PROCmoveship
  220 PROCmovebaddy
  230 PROCmovebase
  240 IF INKEY (-99) THEN p
hoton=TRUE:XP%=XB%+32:diffx
=(1XS%+32-XP%1*50)/700:MOVE
 XP%,YP%:GCOL3,1:DRAW XP%+d
iffx,YP%+diffy
  250 IF photon THEN SOUND
1,1,0,8:REPEAT:PROCphoton:P
ROCmovesight:PROCmoveship:P
ROCmovebaddy:PROCmovebase:U
NTIL photon=FALSE
  260 PROCscore
  280 IF TIME>time THEN lau
nched=TRUE:Xbomb=XBAD:Ybomb
=464:MOVE Xbomb,Ybomb:GCOL3
,3:PRINTCHR$245
  290 IF launched THEN REPE
AT:PROCbomb:PROCmovesight:P
ROCmoveship:PROCmovebaddy:P
ROCmovebase:UNTIL Y(1)<100
OR dead%:TIME=0:time=RND(80
00):Y(1)=200:launched=FALSE
  300 UNTIL dead%:lives%=0:
PROCscore
  310 *FX15,0
  320 MODE 2
  325 VDU 23,1,0;0;0;0;
  330 PROChiscore
  340 IF A$="Y" THEN GOTO 7
5
  350 END
  360 DEF PROCscreen
  365 FOR col=0 TO 3:VDU 19
,col,0;0;:NEXT
  380 MOVE 0,727:DRAW 50,40
0:DRAW50,300:DRAW100,200:DR
AW600,200:DRAW600,300:DRAW
500,300:DRAW650,600:DRAW650
,400:DRAW 1279,400
  390 MOVE 0,0:GCOL0,3:FOR
Y=0 TO 726:PLOT 77,0,Y:NEXT
  400 MOVE 646,0:FOR Y=0 TO
 595:PLOT 77,646,Y:NEXT
  410 MOVE XS%,926:GCOL3,2:
PRINT"+"
  415 VDU 20,19,3,2;0;
  420 ENDPROC
  430 DEF PROCinit
  440 BAD%=8:XS%=640:XB%=10
0:YP%=230:diffy=50:launched
=FALSE:SHIP%=16
  450 score%=0:dead%=FALSE:
photon=FALSE:lives%=5
  470 VDU 23,255,3,14,12,56
,48,224,192,192,23,254,192,
112,48,28,12,7,3,3,28,10,27
,19,23
  480 VDU 23,253,0,0,0,0,0,
0,63,63,23,252,0,0,0,0,0,0,
252,252
  490 VDU 23,251,129,255,24
,60,60,60,66,129,23,250,24,
60,60,126,126,126,66,129
  500 VDU 23,249,7,12,48,10
2,164,128,185,136,23,248,12
,178,194,78,25,9,193,90,23,
247,96,36,38,112,64,33,18,1
2,23,246,18,6,17,177,142,72
,48,0
  510 VDU 23,245,0,24,126,2
55,255,126,24,0
  520 expl$=CHR$249+CHR$248
+CHR$8+CHR$8+CHR$10+CHR$247
+CHR$246
  530 ENDPROC
  540 DEF PROCship
  550 XSHIP=800
  560 MOVE XSHIP,856:GCOL3,
2:PRINT CHR$255;CHR$254:MOV
E XSHIP,856:GCOL3,1:PRINT C
HR$253;CHR$252
  570 ENDPROC
  580 DEF PROCbaddy
  590 XBAD=660+RND(554)
  600 MOVE XBAD,432:GCOL3,2
:PRINT CHR$251
  610 TIME=0:time=RND(10000
)
  620 ENDPROC
  630 DEF PROCmoveship
  640 MOVE XSHIP,856:GCOL3,
2:PRINTCHR$255;CHR$254:MOVE
 XSHIP,856:GCOL3,1:PRINT CH
R$253;CHR$252
  650 XSHIP=XSHIP-SHIP%:IF
XSHIP<300 OR XSHIP>800 THEN
 SHIP%=-SHIP%
  660 MOVE XSHIP,856:GCOL3,
2:PRINTCHR$255;CHR$254:MOVE
 XSHIP,856:GCOL3,1:PRINT CH
R$253;CHR$252
  670 ENDPROC
  680 DEF PROCmovebaddy
  690 MOVE XBAD,432:GCOL3,2
:PRINT CHR$251
  700 XBAD=XBAD+BAD%:IF XBA
D>1214 OR XBAD<660 THEN BAD
%=-BAD%
  710 MOVE XBAD,432:GCOL3,2
:PRINT CHR$251
  720 ENDPROC
  730 DEF PROCmovesight
  740 IF NOT INKEY (-104) A
ND NOT INKEY (-103) THEN EN
DPROC
  750 MOVE XS%,926:GCOL3,2:
PRINT"+"
  760 IF INKEY (-104) THEN
XS%=XS%+32
  770 IF INKEY (-103) THEN
XS%=XS%-31
  780 MOVE XS%,926:GCOL3,2:
PRINT"+"
  790 ENDPROC
  800 DEF PROCbase
  810 MOVEXB%,232:GCOL3,2:P
RINT CHR$250
  820 ENDPROC
  830 DEF PROCmovebase
  840 IF NOT INKEY (-98) AN
D NOT INKEY (-67) THEN ENDP
ROC
  850 MOVE XB%,232:GCOL3,2:
PRINT CHR$250
  860 IF INKEY (-98) THEN X
B%=XB%-16:IF XB%<100 THEN X
B%=100
  870 IF INKEY (-67) THEN X
B%=XB%+16:IF XB%>535 THEN X
B%=535
  880 MOVE XB%,232:GCOL3,2:
PRINT CHR$250
  890 ENDPROC
  900 DEF PROCphoton
  910 MOVE XP%,YP%:GCOL3,1:
DRAW XP%+diffx,YP%+diffy
  920 IF POINT(XP%+diffx,YP
%+diffy)=2 THEN PROCexpl
  930 IF POINT(XP%+diffx,YP
%+diffy+5)=1 THEN diffy=-di
ffy:YP%=800:SOUND 1,2,100,7
  940 IF POINT(XP%+diffx,YP
%+diffy)=3 OR YP%>926 OR XP
%>1279 OR XP%<0 THEN SOUND
1,-15,200,5:photon=FALSE:di
ffy=50:XP%=XB%+32:YP%=230:E
NDPROC
  950 XP%=XP%+diffx:YP%=YP%
+diffy
  960 MOVE XP%,YP%:GCOL3,1:
DRAW XP%+diffx,YP%+diffy
  970 ENDPROC
  980 DEF PROCexpl
  990 IF YP%+diffy=830 THEN
 X1=XSHIP:Y1=888:MOVE XSHIP
,856:GCOL3,2:PRINTCHR$255+C
HR$254:MOVE XSHIP,856:GCOL3
,1:PRINTCHR$253+CHR$252:liv
es%=lives%-1:IF lives%=0 TH
EN dead%=TRUE
 1000 IF YP%+diffy=430 THEN
 X1=XBAD:Y1=464:MOVE XBAD,4
32:GCOL3,2:PRINTCHR$251:sco
re%=score%+150
 1010 IF YP%+diffy=230 THEN
 X1=XB%:Y1=264:MOVE XB%,232
:GCOL3,2:PRINTCHR$250:dead%
=TRUE
 1020 MOVE X1,Y1:GCOL3,2:PR
INT expl$:SOUND0,-15,5,10:F
OR delay=1 TO 500:NEXT:MOVE
 X1,Y1:PRINT expl$
 1030  IF YP%+diffy=830 THE
N PROCship
 1040 IF YP%+diffy=430 THEN
 PROCbaddy
 1050 IF YP%+diffy=230 THEN
 PROCbase
 1060 ENDPROC
 1070 DEF PROCscore
```




```
1080 A%=&00404
1090 VDU4:COLOUR 1:PRINTTA
B(0,0)"SC:";score%;TAB(0,2)
"LIVES: ";lives%:VDU 5
1100 ENDPROC
1110 DEF PROCbomb
1120 IF Xbomb=400 AND Ybom
b=700 THEN PROCshower:ENDPR
OC
1130 MOVE Xbomb,Ybomb:GCOL
3,3:PRINTCHR$245
1140 Ybomb=Ybomb+32:IF Ybo
mb>700 THEN Ybomb=700
1150 IF Ybomb=700 THEN Xbo
mb=Xbomb-64:IF Xbomb<400 TH
EN Xbomb=400
1160 MOVE Xbomb,Ybomb:GCOL
3,3:PRINTCHR$245
1170 IF Xbomb=400 AND Ybom
b=700 THEN SOUND 0,-15,6,5:
MOVE Xbomb,Ybomb:GCOL3,3:PR
INTCHR$245:FOR N=1 TO 12:X(
N)=RND(400)+100:Y(N)=600+RN
D(100):NEXT:GCOL3,3:FOR N=1
 TO 12:PLOT 69,X(N),Y(N):NE
XT
1180 ENDPROC
1190 DEF PROCshower
1200 GCOL3,3:FOR N=1 TO 12
:PLOT 69,X(N),Y(N):NEXT
1210 FOR N=1 TO 12:Y(N)=Y(
N)-32:NEXT
1220 GCOL3,3:FOR N=1 TO 12
:PLOT 69,X(N),Y(N):NEXT
1230 FOR N=1 TO 12
1240 IF POINT(X(N),Y(N))=1
 THEN X1=XB%:Y1=264:MOVE XB
%,232:GCOL3,2:PRINTCHR$250:
PROCexpl:dead%=TRUE:TIME=0
1250 NEXT
1260 ENDPROC
1270 DEF PROChiscore
1280 I=0
1290 FOR S=1 TO 10
1300 IF score%>score(S) TH
EN I=I+1
1310 NEXT
1320 COLOUR3:PRINT'''"
You scored    "
1325 COLOUR 1:PRINT''"
    ";score%
1330 COLOUR 3:PRINT'''"
  you    are"
1340 IF I=0 THEN PRINT''"
       NOT"
1350 COLOUR 5:PRINT'''' o
n the high score"
1360 PRINT'''"       TABLE
."
1370 FOR C=1 TO 2000:NEXT
1380 IF I>0 THEN PROCtable
1390 FOR c=1 TO 5000:NEXT
1400 CLS
1405 *FX15,0
1410 PRINT TAB(0,15)"Anoth
er game?(Y / N)"
1420 REPEAT:A$=INKEY$(0):U
NTIL A$()""
1430 ENDPROC
1440 DEF PROCtable
1450 CLS
1460 COLOUR 3
1465 *FX15,0
1470 PRINTTAB(0,4)"What is
 your name?"
1480 INPUT TAB(4,15),name$
1490 FOR C=1 TO I
1500 name$(C-1)=name$(C):s
core(C-1)=score(C)
1510 NEXT
1511 score(I)=score%:name$
(I)=name$
1515 CLS
1520 COLOUR 3:PRINT"   RO
LL OF HONOUR"
1530 PRINT'''
1540 A%=&00505
1550 FOR C=10 TO 1 STEP -1
1560 COLOUR 1
1570 PRINT'score(C);".....
";name$(C)
1575 GCOL0,6:MOVE 0,0:DRAW
0,1023:DRAW 1279,1023:DRAW
 1279,0:DRAW 0,0:MOVE 0,939
:DRAW 1279,939
1580 NEXT
1590 ENDPROC
1600 DEF PROCinstruct
1610 PRINT'"   The aliens
are patrolling a walled   p
lateau. All airborne weapon
s have     proved useless
against thee. The only   we
apon which can destroy thee
 is the    'PHOTON GUN' whi
ch is very heavy and is gro
und-based."
1620 PRINT''"   The FLEET C
ONMANDER has come up with a
 brilliant idea. All aircra
ft have beenfitted with ref
lective material on the  ba
se. Your PHOTONS must hit t
his base   to be reflected
back onto the aliens."
1630 PRINT'"   If you hit
the ship you will destroy i
t and you only have FIVE le
ft.   The'+'sign at the top
 of the screen is your   si
ght and is the point throug
h which thePHOTON will pass
 if not interrupted."
1640 PRINT''' TAB(5)"PRESS
 SPACE BAR TO CONTINUE"
1650 REPEAT UNTIL GET=32
1660 CLS
1670 PRINT'''TAB(16)"CONTR
OLS"'TAB(16)"--------"
1680 PRINT''"Z ----------
- Move base LEFT"''"X -----
------- Move base RIGHT"''"
( ---------- Move sight (
+) LEFT"''") ---------- M
ove sight (+) RIGHT"''"SPAC
E BAR ---- Fire PHOTON GUN"
'''"            GOOD LUCK!
"
1690 PRINT TAB(5,23)"PRESS
 SPACE BAR TO CONTINUE.":RE
PEAT UNTIL GET=32
1695 CLS:PRINT TAB(2,2)"A
FEW MOMENTS DELAY, THEN BE
READY...."TAB(13,6)"By the
way....."TAB(2,18)"Watch ou
t for the shower bombs!"
1700 FOR DELAY=1 TO 4000:N
EXT
1710 CLS:ENDPROC
1720 DEF PROCerror
1730 REPORT:PRINT" at Line
 ";ERL
1750 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 61.



ROLAND WADDILOVE's handy utility lets you examine your machine code without any fuss or bother

TAKING IT ALL APART

MACHINE code is the language which microprocessors such as the 6502 used by the Electron understand. It consists simply of binary numbers in the range 0 to 255.

As you can imagine, this is very difficult to follow and next to impossible to write. You get line after line of 0s and 1s.

So instead of using straight machine code we normally work with assembly language.

This is a great deal easier to manage, as mnemonics are used to represent each instruction. If you wanted to write a machine code program you would normally write it in assembly language and use an assembler to convert this into machine code.

An assembler is a program which will take a series of assembly language mnemonics and convert them into machine code proper.

To read a machine code program then you do the reverse – convert it into assembly language using a disassembler.

A disassembler is the opposite of an assembler, taking an unintelligent mach-

```
  10 REM Disassembler
  20 REM By R.A.Waddilove
  30 REM Version 3
  40 REM (c) Electron User
  50 MODE 6
  60 PROCinitialise
  70 REPEAT
  80 PROCinput
  90 REPEAT
 100 char$=""
 110 PROCfind_code
 120 IF found PROCdisassem
ble ELSE PRINT TAB(18);"No
such code";:address=address
+1
 130 PRINT TAB(36);char$;:*
FX21,0
 140 UNTIL INSTR("Ii",GET$
)
 150 UNTIL FALSE
 160 END
 170 DEF PROCdisassemble
 180 IF (type AND type(5)
OR (type>8 AND type(12) PRO
Cprint(byte1%):address=addr
ess+2
 190 IF type=5 OR type=6 O
R type=7 OR type=12 PROCpri
nt(byte1%):PROCprint(byte2%
):address=address+3
 200 IF type=9 OR type=0 a
ddress=address+1
 210 RESTORE 1010
 220 FOR I%=0 TO (EVAL("&"
+code$)AND &FF00)DIV &100
 230 READ mnemonic$
 240 NEXT
 250 PRINT TAB(10);mnemoni
c$;" ";
 260 PROCprint_data
 270 ENDPROC
 280 DEF PROCinitialise
 290 VDU 19,1,6;0;19,0,4;0
;
 300 PRINT'TAB(13)"DISASSE
MBLER"''TAB(7)"ROM's";
 310 FOR I%=0 TO 15
 320 IF I%?&2A0 PRINT'I%;"
 : ";:ROM=I%:PROCroms
 330 NEXT
 340 PRINT''TAB(10)"I=inpu
t new address"'" Hold down
any other key to disassembl
e"
 350 ENDPROC
 360 DEF PROCroms
 370 A%=&8009:F%=0
 380 REPEAT byte%=FNbyte(A
%)
 390 IF byte%>31 AND byte%
<127 VDU byte%
 400 A%=A%+1
 410 IF byte%=0 F%=F%+1:PR
INT" ";
 420 UNTIL F%=2
 430 ENDPROC
 440 DEF PROCinput
 450 INPUT'" Start address
=";address$
 460 address=EVAL address$
 470 IF address>&7FFF AND
address<&C000 INPUT " ROM n
umber ";ROM ELSE ROM=-1
 480 ENDPROC
 490 DEF PROCfind_code
 500 IF ROM>-1 byte%=FNbyt
e(address):byte1%=FNbyte(ad
dress+1):byte2%=FNbyte(addr
ess+2) ELSE byte%=?address:
byte1%=address?1:byte2%=add
ress?2
 510 PRINT " ";~address;":
";
 520 PROCprint(byte%)
 530 RESTORE 1020
 540 REPEAT
 550 READ code$
 560 UNTIL (EVAL("&"+code$
)AND &FF)=byte% OR code$="F
FFFFF"
 570 IF code$="FFFFFF" fou
nd=FALSE ELSE found=TRUE:ty
pe=(EVAL("&"+code$)AND &FF0
000)DIV &10000
 580 ENDPROC
 590 DEF FNbyte(B%)
 600 !&F6=B%:Y%=ROM
 610 =USR(&FFB9)AND &FF
 620 DEF PROCprint(B%)
 630 IF B%>31 AND B%<127 c
har$=char$+CHR$(B%)
 640 IF B%<16 PRINT "0";
 650 PRINT;~B%;" ";
 660 ENDPROC
 670 DEF PROCprint_data
 680 REM accumulator
 690 IF type=0 PRINT "A";:
ENDPROC
```

ine code program and converting it back into a list of assembly language mnemonics.

As you probably know, the Electron has a pretty powerful assembler built in to the Basic ROM. This can be used to write machine code programs in assembly language.

What's lacking is a disassembler for reading machine code programs. This isn't quite as essential as an assembler, but is still a useful tool.

The program presented here will fill that gap. It's a powerful disassembler which will convert 6502 machine code back into assembly language mnemonics.

A disassembler is useful for checking whether a machine code program has assembled correctly or if it's become corrupted for some reason.

Also it's interesting to explore the ROMs and follow the various routines within them. These can be selected and disassembled quite easily.

When run, the disassembler will print a list of all the ROMs present and their number.

If you opt to disassemble from an address between

```
          DISASSEMBLER

      ROM's
        0 : VIEW E1.0
        4 : Acorn ADFS 1.00
       11 : BASIC (C)1982 Acorn
       12 : Electron Expansion 1.00

        I=input new address
Hold down any other key to disassemble

Start address=?&900
900:AD 00 06       LDA &600
903:F0 0E          BEQ &913
905:AD 01 06       LDA &601
908:85 77          STA &77          w
90A:AD 02 06       LDA &602
90D:85 78          STA &78          x
90F:A0 00          LDY #&0
911:B1 77          LDA (&77),Y      w
913:85 77          STA &77          w
915:A9 02          LDA #&2
917:20 EE FF       JSR oswrch
91A:A9 1B          LDA #&1B
91C:20 C7 09       JSR &9C7
91F:A9 41          LDA #&41         A
921:20 C7 09       JSR &9C7
924:A9 04          LDA #&4
926:20 C7 09       JSR &9C7
929:A9 FF          LDA #&FF
928:85 72          STA &72          r
```

&8000 and &BFFF you will be prompted for a number. Just type in the number of the ROM you'd like to disassemble and the propgram will do the rest.

The disassembler has been designed to use up as little memory as possible so that a machine code program can sit in the memory at the same time and be disassembled.

The program is reasonably intelligent, so that when a common operating system call is encountered its name will be printed instead of just the address.

Whether you're a serious machine code programmer or just a dabbler, you'll find it such a useful tool you'll wonder how you ever managed without it.

The program needs 4k of memory which can be anywhere, so set PAGE to any value from &E00 (or &1D00 for Plus 3 disc drivers) to &5000 before loading it. This will enable a machine code program to be *LOADed to the memory left over and disassembled.

The start address for disassembly can be entered in decimal or hex. The ROM number, however, must be in decimal.

A hard copy can be obtained by pressing Ctrl+B when you enter the address.

Be careful when entering data statements. When the program is running type in a few machine code programs and test the disassembler. There are several to choose from in the Electron User Guide.

The second set of data statements might seem a little strange. Each item is a three byte hexadecimal number, &AABBCC.

&CC is the first byte of the object code. Each byte is compared with this until a match is found. If there is a match then &BB is a pointer to the instruction and &AA is the type of addressing mode. PROCprint_data shows the various modes.

FNbyte(B%) reads a byte of data from a paged ROM. The address is placed in &F6/&F7 and the ROM number in the Y register. CALL &FFB9 reads the byte, and returns with it in the A register.

```
  700 ON type GOTO 720,740,
760,780,800,880,900,910,930
,960,980,1000
  710 REM immediate
  720 PRINT "#&";~byte1%;:E
NDPROC
  730 REM zero_page
  740 PRINT"&";~byte1%;:END
PROC
  750 REM zero_page_x
  760 PRINT"&";~byte1%;",X"
;:ENDPROC
  770 REM zero_page_y
  780 PRINT"&";~byte1%;",Y"
;:ENDPROC
  790 REM absolute
  800 B%=byte1%+256*byte2%:
RESTORE 1070
  810 FOR J%=0 TO 11
  820 READ OScall$,OScall%
  830 IF B%=OScall% PRINT O
Scall$;:B%=-1
  840 NEXT
  850 IF B%>-1 PRINT"&";~B%;
  860 ENDPROC
  870 REM absolute_x
  880 PRINT"&";~byte1%+256*
byte2%;",X";:ENDPROC
  890 REM absolute_y
  900 PRINT"&";~byte1%+256*
byte2%;",Y";:ENDPROC
  910 ENDPROC
  920 REM relative
  930 IF byte1%<128 PRINT"&
";~address+byte1% ELSE PRI
NT"&";~address-(256-byte1%);
  940 ENDPROC
  950 REM pre_indexed_indir
ect
  960 PRINT"(&";~byte1%;",X
)";:ENDPROC
  970 REM post_indexed_indi
rect
  980 PRINT"(&";~byte1%;"),
Y";:ENDPROC
  990 REM indirect
 1000 PRINT"(&";~byte1%+256
+byte2%;")";:ENDPROC
 1010 DATA ADC,AND,ASL,BCC,
BCS,BEQ,BIT,BMI,BNE,BPL,BRK
,BVC,BVS,CLC,CLD,CLI,CLV,CM
P,CPX,CPY,DEC,DEX,DEY,EOR,I
NC,INX,INY,JMP,JSR,LDA,LDX,
LDY,LSR,NOP,ORA,PHA,PHP,PLA
,PLP,ROL,ROR,RTI,RTS,SBC,SE
C,SED,SEI,STA,STX,STY,TAX,T
AY,TSX,TXA,TXS,TYA
 1020 DATA 80A00,A2201,2220
5,20206,82408,12209,20A,522
0D,5020E,90910,82211,32215,
30216,80D10,72219,6221D,602
1E,51C20,A0121,20624,20125,
22726,82620,10129,2720A,5062
C,50120,5272E,90730,80131,3
0135,32736,82C38
 1030 DATA 70139,60130,6273
E,82940,A1741,21745,22046,8
2348,11749,204A,5184C,5174D
,5204E,90850,81751,31755,32
056,80F50,71759,6175D,6205E
,82A60,A0061,20065,22866,82
568,10069,206A,C186C,50060,
5206E,90C70,80071
 1040 DATA 30075,32876,82E7
8,70079,60070,6207E,A2F01,2
3184,22F85,23086,81688,8358
A,5318C,52F8D,5308E,90390,8
2F91,33194,32F95,43096,8379
8,72F99,8369A,62F9D,11FA0,A
1DA1,11EA2,21FA4,21DA5,21EA
6,833A8,11DA9
 1050 DATA 832AA,51FAC,51DA
D,51EAE,90480,81DB1,31FB4,3
1DB5,41EB6,81068,71D89,8348
A,61FBC,61D8D,71EBE,113C0,A
11C1,213C4,211C5,214C6,81AC
8,111C9,815CA,513CC,511CD,5
14CE,900D0,811D1,311D5,314D
6,80ED8,71109
 1060 DATA 611DD,614DE,112E
0,A29E1,212E4,229E5,218E6,8
19E8,129E9,821EA,518EC,528E
D,518EE,905F0,829F1,329F5,3
18F6,82DF8,729F9,629FD,618F
E,FFFFFF
 1070 DATA osfind,&FFCE,osb
put,&FFD4,osbget,&FFD7,osar
gs,&FFDA,osfile,&FFDD,osrdc
h,&FFE0,osasci,&FFE3,osnewl
,&FFE7,oswrch,&FFEE,osword,
&FFF1,osbyte,&FFF4,oscli,&F
FF7
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

```
10REM**********************
**
20REM
*
30REM Mathematical Curve
*
40REM
*
50REM  By A.J.Reynolds.
*
60REM  (C) ELECTRON USER
*
70REM**********************
**
80MODE2
90REM cursor off
100VDU23,1,0;0;0;0;
110REM setup of variables
120radius=400
130angle=0
140REPEAT
150REM increment angle
160REM the shorter the st
ep
170REM tighter the patter
n
180REM +0.01 is nice
190angle=angle+.1
200x=FNforex
210y=FNforey
220PROCdraw(x,y)
230UNTILFALSE
240END
250REM************
260DEFPROCdraw(x,y)
270REM change colour
280col%=col%+1
290IF col%>6 THEN col%=0
300REM sets graphics  bac
kground
310REM then clears graphi
cs screen
320GCOL0,col%+128
330REM set graphics windo
w
340REM to produce a 200 b
y 200
350REM square
360VDU24,x;y;x+200;y+200;
370CLG
380ENDPROC
390REM************
400REM change formulae fo
r
410REM for different curv
es
420DEF FNforex
430=540-radius*SIN(angle)
440DEF FNforey
450=412+radius*COS(angle)
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

DISCOVER THE ART OF MATHEMATICAL CURVES

MATHEMATICS and art come together in **ANDREW REYNOLDS'** program Mathematical Curve. Well structured and carefully documented with REM statements, it shows how procedures and functions can make a program easy to understand and alter.

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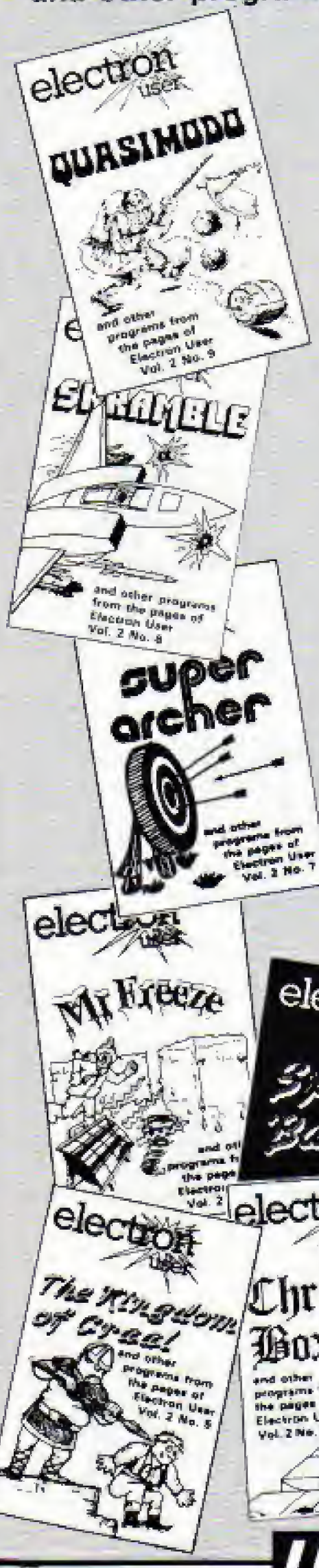


On the June 1985 tape:
QUASIMODO Bellringing classic. **DISASSEMBLER** Machine code utility. **ACTIVITIES** Educational fun. **REFLECT** Aggressive aliens. **ENGINE** Animation. **DODGE** Race track action. **STRINGALONG** Scrolling fun. **CASTLE** Medieval graphics. **MATHS CURVE** Angles and art. **NOTEBOOK** Trees.

On the May 1985 tape:
SKRAMBLE! Compulsive arcade action. **SHEEPNIM** The logic game. **TEXTWRITER** Screen utility. **LIFE** A cultured classic. **CEDRIC** Educational fun. **THREE-D** Outstanding utility. **SPOKES** Fascinating graphics. **MOONORBIT** Heavenly displays. **BLAZON** Heraldic devices. **FLOWERS** A Basic bouquet. **NOTEBOOK** Annotated animation.

On the April 1985 tape:
SUPER ARCHER Target practice. **BINARY SEARCH** Search data efficiently. **JOYPLUS** Switched joystick routine. **ODD ONE OUT** Educational fun. **POLYGONS** 3D rotation. **MONEY CRAZY** Arcade action. **STARCHART** The night sky. **FORTUNE TELLER** Horoscope. **COLLISION DETECTION** Alien encounters. **HILO** Guessing game. **NOTEBOOK** Hello to assembler.

On the March 1985 tape:
MR. FREEZE Ice cube arcade action. **SCREENDUMP** Two procedures for printer dumps. **FILLER** The machine code fill routine. **FRED'S WORD GAME** Educational fun. **BIG LETTERS** Large text utility. **PERCY** Beat the burning fuse. **ANIMATION** Two example programs. **PIGS** Flying bacon. **NOTEBOOK** Display formatting.

On the February 1985 tape:
CRAAL The mystifying maze adventure. **BOUNCY** Addictively annoying action. **PAIRS** Can you remember the cards? **BASE** A Binary/hexadecimal conversion utility. **CATCHER** Collect the eggs before they break. **CLOCK** Time-keeping utility. **RACER** Grand Prix action. **NOTEBOOK** Graphics windows. **TRIG** All the right angles.

On the January 1985 tape:
SPACE BATTLE Destroy the deadly descending aliens! **NEW YEAR** A sound and graphics greeting. **ESCAPE FROM SCARGOV** Minefield action. **PIE CHART** Statistics made simple. **CLAYPIGEON** An Election birdshoot. **ORGAN** Music maestro please! **NOTEBOOK** An original program. **RANDOM NUMBERS** Or not so random! **SNAKES** Reptilian arcade action. **CHEESE RACE** Beat rival mice.

On the December 1984 tape:
CHRISTMAS BOX Align the presents logically. **SILLY SANTA** Sort out the muddle. **SNAP** Match the Xmas pictures. **RECOVERY** The Bad Program message tamed. **CAROL** Interrupt driven music. **AUTODATA** A program that grows and grows. **NOTEBOOK** Simple string handling.

On the November 1984 tape:
STAR FIGHTER Anti-alien missions. **SCROLLER** Wrap around machine code. **URBAN SPRAWL** Environmental action game. **SPELL** Alphabetic education. **JUMPER** Level headed action. **CAESAR** Code breaking broken. **KEYBOARD** Typing game.

On the October 1984 tape:
BREAKFREE Classic arcade action. **ALPHASWAP** A logic game to strain your brain. **SOUND GENERATOR** Tame the Electron's sound channels. **MULTICHARACTER GENERATOR** Complex characters made simple. **RIGEL 5** Out of this world graphics. **MAYDAY** Help with your morse code. **NOTEBOOK** Palindromes and string handling.

On the September 1984 tape:
HAUNTED HOUSE Arcade action in the spirit world. **SPLASH** A logic game for non-swimmers. **SORT SHOWS** How sorting algorithms work. **SORT TIME** The time they take. **CLASSROOM INVADERS** Multicoloured characters go to school. **SAILOR** Nautical antics. **MATHS TEST** Try out your mental powers.

On the August 1984 tape:
SANDCASTLE The Electron seaside outing. **KNOCKOUT** Bouncing balls batter brick walls. **PARACHUTE** Keep the skydivers dry. **LETTERS** Large letters for your screen. **SUPER-SPELL** Test your spelling. **ON YOUR BIKE** Pedal power comes to your Electron. **SCROLLER** Sliced strings slide sideways. **FLYING PIGS** Bacon on the wing.

On the July 1984 tape:
GOLF A day on the links with your Electron. **SOLITAIRE** The classic solo logic game. **TALL LETTERS** Large characters made simple. **BANK ACCOUNT** Keep track of your money. **CHARTIST** 3D graphs. **FORMULAE** Areas, volumes and angles.

On the June 1984 tape:
MONEY MAZE Avoid the ghosts to get the cash. **CODE BREAKER** A mastermind is needed to crack the code. **ALIEN** See little green men - the Electron way! **SETUP** Colour commands without tears. **CRYSTALS** Beautiful graphics. **LASER SHOOT OUT** An intergalactic shooting gallery. **SMILER** Have a nice day!

On the May 1984 tape:
RALLY DRIVER High speed car control. **SPACE PODS** More aliens to annihilate. **CODER** Secret messages made simple. **FRUIT MACHINE** Spin the wheels to win. **CHASER** Avoid your opponent to survive. **TIC-TAC-TOE** Electron noughts and crosses. **ELECTRON DRAUGHTSMAN** Create and save Electron masterpieces.

On the April 1984 tape:
SPACEHIKE A hopping arcade classic. **FRIEZE** Electron wallpaper. **PELICAN** Cross roads safely. **CHESSTIMER** Clock your moves. **ASTEROID** Space is a minefield. **LIMERICK** Automatic rhymes. **ROMAN** Numbers in the ancient way. **BUNNYBLITZ** The Easter program. **DOGDUCK** The classic logic game.

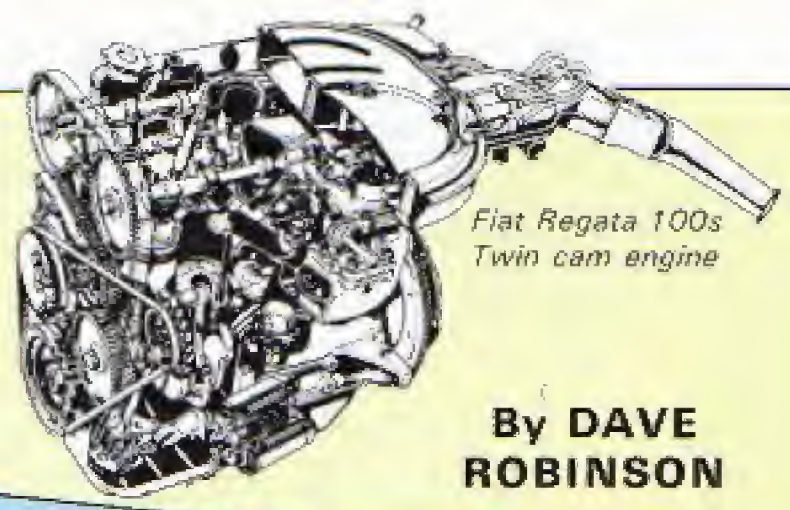
On the March 1984 tape:
CHICKEN Let dangerous drivers test your nerve. **COFFEE** A tantalising word game from Down Under. **PARKY'S PERIL** Parky's lost in an invisible maze. **REACTION TIMER** How fast are you ? **BRAINTEASER** A puzzling program. **COUNTER** Mental arithmetic can be fun! **PAPER, SCISSORS, STONE** Out-guess your Electron. **CHARACTER GENERATOR** Create shapes with this utility.

On the February 1984 tape:
NUMBER BALANCE Test your powers of mental arithmetic. **CALCULATOR** Make your Electron a calculator. **DOILIES** Multi-coloured patterns galore. **TOWERS OF HANOI** The age old puzzle. **LUNAR LANDER** Test your skill as an astronaut. **POSITRON INVADERS** A version of the old arcade favourite.

On the introductory tape:
ANAGRAM Sort out the jumbled letters. **DOODLE** Multicoloured graphics. **EUROMAP** Test your geography. **KALEIDOSCOPE** Electron graphics run riot. **CAPITALS** New upper case letters. **ROCKET, WHEEL, CANDLE** Three fireworks programs. **BOMBER** Drop the bombs before you crash. **DUCK** Simple animation. **METEORS** Collisions in space.

Use the order form on Page 61

ENGINE!



Fiat Regata 100s Twin cam engine

By DAVE ROBINSON

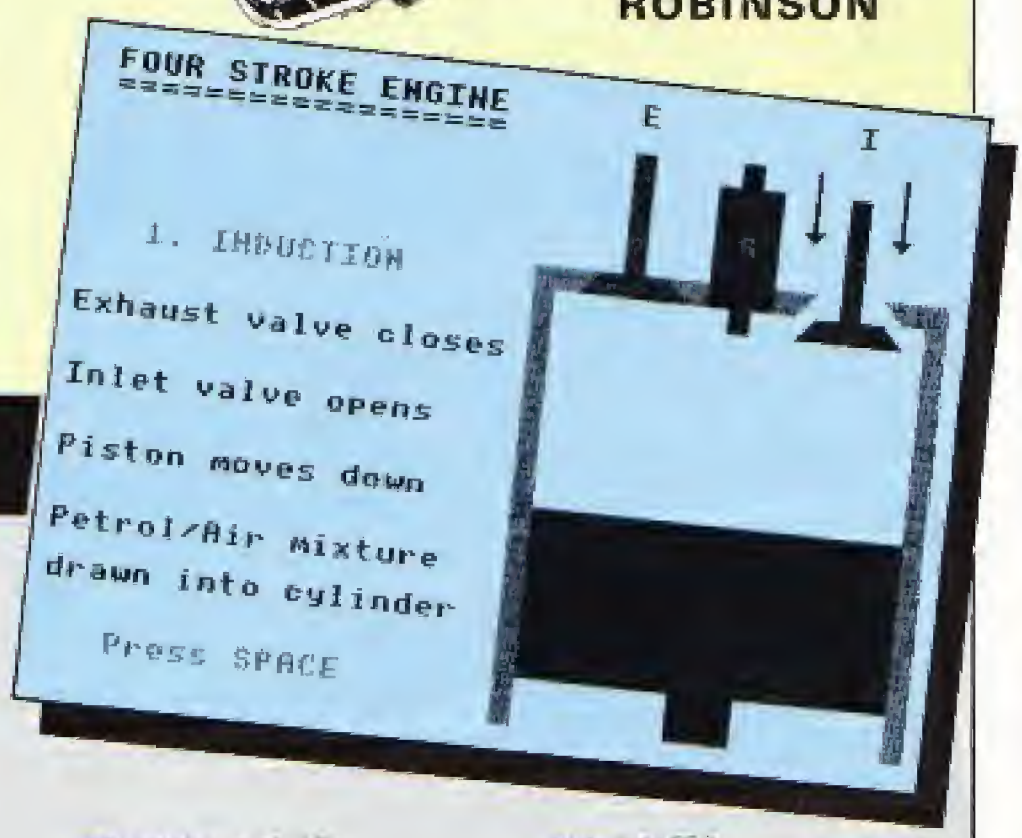
HAVE you ever really understood how a car engine works? Never mind – sit back and let your Electron show you.

The program first draws and names the relevant pieces of machinery involved.

It then runs through the four cycles that make up a petrol driven internal combustion engine.

Each step is clearly labelled. Once you can follow the sequence, things can be speeded up by holding the space bar down continuously.

The program makes extensive use of procedures with lots of meaningful names, and should be easily followed.



Engine listing

```
  10 REM PETROL ENGINE
  20 REM DAVE ROBINSON
  30 REM (C) ELECTRON USER
  40 :
  50 MODE1
  60 ON ERROR PROCerror:EN
D
  70 VDU23,1,0;0;0;0;
  80 PROCchars
  90 PROCtitle
 100 PROCdiagram
 110 REPEAT
 120 PROCengine
 130 UNTIL FALSE
 140 END
 150 :
 160 DEFPROCchars
 170 VDU23,224,255,255,255
,255,255,255,255,255
 180 VDU23,225,255,254,252
,248,240,224,192,128
 190 VDU23,226,128,192,224
,240,248,252,254,255
 200 VDU23,227,255,127,63,
31,15,7,3,1
 210 VDU23,228,1,3,7,15,31
,63,127,255
 220 VDU23,230,24,24,24,24
,24,24,24,24
 230 VDU23,231,24,24,24,24
,255,126,60,24
 240 VDU23,232,24,60,126,2
55,24,24,24,24
 250 A$=CHR$230+CHR$8+CHR$
10
 260 B$=A$+A$
 270 d_arrow$=B$+CHR$231
 280 u_arrow$=CHR$232+CHR$
8+CHR$10+B$
 290 ENDPROC
 300 :
 310 DEFPROCtitle
 320 COLOUR2
 330 PRINTTAB(6,3)"INTERNA
L COMBUSTION ENGINE"
 340 PRINTTAB(6,4)STRING$(
26,"=")
 350 COLOUR3
 360 PRINTTAB(2,8)"A diagr
ammatic explanation of the"
 370 PRINT''"internal worki
ngs of a single cylinder"
 380 PRINT'TAB(2)"from a f
our stroke petrol engine."
 390 PRINTTAB(2,17)"This i
s the type of engine fitted
"
 400 PRINT'" to most motor
 vehicles in use today."
 410 PROCnext(12,26)
 420 ENDPROC
 430 :
 440 DEFPROCnext(AX,BX)
 450 COLOUR1
 460 PRINTTAB(AX,BX)"Press
 SPACE"
 470 REPEAT UNTIL GET=32
 480 ENDPROC
 490 :
 500 DEFPROCdiagram
 510 CLS:COLOUR3
 520 PRINTTAB(1,3)"FOUR ST
ROKE ENGINE"
 530 PRINTTAB(1,4)STRING$(
18,"=")
 540 PROCcylinder
 550 PROCpiston
 560 PROCrod
 570 PROCplug
 580 PROCvalve("I")
 590 PROCvalve("E")
 600 PROCnext(3,28)
 610 ENDPROC
 620 :
 630 DEFPROCengine
 640 PROCinduct
 650 PROCnext(3,27)
 660 PROCcomp
 670 PROCnext(3,27)
 680 PROCignite
 690 PROCnext(3,27)
 700 PROCexhaust
 710 PROCnext(3,27)
 720 ENDPROC
 730 :
 740 DEFPROCcylinder
 750 COLOUR2
 760 PRINTTAB(2,7)"CYLINDE
R"
 770 COLOUR1
 780 VDU7
 790 FORIX=10 TO 28
 800 PRINTTAB(21,IX)CHR$22
4
 810 PRINTTAB(39,IX)CHR$22
4
 820 NEXT
 830 PRINTTAB(22,10)CHR$22
4
 840 PRINTTAB(23,10)CHR$22
5
 850 PRINTTAB(27,10)CHR$22
7
 860 PRINTTAB(28,10)STRING
$(5,CHR$224)
 870 PRINTTAB(33,10)CHR$22
5
 880 PRINTTAB(37,10)CHR$22
7
 890 PRINTTAB(38,10)CHR$22
4
 900 key=INKEY(100)
 910 ENDPROC
 920 :
 930 DEFPROCpiston
 940 COLOUR2
 950 PRINTTAB(2,10)"PISTON
"
 960 VDU7
 970 VDU28,22,20,38,13
 980 COLOUR131
 990 CLS
1000 COLOUR128
1010 VDU26
1020 key=INKEY(100)
1030 ENDPROC
1040 :
1050 DEFPROCrod
1060 COLOUR2
1070 PRINTTAB(2,13)"CONNEC
TING ROD"
1080 VDU7
1090 VDU28,29,28,31,21
1100 COLOUR131
1110 CLS
1120 COLOUR128
1130 VDU26
1140 key=INKEY(100)
1150 ENDPROC
1160 :
1170 DEFPROCplug
1180 COLOUR2
1190 PRINTTAB(2,16)"SPARKI
NG PLUG"
1200 VDU7
```

Turn to Page 48

Classroom Computing on the Electron

To meet the ever-growing demand for educational programs on the Electron, one of the best-selling educational packages for the BBC Micro has now been adapted and enhanced for Electron users.

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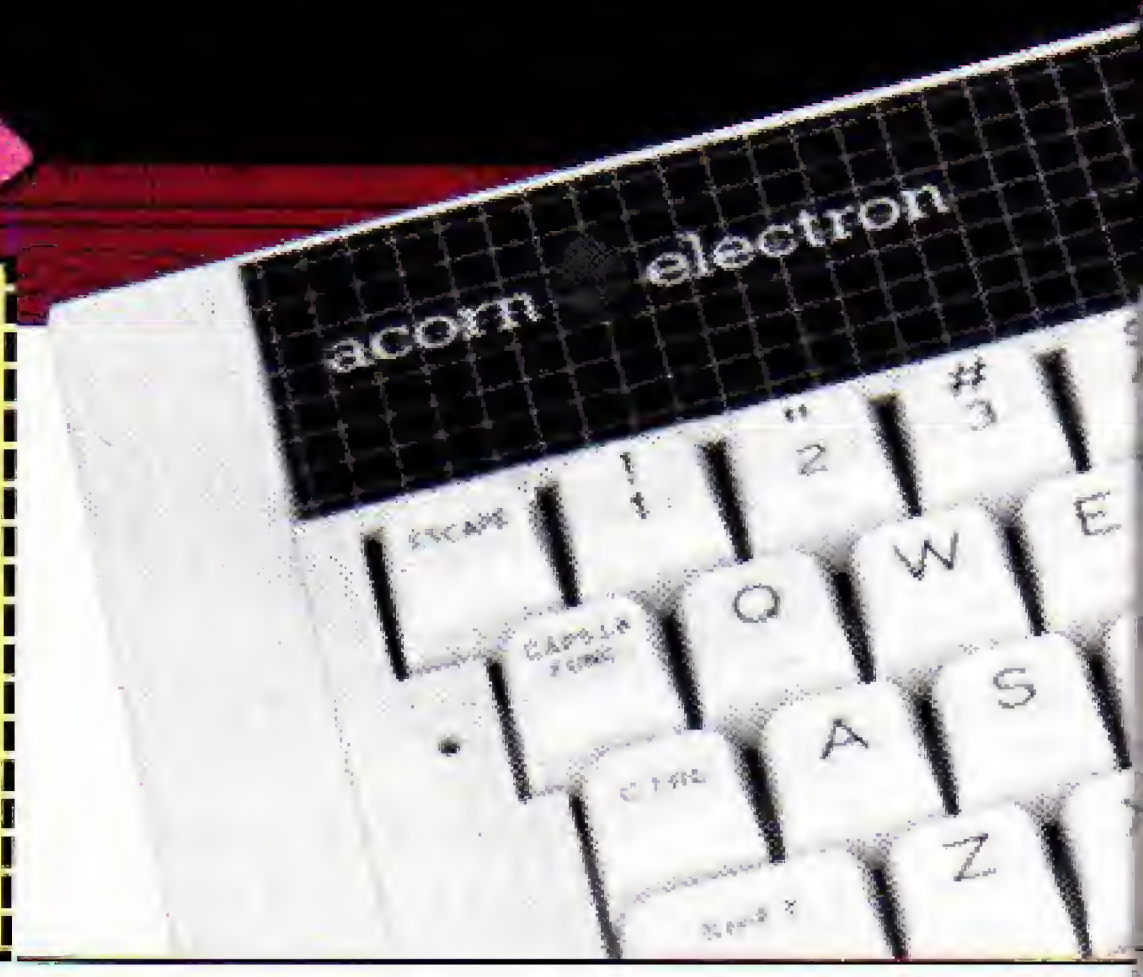

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Tumult: *Helps with elementary multiplication of two digit numbers – in particular where there are 10s to carry.*

Calculator: Sums at a stroke! We turn your micro's screen into an easy-to-use calculator.

Table Mountain: Despite ever-changing fashions in maths teaching, tables still have to be learned. This program adds a lively new dimension to what is all too often tedious rote.

Gottit!: An intriguing two player word guessing game packed full of educational potential. Has three levels of difficulty.

House: Gentle, pictorial word, number and colour recognition for the very early reader or for those with learning difficulties.

Gallery: Based on a shooting gallery, this typing tutor will not only have parents, teachers and children touch-typing with ease – it's fun, too!

Whatnumber?: "I'm thinking of a number" is a well known classroom standby. We've taken it much further in this computer version, giving children far more flexibility in their strategy.

Bridge Breaker: Find the hidden word before it is too late. This is an exciting and novel way to reinforce vocabulary and spelling skills.

Snap: Practice vital pre-reading skills with this letter and number recognition game. Also helps develop coordination.

Manipulation: This is a compulsive and thought-provoking maths game. Given the four rules of number and three integers to work with, how close can you get to the target number?

Matrices: Takes the calculations out of matrix manipulation, leaving the student free to understand the underlying concepts. *(To obtain the fullest benefit from this program see The Micro User Education Special.)*

Hidden Answers: Designed to help primary school children understand a maths learning technique called mapping maths. It explores the ideas of mapping with the use of simple number bonds.

Curvefit: Drawing lines of best fit between points, this program will find applications from the infants' class to the sixth form.

Engine listing

From Page 45

```
 1210 COLOUR3
 1220 VDU26,29,18,31,6
 1230 COLOUR131
 1240 CLS
 1250 VDU26
 1260 COLOUR128
 1270 PRINTTAB(30,5)CHR$224
 1280 PRINTTAB(30,11)CHR$22
4
 1290 COLOUR1:COLOUR131
 1300 PRINTTAB(30,8)"S"
 1310 COLOUR128
 1320 key=INKEY(100)
 1330 ENDPROC
 1340 :
 1350 DEFPROCvalve(A$)
 1360 VDU7
 1370 COLOUR2
 1380 IF A$="I"THEN PRINTTA
B(2,19)"INLET VALVE"ELSE PR
INTTAB(2,22)"EXHAUST VALVE"
 1390 IF A$="I" THEN X%=35
ELSE X%=25
 1400 FOR I%=6 TO 11
 1410 PRINTTAB(X%,I%)CHR$22
4
 1420 NEXT
 1430 PRINTTAB(X%-1,11)STRI
NG$(3,CHR$224)
 1440 PRINTTAB(X%-2,11)CHR$
228
 1450 PRINTTAB(X%+2,11)CHR$
226
 1460 PRINTTAB(X%,3)A$
 1470 key=INKEY(100)
 1480 ENDPROC
 1490 :
 1500 DEFPROCclear
 1510 VDU28,0,30,20,6
 1520 CLS:VDU26
 1530 ENDPROC
 1540 :
 1550 DEFPROCinduct
 1560 PROCclear
 1570 FOR I%=5 TO 7
 1580 PRINTTAB(23,I%)SPC1
 1590 PRINTTAB(27,I%)SPC1
 1600 COLOUR1
 1610 NEXT
 1620 PRINTTAB(3,10)"1. IND
UCTION"
 1630 COLOUR2
 1640 PRINTTAB(0,13)"Exhaus
t valve closes"
 1650 PROCclose("E")
 1660 PRINTTAB(0,16)"Inlet
valve opens"
 1670 PROCopen("I")
 1680 PRINTTAB(0,19)"Piston
 moves down"
 1690 PROCdown
 1700 COLOUR2
 1710 PRINTTAB(0,22)"Petrol
/Air mixture"
 1720 PRINTTAB(0,24)"drawn
into cylinder"
 1730 PROCin
 1740 ENDPROC
 1750 :
 1760 DEFPROCcomp
 1770 PROCclear
 1780 FOR I%=5 TO 7
 1790 PRINTTAB(33,I%)SPC1
 1800 PRINTTAB(37,I%)SPC1
 1810 NEXT
 1820 COLOUR1
 1830 PRINTTAB(3,10)"2. COM
PRESSION"
 1840 COLOUR2
 1850 PRINTTAB(0,13)"Inlet
valve closes"
 1860 PROCclose("I")
 1870 PRINTTAB(0,16)"Piston
 moves up"
 1880 PRINTTAB(0,18)"mixtur
e compressed"
 1890 PROCup
 1900 ENDPROC
 1910 :
 1920 DEFPROCignite
 1930 PROCclear
 1940 COLOUR1
 1950 PRINTTAB(3,10)"3. IGN
ITION"
 1960 COLOUR2
 1970 PRINTTAB(0,13)"Electr
icity to plug"
 1980 PRINTTAB(30,1)d_arrow
$
 1990 key=INKEY(100)
 2000 PRINTTAB(0,16)"Mixtur
e ignited"
 2010 GCOL0,1
 2020 FOR I%=752 TO 1254 ST
EP56
 2030 MOVEI%,600
 2040 DRAW972,632
 2050 NEXT
 2060 FOR I%=4 TO 7
 2070 SOUND0,-15,I%,2
 2080 NEXT
 2090 key=INKEY(100)
 2100 PRINTTAB(0,19)"Piston
forced down"
 2110 PRINTTAB(0,21)"by exp
anding gases"
 2120 PROCdown
 2130 ENDPROC
 2140 :
 2150 DEFPROCexhaust
 2160 PROCclear
 2170 FOR I%=1 TO 3
 2180 PRINTTAB(30,I%)SPC1
 2190 NEXT
 2200 PRINTTAB(23,12)SPC15
 2210 COLOUR1
 2220 PRINTTAB(3,10)"4. EXH
AUST"
 2230 COLOUR2
 2240 PRINTTAB(0,13)"Exhaus
t valve opens"
 2250 PROCopen("E")
 2260 PRINTTAB(0,16)"Piston
 moves up"
 2270 PROCup
 2280 COLOUR2
 2290 PRINTTAB(0,19)"Burnt
mixture out"
 2300 PRINTTAB(23,5)u_arrow
$
 2310 PRINTTAB(27,5)u_arrow
$
 2320 ENDPROC
 2330 :
 2340 DEFPROCclose(A$)
 2350 IF A$="I" THEN X%=35
ELSE X%=25
 2360 PRINTTAB(X%-2,11)SPC5
 2370 PRINTTAB(X%,5)CHR$224
 2380 PRINTTAB(X%-1,10)STRI
NG$(3,CHR$224)
 2390 COLOUR129
 2400 PRINTTAB(X%-2,10)CHR$
228
 2410 PRINTTAB(X%+2,10)CHR$
226
 2420 COLOUR128
 2430 key=INKEY(100)
 2440 ENDPROC
 2450 :
 2460 DEFPROCopen(A$)
 2470 IF A$="I" THEN X%=35
ELSE X%=25
 2480 PRINTTAB(X%,5)SPC1
 2490 PRINTTAB(X%-2,10)SPC2
;TAB(X%+1,10)SPC2
 2500 COLOUR1
 2510 PRINTTAB(X%-2,10)CHR$
225
 2520 PRINTTAB(X%+2,10)CHR$
227
 2530 COLOUR2
 2540 PRINTTAB(X%-1,11)STRI
NG$(3,CHR$224)
 2550 PRINTTAB(X%-2,11)CHR$
228
 2560 PRINTTAB(X%+2,11)CHR$
226
 2570 key=INKEY(100)
 2580 ENDPROC
 2590 :
 2600 DEFPROCdown
 2610 COLOUR3
 2620 FOR I%=13 TO 19
 2630 SOUND1,-15,I%+50,2
 2640 VDU28,22,I%,38,I%
 2650 COLOUR128:CLS
 2660 VDU28,22,I%+7,38,I%+7
 2670 COLOUR131:CLS
 2680 key=INKEY(5)
 2690 NEXT
 2700 key=INKEY(100)
 2710 VDU26:COLOUR128
 2720 ENDPROC
 2730 :
 2740 DEFPROCup
 2750 COLOUR3
 2760 FOR I%=19 TO 13 STEP-
1
 2770 SOUND1,-15,I%+50,2
 2780 VDU28,22,I%,38,I%
 2790 COLOUR131:CLS
 2800 VDU28,22,I%+7,28,I%+7
 2810 COLOUR128:CLS
 2820 VDU28,32,I%+7,38,I%+7
 2830 COLOUR128:CLS
 2840 key=INKEY(5)
 2850 NEXT
 2860 key=INKEY(100)
 2870 VDU26:COLOUR128
 2880 ENDPROC
 2890 :
 2900 DEFPROCin
 2910 PRINTTAB(33,5)d_arrow
$
 2920 PRINTTAB(37,5)d_arrow
$
 2930 ENDPROC
 2940 :
 2950 DEFPROCerror
 2960 VDU22,6
 2970 IF ERR=17 THEN END
 2980 REPORT:PRINT" at line
";ERL
 2990 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

Micro Messages

The Elite way to become Deadly!

I HAVE compiled a list of tips for Elite players who are just starting out.

As soon as you have 1000 credits, buy a front beam laser. You will get 400 credits refunded for the pulse laser.

Replenish your credits back to 1000 credits, then buy an extra cargo bay. This will extend your capacity from 20 tonnes to 35 tonnes, thus increasing the profit on each trip.

Soon after those, both docking computers and an Energy unit are musts.

Never, once you have got your amount of credits above 400, let it fall down below 400 when buying extra equipment because (unless you bought your cargo first) you will not have enough money for a profitable amount of cargo.

Unless you know it is a meteor (asteroid) never shoot anything inside the Safety area. Otherwise the vipers get kill-happy and won't let you dock with a docking computer, or manually (I think).

As soon as you have a beam laser, instead of hyperspacing straight after you get out of the Coriolis, when you get out of the Coriolis, speed right up, switch to rear view, do a loop until the planet is full on your rear view.

Switch to market price or Data on system etc, then wait for the S to disappear, then Front view and Jump until something appears on your scanner.

Blast it, make sure you're going away from the planet again and repeat.

This, within a short time, will push your rating up to Above Average.

If you ever get into trouble, for example, Shields Down, hyperspace to the next system, unless the planet is Anarchy or Feudal. In that case, alter it to a safer one. Or, if nothing is on your scanner, in that case slow right down and drift until shields are up again.

I hope that helps the potential combateers.

It should. I'm Deadly, soon to be Elite (hopefully!!) – **David Kennedy, Teignmouth.**

How do I keep it secret?

I HAVE been computing for only a short time and would like to learn program security – how I can stop people being able to break into my programs and see what I've written? – **D.S. Leng, Cottingham, N. Humberside.**

● Add the following line to your program:

```
1 REM ...............
```

and enter in direct mode.

```
?(PAGE+15)=21
```

This will poke character 21, which disables the VDU, into the first line.

Adding *FX200,3 will disable the Escape and Break keys. Your programs should now be quite secure.

A bug down in the Valley

I HAVE written to Electron User once before, giving some suggestions to improve the magazine (glad to see that Merlin has finally started a column).

It is Justin Leese's letter in the March issue of Electron User which has inspired me to write again.

He tells Katy King and the rest of us that we should SAVE our initial position on Twin Kingdom Valley, and so, when we die, we could simply LOAD this position in the computer, reducing the time of waiting between games.

Is this a theory or has he tested it? On my copy of the game, and other people's, a saved position will not re-load.

I have not yet solved the adventure, but I now know how to and a saved position seems essential. HELP! – **David Thompson, Sale, Cheshire.**

● I have noticed recently in Micro Messages and my own mail that readers are having difficulty loading and saving their position in Twin Kingdom Valley.

On the review copy I received from Bug-Byte the commands used are *SAVE and *LOAD to save and restore your position.

These commands are documented in the cassette insert and worked perfectly at all times.

I have now finished the game and probably would not have done so had the commands not worked.

I suggest that if anyone has problems with these commands still not working they presumably have a faulty copy and should contact Bug-Byte on 051-709 7071 who will I'm sure be happy to organise a replacement. – **Merlin.**

SLEEPLESS KNIGHTS!

FOR the third time my wife called down: "Are you coming to bed or are you sleeping down there again tonight?"

*The time was 1.30am. The game was Acornsoft Chess. I had been waiting 45 minutes for my Electron to make the next obvious (indeed the **only**) move to avoid checkmate.*

In sheer desperation – and to prevent further domestic trauma – I pressed Escape, got the Main Menu, switched to Player vs. Player, switched back to the Chess Board and made the obvious move for the poor comatose computer. But I did not get the message.

On resuming the vs. Computer game, with no word of thanks for my help, it went back into its slothful routine of a move about every 45 minutes. (Castling took about 50 minutes.)

I have tried everything to speed up a game of chess with Acornsoft Chess – playing at all levels, switching levels during a game, cursing, making stupid moves which a normal opponent would pounce on right away, cheating, typing in derogatory messages – all to no avail.

Acornsoft Chess still plods on its weary come-back-tomorrow pace.

Perhaps one of your more experienced readers might devise a way of speeding up the computer chess moves.

Or, better still, perhaps Acornsoft will issue another Chess program more suited to ageing chaps like myself who have not all that much time left in which to play computer chess. – **V.J. Horgan, Didcot, Oxon.**

● On the higher levels it is rather slow, but is pretty quick on level 0 or 1.

Ghouls have me fooled . . .

COULD you tell me how to get the treasure and to get on to the rest of the screens in Micro Power's Ghouls? I have tried and tried without success. – **Paul Godley.**

● Can any of our readers help?

No joy with the joystick

AFTER buying a Plus 1 for my Electron, along with a Voltmace Delta 14b joystick, I was disgusted to find that the joystick did not work on two of my favourite games – Elite and Zalaga.

Both these games stated that it was possible to use a joystick.

I obviously thought it must be a fault in the Plus 1 of the joystick, but when I returned the equipment to the shop where I bought them, there were no faults to be found.

Does this mean that programmers are getting lazy?

Will there be more half-finished games in the future? – **Robert Cope (age 13), Chelmsford, Essex.**

● Both programs have bugs in which prevent joysticks being used.

You're right to be annoyed, as these bugs should have been spotted before the programs were released. However, even the experts make mistakes occasionally.

Even numbers are odd . . .

I MAY sound sarcastic, but I must complain about two letters (Electron User April issue).

First of all, J. Gooding, you can't have 59,528 on Guardian because 28 is not possible. 20, 25 or 30 is OK, but no even numbers are possible unless they go up in tens.

Also, D.M. Bell, of Manchester, the reason why Elite is so inferior is because the Electron has less memory available than the BBC.

By the way here are my highest scores:

Guardian, 28,060.

Danger UXB, 147,010.

Felix In The Factory 7,440.

– **Tim Hier (age 13), Pembrey, South Wales.**

Frustration is overcome

WHEN writing programs in the graphic modes, it can be frustrating to try making sense of your listing when the size of the character set makes it hard to read and edit.

Mode 6 provides the most legible writing, but changing back to this mode each time is time-consuming.

The following program overcomes this problem by inserting control codes into the first line of the program which will change to mode 6, with a blue background, and paged mode on, whenever the program is LISTed.

Also, to overcome the problem of losing the top line of the display, control code 10 is inserted before the program is listed, which moves the display down by one line.

Lastly, as a reminder that the line is still in memory, a short message is shown at the head of the listing.

To produce this effect, first type in the following program carefully, making sure that no spaces lie between the line number 0, and the REM statement, nor between the REM and the series of numbers that follow it.

If this is not done, it will result in a "Bad program" error when the program is RUN.

```
   0REM12345678901FIRST LI
NE IN USE
   10P%=PAGE+6
   20FOR A%=1 TO 10
   30READ byte
   40[ EQUB byte:]
   50NEXT
   60DATA22,6,19,0,4,0,0,0,
14,10
```

Now RUN the program, and the screen will display an assembly listing. The program should now be ready, so test it by typing LIST. The effects of the program should now be apparent.

Delete lines 10 to 60, and SAVE line 0 for future use by typing:

SAVE "line.0".

To insert this line into other programs, first make sure your own program does not already include a line 0, as this will cause later confusion.

Now to combine the two programs, type:

```
LOAD "line.0"
PRINT~TOP-2
*LOAD "XXXX" SSS
```

Where XXXX is the file name of your program, and SSS is the result that you should have obtained from TOP-2. The two programs should now be combined, and typing LIST when in any mode should produce a clear and legible listing. – **Stephen Harrop, Radyr, Cardiff.**

I thought I'd go mad . . .

MANY, many thanks for your help with Mr Freeze (March Electron User). I thought I'd go mad typing it in, but your comments helped me find and correct my mistakes.

I don't know which is better, the game (which is great), or the feeling of accomplishment when it actually ran! Again, thanks. – **Cliff Holmes, Rotherham.**

● It's nice to hear from someone we've helped. Believe us, we know all too well how frustrating it can be, typing in listings. We do our best to help everyone who writes, but we need two things. The first is a stamped addressed envelope, the second is patience!

Title pages – my method

I HAVE always been envious of the title pages used by games on the Sinclair Spectrum.

I didn't want to let my friends get away with this so I came up with a method similar to the Spectrum's method. It is used by the Island and Planets programs on the Introductory cassette.

It is fairly simple. All you do is save the screen memory direct to cassette.

As the length of the screen memory varies from mode to mode, it goes like this:

*Mode 0,1,2 = *SAVE 3000 8000*

*Mode 3 = *SAVE 4000 8000*

*Mode 4,5 = *SAVE 5800 8000*

*Mode 6 = *SAVE 6000 8000*

Firstly though you have to draw the picture you want to save and in the same mode with the picture on screen, type the relevant command above.

In Modes 0, 1 and 2 it takes a long time as the screen memory is 20k long. It may be better with a disc drive connected. – **Robert Fothergill, Redditch, Worcs.**

Solved

IN regard to Polygons (Electron User April issue) I would be grateful if you could explain where is the VDU25 that

DON'T GIVE UP – IT WORKS!

I'VE finally worked out how to get the Galactic Hyperspace in Elite to work!

Press F6 (local chart) and make sure the cursor is positioned at the planet you are presently at.

After that, press the buttons Caps Lk Func, Ctrl and H simultaneously and very quickly.

Keep pressing the buttons rapidly until the message "Galactic Hyperspace" appears. You may get times when you think it's not going to work and your fingers are killing you – but don't give up, it will work eventually.

If this ever happens, and it usually does, it helps to change the screen or view after a few rapid bursts of pressing the buttons.

That is – after pressing F6 (local chart) press the buttons very quickly about 20 times and if it still doesn't work press F4 (right view) and press buttons again.

If still no response, change view once again and press buttons.

Like I said before, don't give up – it will work.

One more thing. Don't worry if the message "Hyperspace range" comes up. It always does – so just keep on hitting those keys. – **Colin Harris, Stoke Newington.**

actually draws the figures in the listing given on Page 56? – **R.A. Smith, Camberley, Surrey.**

● Line 780 is the machine code equivalent of VDU25.

A Top Ten for games?

THANK you for a great magazine – but please can we have more!

For example, a software chart of the top-selling 10 or 20 games. A hall of fame where readers can send in their best scores. Readers' tips on how to do well at certain games (for example, Elite and Guardian). And more reviews on the hardware and software being produced for the Electron.

Can you tell me: Would it be possible to use Acorn's Plus 3 in conjunction with First Byte's joystick interface? – **Steven Haig (age 15), Stockport.**

● Unfortunately both the Plus 3 and the First Byte interface use the same area of memory, causing problems if they are both used at the same time.

Either can be used separately, though.

The Plus 3 can be disabled with *NOADFS allowing the interface to be used.

Riddle of the Lost Bracket

SURELY there's a mistake in April's Game of the Month? In the listing line 1670 reads:

```
x=arrowdev(play,arrow
```

Surely there should be a bracket at the end as in:

```
x=arrowdev(play,arrow)
```

– **Dean Warner, Peterborough.**

● Sadly, your are right. The listing was all right when it left the editorial office (all our listings are taken from working programs). However, somewhere between here and your magazine the bracket went walkabout.

So far we've had no reports of its progress but we're dreading its arrival in another program!

Our apologies to our readers and Ian Brown, the author.

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

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

Now's here is your opportunity to share your experiences.

Remember that these are the pages that you write yourselves. So tear yourself away from your Electron keyboard and drop us a line. And please, if you want a reply, enclose an SAE. The address is:

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

Attack – in slow motion

I RECENTLY bought Cylon Attack by A&F Software for my Electron.

The program was written for the BBC Micro, but I found it worked fantastic with my Electron.

Because of this I bought Chuckie Egg and Painter by A&F for the BBC 32k.

When I loaded them into my Electron they worked – but are so slow that they are virtually unplayable.

As I bought them from a clearance sale on a "no return" basis I was disappointed by having spent my money on two very good but slow pieces of software.

Can you tell me of any routine which I could enter before loading these programs to make them faster?

The only routine I know and have tried is setting the auto repeat to the fastest rate and loading the programs, but this was unsuccessful.

It would be a good idea if readers suggested ways of speeding up slow BBC software and telling other readers which software works. – **Mansoor, Hafesowen, West Mildlands.**

● The Electron can't be made to run as fast as the BBC, unfortunately.

The simple answer is to buy Electron software – this will run at the correct speed.

By all means borrow BBC software from friends, but don't buy any without seeing it running. Then you know what it's like.

A question of education

I BOUGHT an Electron 15 months ago hoping to help my sons' education as well as for its entertainment value.

While it has obviously been of assistance in their computer studies, I have been unsuccessful in obtaining any software of an O or A-level standard.

I have seen one mentioned in the December 1984 issue of Electron User – Micro English produced by L.C.L, but have been unable to obtain their address.

Is it, as a non-user, that I do not know what to look for, or is there very little good O and A-level software about? – **M.K. Pelling, St. Leonards-on-Sea, Sussex.**

● Most educational software is written for the BBC Micro, but some has been converted for the Electron, though. L.C.L. is at 26 Avondale Avenue, Staines, Middlesex.

Don't make my mistake!

I AM writing to warn other readers about the mistake that I made. I was writing the program for Mark Frost, who requested a rotating circle in the April edition of Electron User.

My friend asked me why integer variables are faster and I demonstrated by allocating values to A% variable and a normal one.

I pressed Break and called up each variable and showed him how it no longer had the normal variable in memory.

Then to my amazement I discovered the program was now unlistable. Is there any explanation for this?

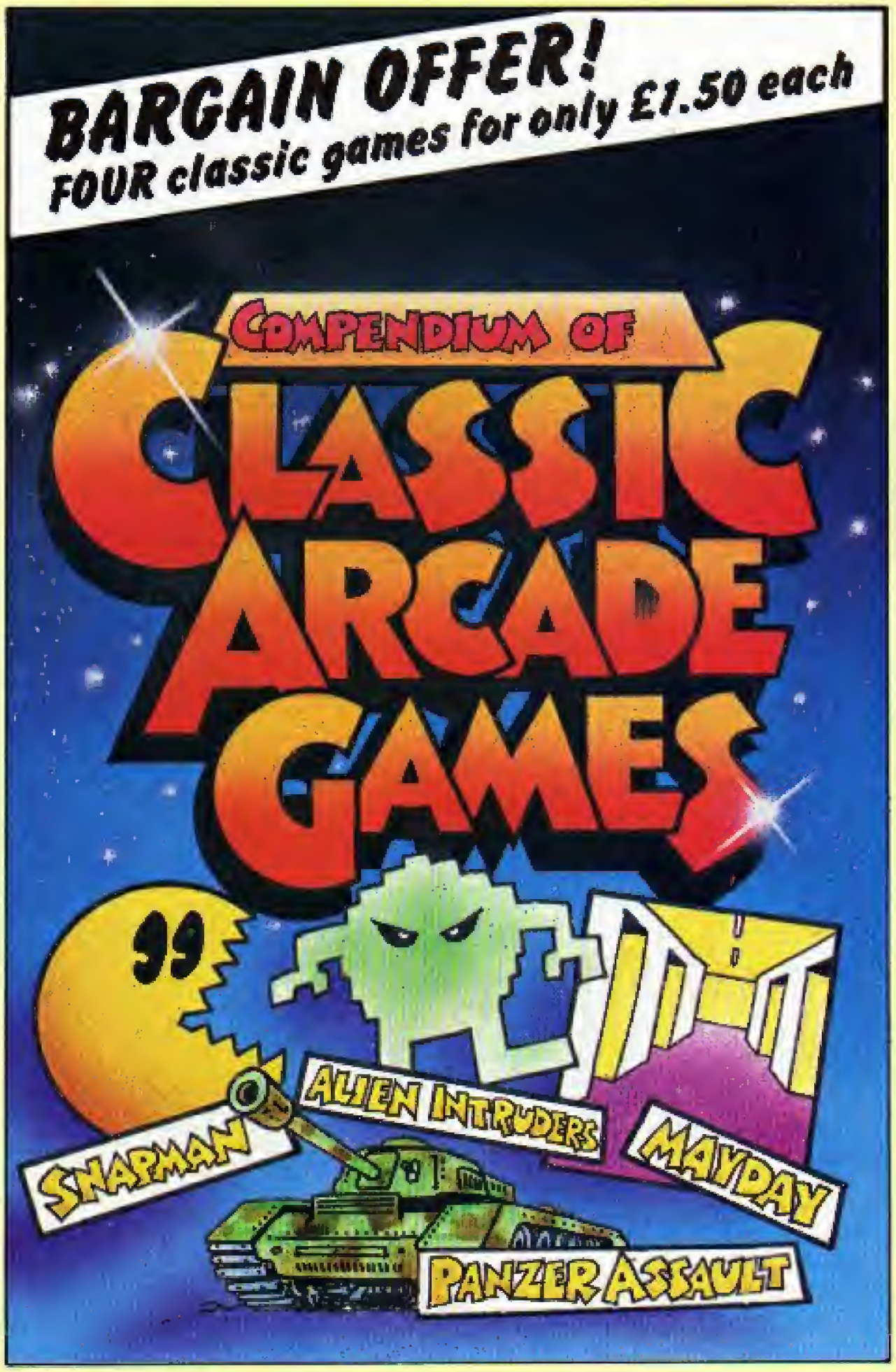
*Incidentally, if anyone wants to protect their programs *FX200,1 makes it inescapable and *FX200,3 makes it inescapable and when broke inlistable. So if you use these codes always SAVE before running.*

I wasn't quite sure what Mark meant about a rotating circle so I have written a rotating disc. If you look closely the effect can be quite good. – **Paul Golding, Winchmore Hill, London.**

● We don't know why you couldn't list your program. We couldn't reproduce the fault.

```
  10 REM **ROTATING DISC**
  20 REM By Paul Golding 1
985
  30 REM When the program
is run the building of each
 seperate frame takes a whi
le,so you must wait 50 seco
nds before you can see anyt
hing
  40 REM it will run faste
r on the BBC Computer
  50 MODE 2
  60 VDU 23,1,0;0;0;0;
  70 FOR XX=1 TO 11
  80 VDU 19,XX,0;0;
  90 NEXT
 100 CX=1:RX=500
 110 FOR BX=1 TO 11
 120 MOVE 640,1012
 130 GCOL 0,CX
 140 FOR A=0 TO 2*PI STEP
0.25
 150 DRAW 640+RX*SIN(A),51
2+500*COS(A)
 160 NEXT
 170 CX=CX+1:RX=RX-50
 180 NEXT
 190 FOR XX=1 TO 11
 200 VDU 19,XX,7;0;
 210 PROCpause
 220 VDU 19,XX,0;0;
 230 NEXT
 240 FOR XX=11 TO 1 STEP -1
 250 VDU 19,XX,7;0;
 260 PROCpause
 270 VDU 19,XX,0;0;
 280 NEXT
 290 GOTO 190
 300 END
 310 DEF PROCpause
 320 FOR X=1 TO 50:NEXT
 330 ENDPROC
```

Here's something SPECIAL from



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'Each player is shown with three digits below him relating to skill, accuracy and stamina in the range 1-5. To start off with each man has 3-3-3, giving him a total of 9. So the total for your team is 11x9..99. This total of 99 cannot be exceeded, but the object is for you, the manager, to formulate your winning team using the best possible combinations of positions and skills.'

'Of course, as a professional footballer, injuries sustained by myself and team-mates often had a great influence on the outcome of the game. So, to create even more realism, you may add optional 'injuries' to the game, which are allocated randomly to each team by computer...hold your breath as your star forward swivels to shoot or goes in for a hard tackle!'

'Once your team is formulated, you are ready to move on from the *Management Module* to Module II–*Match Play*.'

'With realistic 3D view of the pitch from the 'TV Camera' position the game really comes to life. From the kick off every moment of the match unfolds realistically, with throw-ins, goal kicks, corner kicks, passing and shooting.'

'The game can be played by 2 people, 1 person v the computer or computer v computer. If the game is player controlled your joystick will control one man at once. Pressing the fire button enables you to change player...or, if the opposition are attacking your goal, to the goalkeeper.'

'If a player is in possession of the ball the fire button initiates a pass or a shot. Control the accuracy and strength of the pass or shot by the extent of joystick movement and the height of the kick by the length of time that the fire button is depressed... from a Bobby Charlton cannonball shot, to a carefully flighted Bryan Robson through-ball! Although you have set the skill, accuracy and stamina levels of your players during the *Manager Module*, the more a player is involved in the game, the more energy he uses...his stamina level falls and he runs more slowly! Then, when the player is not under joystick control, his stamina slowly builds up again.'

'If the game is under computer control, one or both teams are played entirely by computer. Under joystick control the player controls one man at a time, whilst the computer provides intelligent action for the other 10.'

'The skill level you have chosen affects the success of tackles, the accuracy level and the direction of the ball when kicked...what could be more realistic than the Bobby Charlton Soccer Game from DACC?'

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ACTIVITIES

By MIKE PLUMMER

As it stands Activities is an educational program for use by younger school children. It could, however, be modified so that it could be an asset to older children as well.

It has been used by the teachers at my children's school in a slightly modified form on their disc based BBC Micros, and they tell me it is useful and well liked (although maybe they're just being polite).

The idea is to test a child's powers of observation and association.

The Electron selects a random activity from a list and draws some items on the screen which are associated with that activity. It also draws some irrelevant items.

The child's task is to decide which items are relevant and select them by pressing number keys 1-6.

If the selected item is relevant then it's ticked and the computer plays a chord, otherwise the drawing is crossed out and the computer makes a rude noise.

When the child thinks that he or she has all of the right items selected then they can press the F key, whereupon the computer will assess how well they have done.

Any drawings which should have been selected but were not are left on the screen, along with a comment. All irrelevant or correctly selected ones are rubbed out.

After 10 activities (none of which are the same), a score sheet is printed and another turn is invited.

The initial instruction page can be returned to at any time by pressing the Escape key and the sound effects can be turned on or off whenever the computer is expecting a key to be pressed.

Although this all sounds very daunting, in fact most children seem to be able to use the program easily and enjoy doing so.

My children run it on our Electron, but the program was originally written on a BBC, and because I am a lazy typist I'm afraid that the variable and procedure names are in upper case.

Also, because memory is at such a premium in the otherwise superb BBC/Electron computers, the variable and procedure names are rather cryptic.

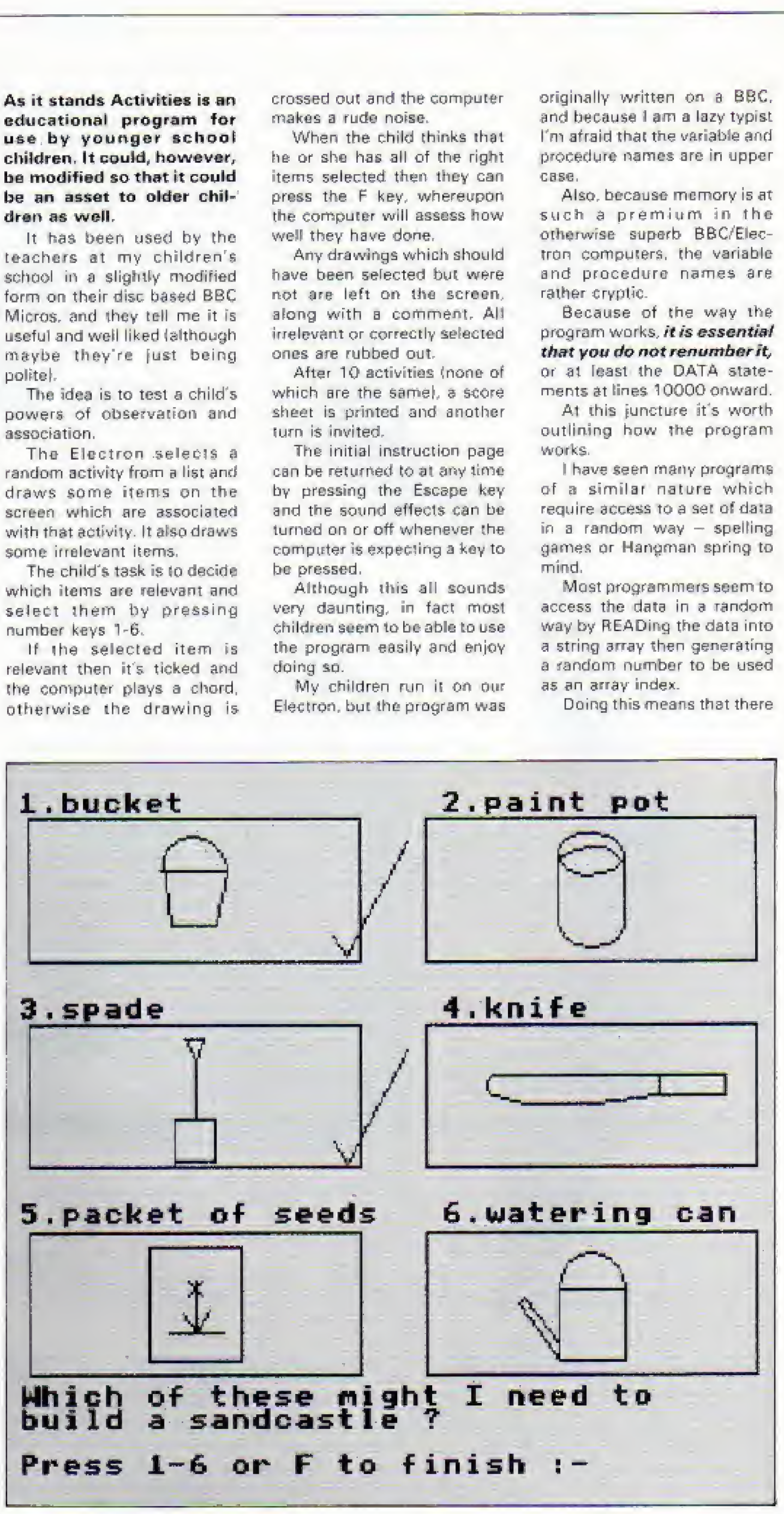
Because of the way the program works, ***it is essential that you do not renumber it,*** or at least the DATA statements at lines 10000 onward.

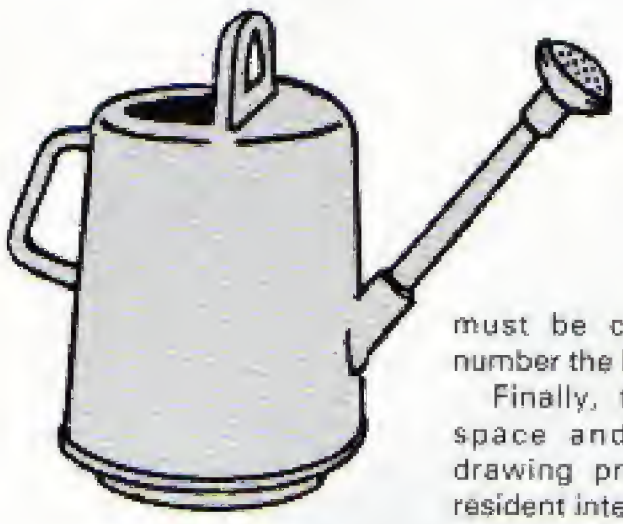
At this juncture it's worth outlining how the program works.

I have seen many programs of a similar nature which require access to a set of data in a random way – spelling games or Hangman spring to mind.

Most programmers seem to access the data in a random way by READing the data into a string array then generating a random number to be used as an array index.

Doing this means that there





are two copies of the data in the aforementioned limited Acorn memory. (When is some bright spark going to bring out a main RAM expansion for the Electron, like there is for the BBC?)

Because it is possible in BBC Basic to use the RESTORE statement using a variable or an expression rather than a line number, any DATA statement can be READ by setting the value of the variable to the line number of the DATA statement that you want.

It looks tricky, but in fact is very easy. This means that you must be careful how you number the DATA statements.

Finally, to save memory space and speed up the drawing process a bit, the resident integer variables have been used to some degree.

As I have already hinted, it is possible to add extra activities and drawings to the list or create a completely different one.

To create a new activity you must add a new DATA statement as follows (numbers are counted from 0):

```
100nn DATA activity
name,n1,n2...ni,*
```

where nn is the number of the activity and n1,n2 etc are the numbers of the associated items.

There can be from one to six items in the list. The asterisk at the end is to tell the computer there are no more items in the list.

Line 19999 with the hash sign must be present to show there are no more lists. Each individual drawing is defined as shown:

```
200nn0 DATA item
name,M,x,y,D,x,y,E,x,y,r1,r
2,a1,a2...,*
```

where nn is the item number and x and y are the coordinates of a 500 x 200 grid on which the item is drawn. The graphics interpreter reads these codes as follows:

M,x,y: Moves the graphics cursor to x,y without drawing.

D,x,y: Draws a line to x,y from the last graphics point.

E,x,y,r1,r2,a1,a2: Draws part of an ellipse with centre x,y, radii r1,r2 starting at angle a1 and finishing at angle a2.

The angles are measured in radians and increase anti-clockwise with 3 o'clock being zero.

These codes may be in any order, but there is no error trapping, so they must be correct.

The asterisk at the end of the statement is to indicate the end of the drawing. If the codes will not all fit into one DATA statement they may be continued into another one, although the line number for this must be less than 10 more than the initial one (for example, see lines 20100 and 20102).

The final DATA statement with the # indicates no more drawings are present, and it must be there.

If some clever dick of a little Johnnie points out that a so called irrelevant item goes with an activity, just add its number to the activity list.

Activities listing

```
  10REM ACTIVITIES
  20REM (C) Electron User
1985
  30REM by Mike Plummer
  40ON ERROR GOTO 1420
  50MODE 6:PROCSETUP
  60DIM AN%(5),QU%(5):LST$
=STRING$(40,"*"):ITEM$=LST$
  70CLS:PRINT TAB(5,10)"Wa
it a minute, I am thinking"
:VDU 23,1,0;0;0;0;
  80RESTORE 10000:LC%=-1:R
EPEAT LC%=LC%+1
  90REPEAT READ LST$:UNTIL
 LST$="*" OR LST$="*":UNTIL
 LST$="#"
 100RESTORE 20000:IC%=-1:R
EPEAT IC%=IC%+1
 110REPEAT READ ITEM$:UNTI
L ITEM$="*" OR ITEM$="*":UN
TIL ITEM$="#"
 120REPEAT:RI%=0:WR%=0:TT%
=0:MODE4:VDU19,0,4;0;23,1,0
;0;0;0;:FOR TEST=0 TO 9:CLS
:PROCASK:PROCANS:NEXT:MODE6
:VDU19,0,4;0;23,1,0;0;0;0;:
PROCSC:UNTIL FALSE
 130:
 140REM -- Get a set of it
ems + some random ones --
 150DEF PROCASK:LOCAL N1%,
N2%:FOR N1%=0 TO 5:QU%(N1%)
=-1:AN%(N1%)=-1:NEXT:HX=TRU
E
 160REPEAT T%=TRUE:N1%=RND
(LC%):FOR IC%=0 TO 9:IF N1%
=ST%(IC%) T%=FALSE
 170NEXT:UNTIL T%
 180ST%(TEST)=N1%
 190RESTORE (9999+N1%):REA
D LST$:NANS%=0:REPEAT READ
ITEM$:IF ITEM$<>"*" THEN AN
%(NANS%)=VAL(ITEM$):NANS%=N
ANS%+1
 200UNTIL ITEM$="*"
 210FOR N1%=NANS% TO 5:REP
EAT:SAME%=FALSE:QST%=RND(IC
%)-1:FOR N2%=0 TO 5:IF AN%(
N2%)=QST% THEN SAME%=TRUE
 220NEXT:UNTIL NOT SAME%:A
N%(N1%)=QST%:NEXT
 230FOR N1%=0 TO 5:REPEAT
QST%=RND(6)-1:UNTIL QU%(QST
%)=-1:QU%(QST%)=AN%(N1%):NE
XT
 240FOR N1%=0 TO 5:PROCDR
ITEM(N1%):NEXT:TT%=TT%+NANS%
:NANS%=NANS%-1
 250KP$=""
 260PRINT TAB(1,27);"Which
 of these might I need to"'
" ";LST$+" ?"
 270ENDPROC
 280:
 290REM -- Draw an item (1
..6) --
 300DEF PROCDRITEM(N%):QST
%=QU%(N%):RESTORE (10*QST%+
20000):READ ITEM$:PRINT TAB
(1+(N% MOD 2)*20,1+(N% DIV
2)*9);N%+1;".";ITEM$
 310U%=(N% MOD 2)*600+50:V
%=755-(N% DIV 2)*290
 320MOVE U%,V%:PLOT 1,0,20
0:PLOT 1,500,0:PLOT 1,0,-20
0:PLOT 1,-500,0
 330D$="":REPEAT PROCINTPR
T:UNTIL D$="*"
 340ENDPROC
 350REM:
 360REM -- Interpret graph
ics code --
 370DEF PROCINTPRT:READ D$
:D$=LEFT$(D$,1)
 380IF D$="E" THEN PROCELL
:ENDPROC
 390IF D$<>"*" THEN READ X
%,Y% ELSE ENDPROC
 400IF D$="M" THEN PT%=4 E
LSE PT%=5
 410PLOT PT%,U%+X%,V%+Y%
 420ENDPROC
 430:
 440REM -- Read answer fro
m keys --
 450DEF PROCANS
 460AN$="":REPEAT:REPEAT
 470*FX21,0
 480PRINT TAB(1,30);"Press
 1-6 or F to finish :-  "+C
HR$(8);:AN$=GET$:IF AN$="f"
```

→

From Page 55

```
 THEN AN$="F"
  490IF AN$="q" OR AN$="Q"
THEN *FX210,1
  500IF AN$="s" OR AN$="S"
THEN *FX210,0
  510UNTIL (AN$)="1" AND AN
$(="6") OR AN$="F"
  520IF AN$="F" THEN PROCEN
CH ELSE PROCNOCH:IF LEN(KP$
)=6 AN$="F":PROCENCH
  530UNTIL AN$="F":ENDPROC
  540:
  550REM -- Number answer h
andling --
  560DEF PROCNOCH:ANS%=VAL(
AN$)-1:IF INSTR(KP$,AN$)=0
KP$=KP$+AN$
  570IF QU%(ANS%)=-2 THEN S
OUND 1,-15,192,2:SOUND 1,-1
5,0,4:ENDPROC
  580F%=FALSE:FOR N%=0 TO N
ANS%:IF AN%(N%)=QU%(ANS%) T
HEN F%=TRUE:AN%(N%)=-2:QU%(
ANS%)=-2
  590NEXT:IF F% THEN PROCHE
ER:MOVE (ANS% MOD 2)*600+51
0,790-(ANS% DIV 2)*290:PLOT
 1,20,-30:PLOT 1,90,160:PRO
CDEL:ENDPROC
  600PROCRASP:MOVE (ANS% MO
D 2)*600+50,755-(ANS% DIV 2
)*290:PLOT 1,500,200:PLOT 0
,-500,0:PLOT 1,500,-200:QU%
(ANS%)=-1:H%=FALSE:PROCDEL:
ENDPROC
  610:
  620REM -- Small delay --
  630DEF PROCDEL
  640TIME=0:REPEAT UNTIL TI
ME=100
  650ENDPROC
  660:
  670REM -- Blow raspberry
--
  680DEF PROCRASP
  690FOR P%=4 TO 7:SOUND 0,
-15,P%,5:NEXT
  700IF QU%(ANS%)<>-1 THEN
WR%=WR%+1
  710QU%(ANS%)=-2
  720ENDPROC
  730:
  740REM -- Fanfare --
  750DEF PROCHEER
  760RI%=RI%+1
  770FOR P%=5 TO 20 STEP 15
  780SOUND 1,-15,53,1
  790SOUND 1,-15,69,1
  800SOUND 1,-15,81,P%
  810TIME=0:REPEAT UNTIL TI
ME = 25
  820NEXT:ENDPROC
  830:
  840REM -- End of answers
handling --
  850DEF PROCENCH
  860F%=FALSE:FOR N%=0 TO 5
  870G%=TRUE:FOR P%=0 TO NA
NS%:IF (QU%(N%)=AN%(P%)) AN
D QU%(N%)>-1 THEN G%=FALSE:
F%=TRUE
  880NEXT P%:IF G% OR QU%(N
%)<0 THEN LET X%=(N% MOD 2)
*20:Y%=(N% DIV 2)*9:FOR I%=
Y% TO Y%+8:PRINT TAB(X%,I%)
;SPC(20);:NEXT I%
  890NEXT N%
  900PRINT TAB(1,27)STRING$
(78," ")
  910PRINT TAB(8,28);:IF F%
 THEN PRINT "     What abou
t this ?" ELSE IF NOT H% TH
EN PRINT "You had some wron
g guesses!" ELSE PRINT "
  VERY WELL DONE !"
  920PRINT TAB(0,30)STRING$
(38," ")TAB(15,30)"Press SP
ACE":REPEAT UNTIL GET$=" ":
ENDPROC
  930:
  940REM -- Draw an ellipse
 --
  950DEF PROCELL:READ X%,Y%
,R1,R2,A1,A2:INC=40/(R1+R2)
:PLOT 4,R1*COS(A1)+U%+X%,R2
*SIN(A1)+V%+Y%
  960FOR A=A1 TO A2 STEP IN
C:PLOT 5,R1*COS(A)+U%+X%,R2
*SIN(A)+V%+Y%:NEXT:ENDPROC
  970:
  980REM -- Display scores
 --
  990DEF PROCSC:CLS:PRINT T
AB(5,2);"Your final scores
are :-"
 1000PRINT'" Total number o
f items wanted    ";TT%
 1010PRINT'" Total number o
f correct answers ";RI%
 1020PRINT'" Total number o
f wrong answers   ";WR%
 1030PRINT'" Press SPACE fo
r some one else to try'
 1040*FX21,0
 1050REPEAT:KEY$=GET$:IF KE
Y$="q" OR KEY$="Q" THEN *FX
210,1
 1060IF KEY$="s" OR KEY$="S
" THEN *FX210,0
 1070UNTIL KEY$=" ":ENDPROC
 1080:
 1090REM Print instructions
 1100DEF PROCSETUP
 1110DIM ST%(9)
 1120*FX18,0
 1130*FX11,0
 1140CLS
 1150VDU 19,0,4;0;23,1,0;0;
0;0;
 1160PRINT:PRINT TAB(15)"AC
TIVITIES"
 1170PRINT '" The computer
will decide that it wants"
 1180PRINT "to do something
 and will draw six items"
 1190PRINT "on the screen,
along with their name &"
 1200PRINT "a number. Some
of the items drawn will"
 1210PRINT "be needed to do
 whatever the computer"
 1220PRINT "wants to do. Yo
u must tell it what it"
 1230PRINT "needs by pressi
ng keys 1-6.If the item"
 1240PRINT "is needed then
a tick will be drawn by"
 1250PRINT "the picture, ot
herwise it will be"
 1260PRINT "crossed out. Yo
u will have 10 tries"
 1270PRINT "then the comput
er will tell you your"
 1280PRINT "score and ask f
or someone else to try."
 1290PRINT '" Set the sound
 effects on by pressing"'"t
he 'S' key and turn them of
f with the"'"'Q' key. This
can be done now or at any"'
'"time the computer is waiti
ng for a key"'"to be presse
d. Select now (S/Q) "
 1300REPEAT:*FX21,0
 1310key$=CHR$(GET AND &5F)
 1320UNTIL key$="S" OR key$
="Q"
 1330IF key$="S" THEN *FX 2
10,0
 1340IF key$="Q" THEN *FX 2
10,1
 1350PRINT '"Press SPACE to
 start, ESC for this page";
 1360*FX21,0
 1370REPEAT UNTIL GET$=" ";
CLS
 1380FOR IC%=0 TO 9:ST%(IC%
)=-1:NEXT
 1390ENDPROC
 1400:
 1410REM -- Error trapping
--
 1420ON ERROR OFF:IF ERR=17
 THEN RUN ELSE MODE6:REPORT
:PRINT " at line ";ERL:*FX1
2,0
 1430END
 1440:
10000 DATA plant some seeds
,0,1,2,*
10001 DATA paint the house,
3,4,5,*
10002 DATA have my dinner,6
,7,8,16,*
10003 DATA build a sandcast
le,0,9,*
10004 DATA go for a drive,1
0,11,*
10005 DATA go for a sail,12
,13,14,*
10006 DATA have a drink of
tea,15,16,17,*
10007 DATA fly in the sky,1
8,19,20,*
10008 DATA play cricket,21,
22,23,*
10009 DATA tell the time,24
,25,26,*
10010 DATA write a story,27
,28,29,*
10011 DATA wash the windows
,9,4,30,*
10012 DATA do some woodwork
,28,31,32,33,36,*
10013 DATA do some cooking,
6,6,34,35,*
10014 DATA mend the car,10,
36,37,32,38,*
10015 DATA clean my teeth,3
9,40,41,*
10016 DATA wash my face,42,
43,44,45,*
10017 DATA walk in the rain
,46,47,48,*
10018 DATA do my shopping,4
9,50,51,*
10019 DATA play a tune,52,5
3,54,*
10020 DATA go for a swim,13
,43,55,*
10021 DATA play football,21
,56,57,*
10022 DATA have a party,58,
59,60,*
```

```
10023 DATA send a letter,28
,29,61,62,63,*
10024 DATA make a phone cal
l,64,65,*
10025 DATA do the washing u
p,66,67,68,69,*
10026 DATA go to bed,70,71,
72,*
19999 DATA #
20000 DATA spade,M,220,10,D
,200,10,D,200,70,D,220,70,D
,220,5,M,250,70,D,250,150,D
,235,180,D,265,180,D,250,15
0,*
20010 DATA packet of seeds,
M,180,20,D,320,20,D,320,180
,D,180,180,D,180,20,M,210,6
0,D,290,60,M,250,60,D,250,1
30,M,260,130,D,240,110,M,24
0,130,D,260,110,M,270,90,D,
250,60,D,230,85,*
20020 DATA watering can,M,2
00,20,D,300,20,D,300,120,D,
200,120,D,200,20,D,140,100,
D,146,106,D,200,42,E,250,12
0,50,50,0,3.34,*
20030 DATA paint brush,M,24
0,100,D,240,190,D,260,190,D
,260,100,D,280,80,D,220,80,
D,240,100,M,220,73,D,220,63
,D,210,13,D,290,13,D,280,63
,D,220,63,D,220,73,M,280,73
,D,280,63,*
20040 DATA ladder,M,150,10,
D,240,190,M,340,190,D,250,1
0,M,260,30,D,160,30,M,170,5
0,D,270,50,M,280,70,D,180,7
0,M,190,90,D,290,90,M,300,1
10,D,200,110,M,210,130,D,31
0,130,M,320,150,D,220,150,M
,230,170,D,330,170,*
20050 DATA paint pot,E,250,
150,50,30,0,6.28,E,250,130,
50,30,.15,3,E,250,50,50,30,
3.14,6.28,D,300,150,M,200,1
50,D,200,50,*
20060 DATA fork,M,80,70,D,1
80,70,D,200,90,D,400,90,D,4
00,110,D,200,110,D,180,130,
D,150,130,D,150,70,M,150,90
,D,80,90,M,80,110,D,150,110
,M,150,130,D,80,130,*
20070 DATA plate,E,250,100,
120,50,0,6.3,E,250,100,100,
30,0,6.3,*
20080 DATA knife,M,350,100,
D,450,100,D,450,130,D,100,1
30,D,90,120,D,90,110,D,100,
100,D,150,90,D,250,90,D,350
,100,D,350,130,*
20090 DATA bucket,E,250,125
,50,50,0,3.14,D,215,50,D,28
5,50,D,300,125,D,200,125,*
20100 DATA car,E,150,50,25,
25,0,6.433,E,350,50,25,25,0
,6.433,E,350,50,30,30,0,3.2
,E,150,50,30,30,0,3.2,D,120
,50,D,100,50,D,120,100,D,20
0,110,D,225,150,D,350,150,D
,400,100,D,400,50,D,380,50,
M,320,50,D,180,50
20102 DATA M,300,60,D,210,6
0,D,210,100,D,370,100,D,350
,140,D,300,140,D,300,60,M,3
00,140,D,225,140,D,210,100,
*
20110 DATA steering wheel,E
,250,100,75,75,0,6.45,D,250
,100,D,200,50,M,250,100,D,2
00,150,*
20120 DATA boat,M,150,75,D,
175,50,D,350,50,D,400,60,D,
400,75,D,150,75,D,250,190,D
,400,85,D,400,75,M,250,75,D
,250,190,M,400,85,D,165,85,
*
20130 DATA lifebelt,E,250,1
00,50,50,0,6.5,E,250,100,75
,75,0,6.5,M,325,90,D,300,90
,M,200,90,D,175,90,M,175,11
0,D,200,110,M,300,110,D,325
,110,*
20140 DATA compass,E,250,10
0,90,90,0,6.5,M,250,140,D,2
40,100,D,250,60,D,260,100,D
,250,140,M,240,145,D,240,16
5,D,260,145,D,260,165,*
20150 DATA teapot,E,250,160
,10,10,0,6.4,E,250,100,50,5
0,5.5,10.3,M,275,55,D,225,5
5,D,150,135,D,160,135,D,200
,100,M,295,75,D,330,75,D,33
0,120,D,295,120,M,280,135,D
,220,135,*
20160 DATA mug,E,250,150,50
,30,0,6.28,E,250,130,50,30,
.15,3,E,250,50,50,30,3.14,6
.28,D,300,150,M,200,150,D,2
00,50,M,300,125,D,333,125,D
,333,75,D,300,75,*
20170 DATA kettle,E,250,100
,50,50,0,3.25,E,250,110,10,
10,0,6.4,M,175,25,D,175,75,
D,200,100,D,300,100,D,325,7
5,D,325,25,D,175,25,D,115,1
00,D,130,100,D,175,55,*
20180 DATA aeroplane,M,150,
60,D,250,60,D,250,80,D,200,
80,D,200,60,D,300,60,D,400,
100,D,150,100,D,150,60,M,13
5,60,D,135,120,M,135,90,D,1
50,90,M,400,100,D,400,140,D
,365,140,D,350,100,M,300,10
0,D,280,125,D,225,125,D,200
,100,*
20190 DATA airship,E,250,10
0,150,50,0,6.4,D,350,100,M,
350,135,D,380,170,D,400,170
,D,400,30,D,380,30,D,350,65
,M,300,55,D,285,20,D,220,20
,D,200,55,M,220,42,D,265,42
,D,265,30,D,220,30,D,220,42
,*
20200 DATA balloon,E,250,14
0,50,50,0,6.4,M,300,140,D,2
00,140,D,230,50,D,270,50,D,
300,140,M,250,140,D,250,50,
M,230,50,D,230,15,D,270,15,
D,270,50,*
20210 DATA ball,E,250,100,5
0,50,0,6.5,*
20220 DATA cricket bat,M,23
0,10,D,270,10,D,270,140,D,2
55,150,D,255,190,D,245,190,
D,245,150,D,230,140,D,230,1
0,M,245,150,D,255,150,*
20230 DATA wicket,M,220,10,
D,220,190,D,280,190,D,280,1
0,M,250,10,D,250,190,*
20240 DATA sundial,E,250,75
,100,25,0,6.4,M,300,75,D,25
0,115,D,200,75,D,300,150,*
20250 DATA watch,E,250,100,
50,50,0,6.5,M,275,100,D,250
,100,D,250,140,M,295,75,D,4
35,75,D,450,100,D,435,125,D
,295,125,M,205,75,D,50,75,D
,50,125,D,205,125,M,75,125,
D,75,75,M,75,100,D,62,100,*
20260 DATA clock,E,250,100,
75,75,0,6.5,E,250,100,15,15
,0,6.8,M,150,15,D,350,15,D,
350,185,D,150,185,D,150,15,
M,260,110,D,280,130,M,260,9
0,D,300,50,M,250,25,D,250,4
0,M,175,100,D,200,100,M,250
,175,D,250,150,M,325,100,D,
300,100,*
20270 DATA writing book,E,2
00,125,75,35,0.5,2.5,E,300,
125,75,35,0.5,2.5,E,200,25,
75,35,0.6,2.5,E,300,25,75,2
5,0.6,2.5,M,250,150,D,250,5
0,M,150,50,D,150,150,M,350,
150,D,350,50,M,360,45,D,360
,147,*
20280 DATA pencil,M,150,80,
D,400,80,D,400,120,D,150,12
0,D,75,100,D,150,80,D,150,1
20,M,100,94,D,100,106,M,150
,100,D,400,100,*
20290 DATA rubber,M,100,100
,D,125,75,D,275,75,D,300,12
5,D,275,150,D,125,150,D,150
,125,D,300,125,M,100,100,D,
125,150,M,150,125,D,125,75,
*
20300  DATA washleather,M,2
00,50,D,300,50,D,300,150,D,
200,150,D,200,50,*
20310 DATA saw,M,100,100,D,
100,50,D,300,50,D,300,100,D
,100,100,D,100,115,D,300,11
5,D,325,135,D,365,135,D,365
,75,D,325,75,D,300,100,D,30
0,115,M,310,115,D,330,85,D,
350,80,D,350,125,D,325,125,
D,310,115,*
20320 DATA hammer,M,200,85,
D,200,135,D,215,159,D,200,1
50,D,170,115,D,170,50,D,200
,50,D,200,90,D,400,90,D,400
,110,D,200,110,*
20330 DATA nails,M,150,50,D
,210,140,D,200,150,D,220,13
0,M,250,40,D,250,150,D,240,
150,D,260,150,M,400,100,D,2
75,100,D,275,110,D,275,90,M
,400,10,D,300,50,D,294,40,D
,306,60,*
20340 DATA mixing bowl,E,25
0,150,100,100,3.14,4.2,M,20
0,70,D,300,70,M,150,150,D,3
50,150,E,250,150,100,100,5,
3,6.30,*
20350 DATA cooker,M,200,10,
D,300,10,D,300,190,D,200,19
0,D,200,10,M,210,25,D,290,2
5,D,290,80,D,210,90,D,210,2
5,M,270,70,D,280,70,M,200,1
00,D,300,100,M,300,120,D,20
0,120,M,200,170,D,300,170,M
,210,110,D,215,110,M,247,11
0,D,253,110
20352 DATA M,290,110,D,285,
110,*
20360 DATA screwdriver,M,15
0,90,D,300,90,D,300,125,D,4
00,125,D,400,75,D,300,75,D,
300,110,D,150,110,D,125,115
,D,100,110,D,100,90,D,125,8
5,D,150,90,*
20370 DATA oil can,M,45,150
,D,200,50,D,200,150,D,300,1
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50,D,300,65,D,350,65,D,350,
135,D,300,135,D,300,50,D,20
0,50,D,200,65,D,55,150,D,45
,150,M,200,150,D,200,170,D,
250,170,D,250,150,M,250,170
,D,350,160,*
20380 DATA spanner,M,50,50,
D,100,50,D,150,80,D,350,80,
D,400,50,D,450,50,D,450,70,
D,400,70,D,375,100,D,400,13
0,D,450,130,D,450,150,D,400
,150,D,350,120,D,150,120,D,
100,150,D,50,150,D,50,130,D
,100,130,D,125,100,D,100,70
,D,50,70,D,50,50,*
20390 DATA toothpaste,M,125
,75,D,50,75,D,50,125,D,125,
125,D,150,150,D,450,150,D,4
50,50,D,150,50,D,125,75,D,1
25,125,M,150,150,D,150,50,M
,440,50,D,440,150,*
20400 DATA toothaug,E,250,1
50,50,20,0,6.33,E,250,125,4
0,16,0,6.33,E,250,50,25,10,
0,6.33,M,225,50,D,200,150,M
,275,50,D,300,150,*
20410 DATA toothbrush,M,100
,75,D,200,75,D,250,100,D,45
0,100,D,450,110,D,250,110,D
,200,85,D,100,85,D,100,75,D
,100,125,M,117,85,D,117,125
,M,134,85,D,134,125,M,150,8
5,D,150,125,M,167,85,D,167,
125,M,184,85,D,184,125,M,20
0,85,D,200,125,*
20420 DATA face flannel,M,2
00,50,D,300,50,D,300,150,D,
200,150,D,200,50,*
20430 DATA towel,M,125,50,D
,375,50,D,375,150,D,125,150
,D,125,50,*
20440 DATA wash basin,M,150
,100,D,350,100,D,350,125,D,
150,125,D,150,100,M,175,125
,D,175,150,D,190,150,D,190,
125,M,325,125,D,325,150,D,3
05,150,D,305,125,M,300,150,
D,330,150,M,200,150,D,175,1
50
20442 DATA E,200,100,50,59,
3.14,4.91,E,300,100,50,59,4
,91,6.4,M,200,41,D,225,41,D
,225,0,M,300,41,D,275,41,D,
275,0,*
20450 DATA soap,E,250,100,1
50,50,1.1,2.2,E,250,100,150
,50,4.2,5.3,M,175,60,D,175,
140,M,325,60,D,325,140,E,25
0,100,30,10,0,6.4,*
20460 DATA umbrella,M,150,1
50,D,350,150,E,250,50,141,1
41,.78,2.4,M,250,150,D,250,
50,E,225,50,25,25,3.14,6.4,
*
20470 DATA wellingtons,M,15
0,50,D,200,50,D,200,150,D,2
50,150,D,250,20,D,220,20,D,
220,25,D,100,20,D,120,20,E,
150,20,30,30,1.55,3.14,M,22
0,150,D,220,170,D,270,170,D
,270,40,D,250,40,M,200,70,D
,170,70,E,170,40,30,30,1.55
,3,*
20480 DATA raincoat,M,200,2
0,D,300,20,D,300,125,D,340,
70,D,360,75,D,300,170,D,275
,175,D,225,175,D,200,170,D,
140,75,D,160,70,D,200,125,D
,200,20,M,250,20,D,250,125,
D,225,175,D,210,175,D,250,1
20,D,290,175,D,275,175,D,25
0,125,*
20490 DATA money,M,150,50,D
,150,100,D,250,100,D,250,50
,D,150,50,E,300,100,25,25,0
,6.44,E,275,150,20,20,0,6.3
3,*
20500 DATA shopping list,M,
200,10,D,200,175,D,300,175,
D,300,10,D,200,10,M,220,150
,D,200,150,M,220,110,D,260,
110,M,220,80,D,240,80,M,220
,60,D,275,60,M,220,40,D,240
,40,M,220,20,D,260,20,*
20510 DATA shopping bag,M,1
50,25,D,350,25,D,350,125,D,
150,125,D,150,25,E,250,125,
50,70,0,3.2,*
20520 DATA music book,M,250
,50,D,250,150,D,150,150,D,1
50,50,D,350,50,D,350,50,D,3
50,150,D,250,150,M,160,125,
D,240,125,M,160,100,D,240,1
00,M,160,75,D,240,75,M,260,
125,D,340,125,M,260,100,D,3
40,100,M,260,75,D,340,75,*
20530 DATA drum,E,250,125,1
00,25,0,6.33,E,250,50,100,2
5,3.14,6.33,M,350,125,D,350
,50,D,300,105,D,250,25,D,20
0,105,D,150,50,D,150,125,M,
100,175,D,225,160,M,275,160
,D,400,175,*
20540 DATA recorder,E,400,7
0,30,30,1.57,3.14,D,400,70,
D,50,80,D,20,70,D,20,130,D,
50,120,D,400,130,D,400,130,
D,400,110,M,450,130,D,450,1
15,D,430,115,D,430,130,*
20550 DATA swimming costume
,M,150,25,D,100,50,D,100,75
,D,200,75,D,200,50,D,150,25
,M,350,15,D,400,40,D,380,75
,D,400,150,D,375,170,D,350,
130,D,325,170,D,300,150,D,3
20,75,D,300,40,D,350,15,*
20560 DATA football boots,M
,150,50,D,200,50,D,200,70,D
,250,70,D,250,20,D,220,20,D
,220,25,D,100,20,D,120,20,E
,150,20,30,30,1.55,3.14,M,2
20,70,D,220,90,D,270,90,D,2
70,40,D,250,40,M,200,70,D,1
70,70,E,170,40,30,30,1.55,3
,*
20570 DATA football shorts,
M,175,50,D,235,50,D,250,70,
D,260,50,D,325,50,D,325,125
,D,175,125,D,175,50,*
20580 DATA glass of squash,
E,250,150,50,20,0,6.33,E,25
0,125,40,16,0,6.33,E,250,50
,25,10,0,6.33,M,225,50,D,20
0,150,M,275,50,D,300,150,M,
225,50,D,275,125,D,325,160,
*
20590 DATA fancy cake,E,250
,125,100,15,0,6.33,E,250,50
,100,15,3.14,6.33,D,350,125
,M,150,125,D,150,50,M,190,1
30,D,190,160,M,250,140,D,25
0,170,M,310,130,D,310,160,*
20600 DATA balloons,E,150,1
25,30,30,0,6.33,M,150,95,D,
150,50,E,250,150,45,45,0,6.
33,M,250,105,D,250,50,E,400
,100,50,50,0,6.53,M,400,50,
D,400,10,*
20610 DATA "paper,envelope"
,M,100,40,D,200,40,D,200,17
5,D,100,175,D,100,40,M,250,
50,D,400,50,D,400,120,D,250
,120,D,250,50,D,310,75,D,34
0,75,D,400,50,M,400,120,D,3
40,75,D,310,75,D,250,120,*
20620 DATA stamp,M,200,50,D
,300,50,D,300,150,D,200,150
,D,200,50,M,250,55,D,250,70
,E,275,60,10,10,0,6.35,M,22
5,75,D,275,85,D,265,100,D,2
75,115,D,275,140,D,225,140,
D,225,100,D,235,93,D,235,86
,D,225,75,*
20630 DATA postbox,M,200,10
,D,300,10,D,300,150,D,200,1
50,D,200,10,M,225,120,D,275
,120,D,275,135,D,225,135,D,
225,120,E,250,100,70,70,0.8
,2.4,*
20640 DATA phone directory,
E,200,125,75,35,0.5,2.5,E,3
00,125,75,35,0.5,2.5,E,200,
25,75,35,0.6,2.5,E,300,25,7
5,25,0.6,2.5,M,250,150,D,25
0,50,M,150,50,D,150,150,M,3
50,150,D,350,50,M,360,45,D,
360,147,*
20650 DATA telephone,E,250,
85,25,25,0,6.5,M,150,50,D,1
50,15,D,350,15,D,350,50,D,1
50,50,D,200,125,D,300,125,D
,350,50,M,300,125,D,350,125
,D,350,100,D,400,100,D,375,
150,D,125,150,D,100,100,D,1
50,100,D,150,125,D,200,125,
*
20660 DATA dishcloth,M,200,
50,D,300,50,D,300,150,D,200
,150,D,200,50,*
20670 DATA washing up bowl,
M,150,100,D,175,50,D,325,50
,D,350,100,D,150,100,*
20680 DATA tea towel,M,125,
50,D,375,50,D,375,150,D,125
,150,D,125,50,*
20690 DATA washing up liqui
d,M,200,10,D,300,10,D,300,1
60,D,275,175,D,275,190,D,22
5,190,D,225,175,D,200,160,D
,200,10,*
20700 DATA bed,M,150,50,D,1
50,120,M,150,100,D,350,100,
D,350,75,D,150,75,M,350,50,
D,350,140,*
20710 DATA nightshirt,M,200
,10,D,300,10,D,300,115,D,32
5,80,D,350,100,D,300,150,D,
270,160,D,250,140,D,230,160
,D,200,150,D,150,100,D,170,
60,D,200,115,D,200,10,*
20720 DATA pillow,E,250,100
,150,50,1.1,2.2,E,250,100,1
50,50,4.2,5.3,M,175,60,D,17
5,140,M,325,60,D,325,140,*
29999 DATA #
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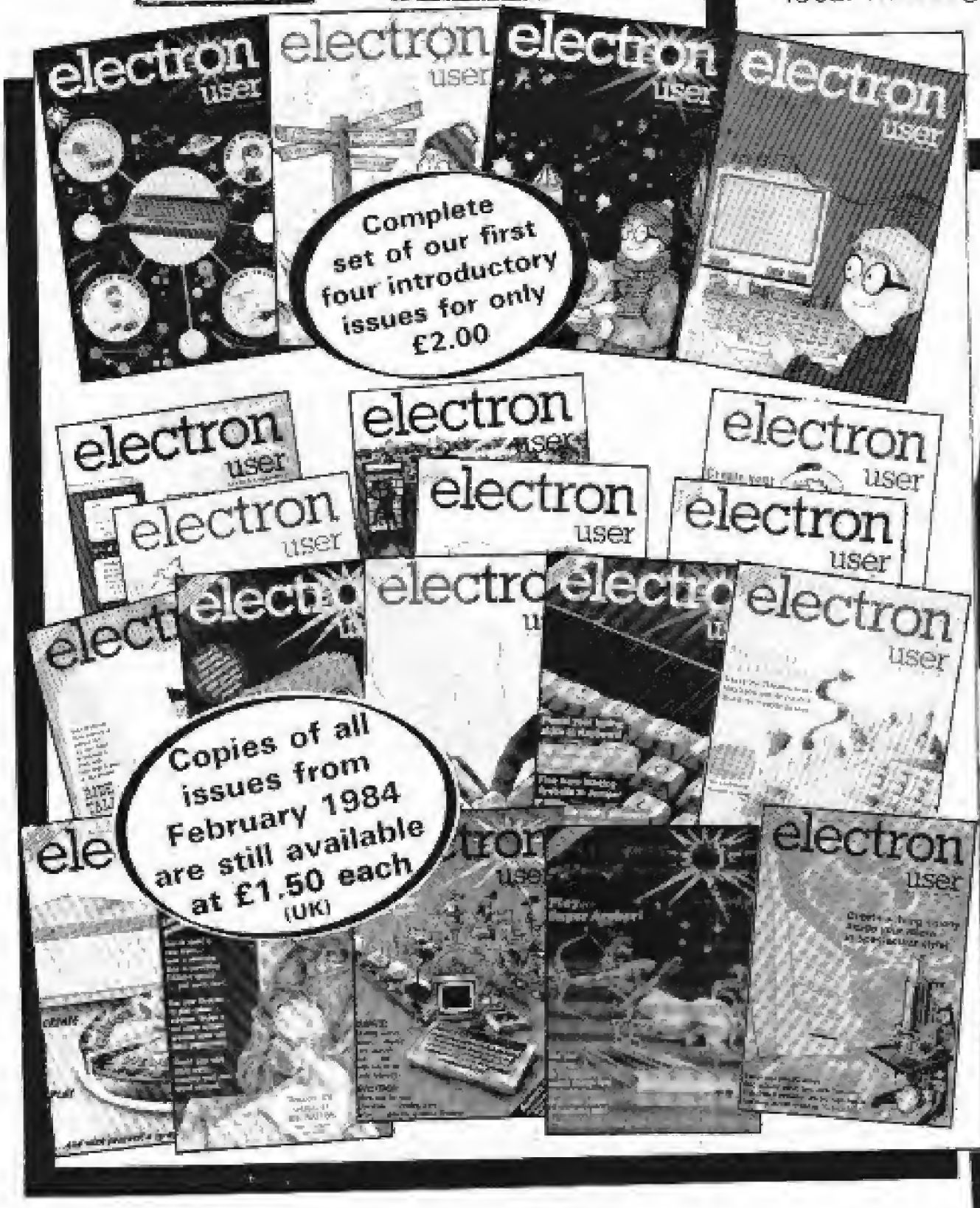

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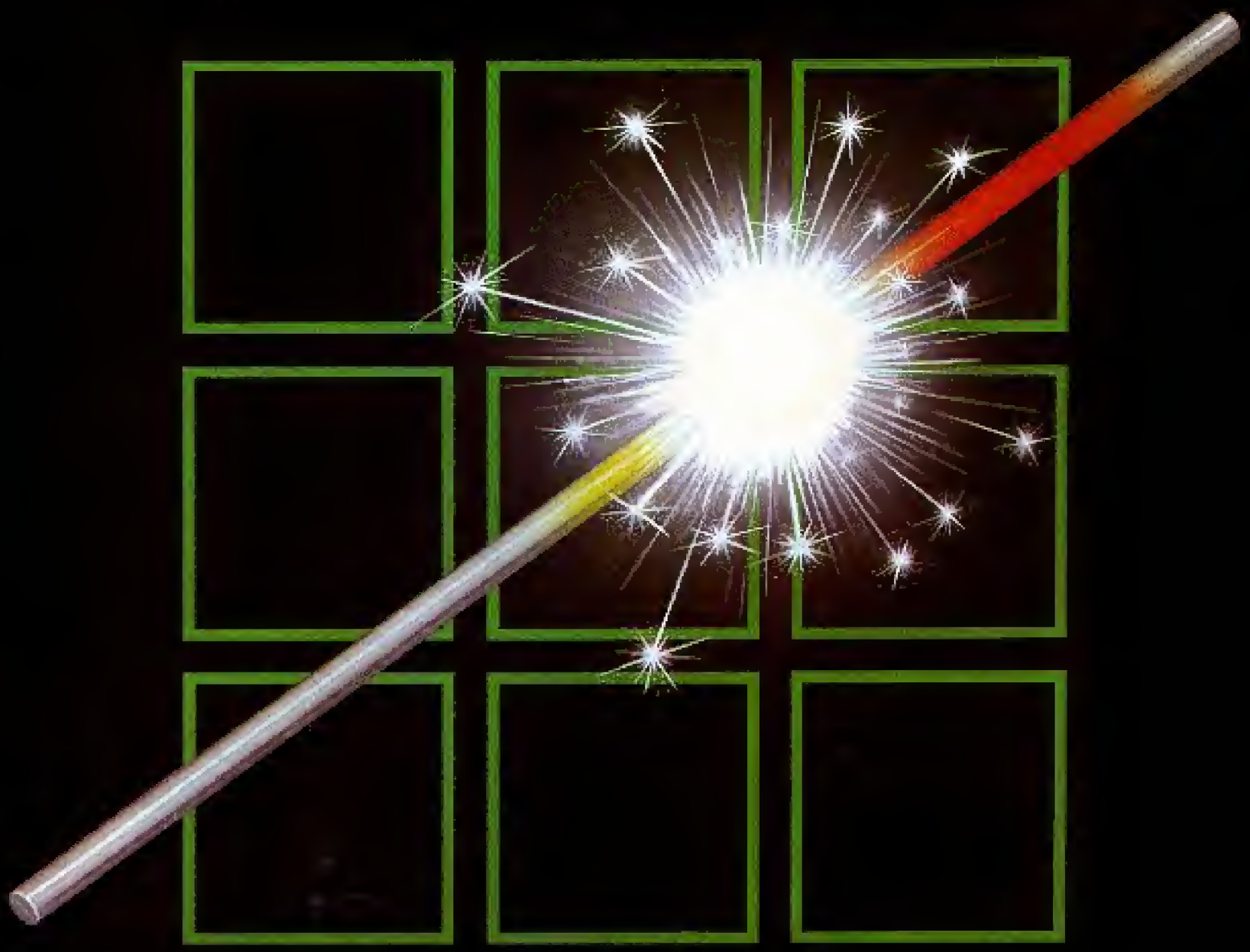

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