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WHICH MICRO? & SOFTWARE REVIEW

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January 1984

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with the BBC B

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manufacturers want

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Our unique reviews
of the new programs

So what else can
you do with a micro?

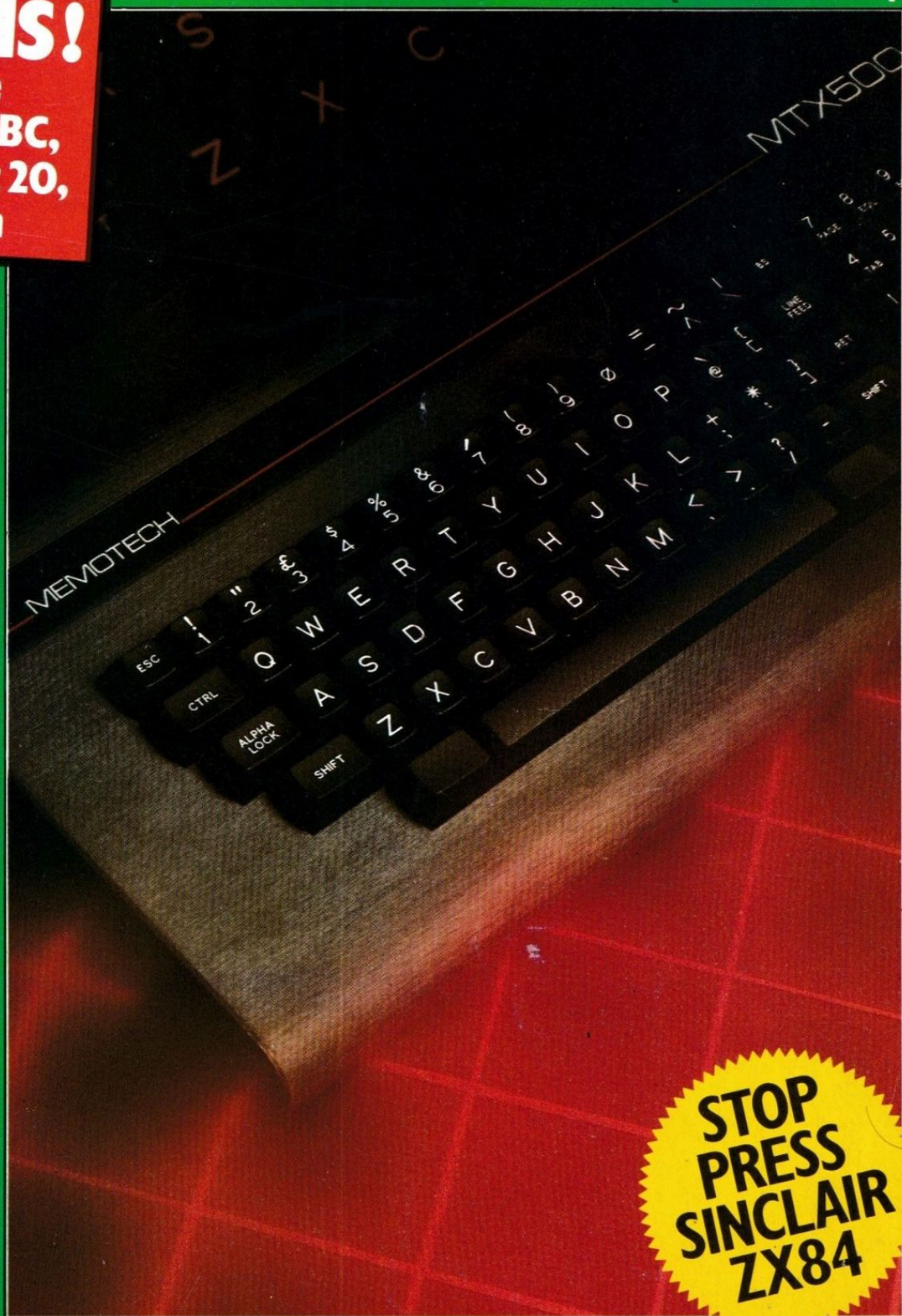
A round-up of all
the different uses

The Coming of Cable

Will 1984 see the
death of cassette-
based software?

Tape Copiers

Can they help the
Spectrum owner?



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Money - an introduction to coins and notes and their use in shopping. 4-10 yrs. (Spectrum 48k.)

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An educational game for 4-10 years

Missing Words - watch the train move forward when you type in the right word. 4-10 yrs. (Spectrum 48k.)

Time
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Time - learn to tell the time with this simple step by step guide. 3-10 yrs (Spectrum 48k, BBC B, Electron.)

Identikit
An educational game for 2-8 years

Identikit - choose from a range of features and build up a face on the screen. 2-8 yrs. (Spectrum 48k.)

Micros for Children
4 educational games for 3-8 years

Micros for Children 1. a set of four educational games for children of 3-8 yrs. Excellent value. (Spectrum 16/48k.)

Railroader
An educational game for 4-10 years

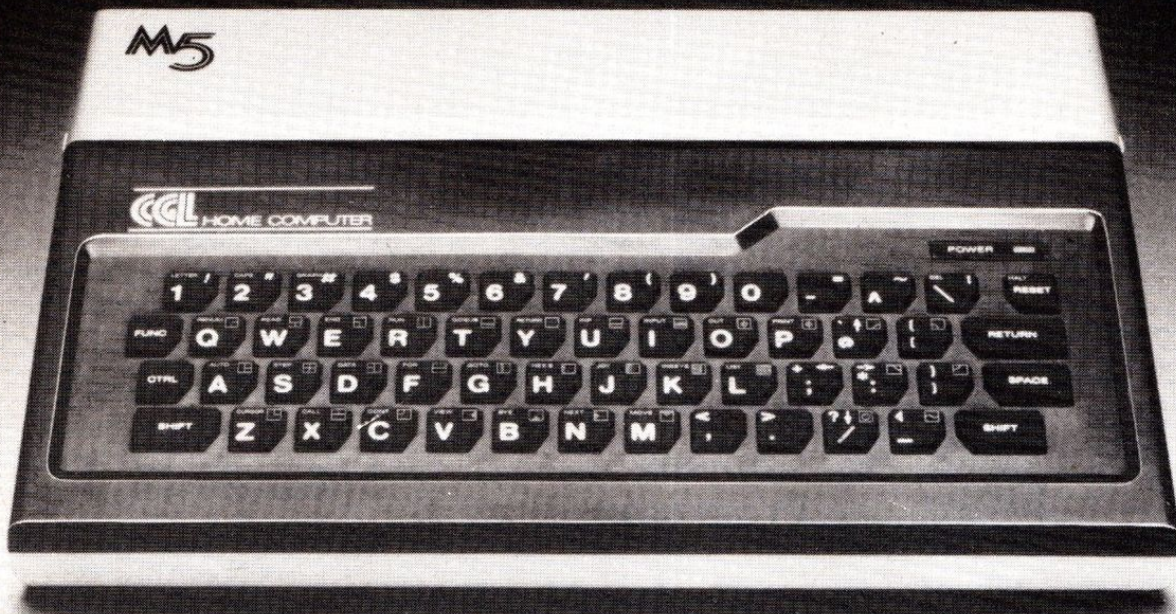
Railroader - lay track on the screen in any layout you want. 4-10 yrs. (BBC B, Electron.)

Spectrum programs only **£6.95** BBC/Electron programs only **£7.95**
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 and all good computer shops, where most titles are available.
 Dealers should contact their regular distributors.

No. 1 in Education

Stell Software 36 Limefield Ave, Whalley, Lancs, BB6 9RJ.

AT LAST, A HOME COMPUTER THAT IMPROVES WITH AGE.



It's surprising how many first-time relationships with a home computer go sour with age.

You buy an attractive, discounted little machine so that you and the children can learn about computers.

Instead, you learn about its limitations: the dull graphics. The plugs that fall out. The cheap power supply. The unalterable "beginners" language. The stiff, fragile keys. No provision for future developments. If only you'd looked around a bit in the beginning... *"Quality costs a little more, but it's usually worth paying for"* (Personal Computer News - CGL M5 Review, June '83.)

The CGL M5 is designed and built by Sord, one of Japan's leading computer specialists, with three main ideas in mind.

First, to be easy and fun to learn and operate.

Second, to be rugged enough to last through hours and hours of operation.

And third, to form the basis of a powerful, versatile home computer system that won't need replacing until you're ready for a dedicated business system.

Built to learn

The CGL M5 is designed to be easy for non-geniuses to use.

"On the M5, most of the work is done for you, and all that is left is the need to work out what to do next, rather than how to do it." (Personal Computer News, June '83.)

If you make a mistake, you can correct it with a simple movement of the cursor. So you only correct that mistake, not a whole line; nor do you have to indulge in complex edit commands.

Budding video game designers and computer artists will love to get their hands on the 16 colour graphics and 32 moveable images called "sprites."

"The M5 makes professional graphic

effects very simple for even the beginner to achieve." (Personal Computer World, Aug. '83.)

Built to last

"It works first time, doesn't need a lot of mollycoddling and jiggery-pokery to persuade it to continue to do so, and what's even better, it continues to work well. You don't have to balance cold cartons of milk on the top, shove matches in the back to keep the plugs in, or press the keys with several pounds force to make them respond." (Personal Computer News, June '83.)

Being able to build things that work and carry on working without endless maintenance is something at which the Japanese seem to excel.

Built to grow

To be truly versatile, a home computer has to understand very different things.

So you need different "languages," which the M5 provides by supplying part of its memory in plug-in cartridges.

"The M5 eliminates the worst limitations on machines at this level, which is that they tend to be stuck with whatever language is provided by the management." (Personal Computer News, June '83.)

The computer is supplied complete with a Basic-I cartridge, a standard integer BASIC language and a simple learning text.

Plug in the Basic-G cartridge, and you can access the M5's incredibly sophisticated graphic and sound capabilities which are far in advance of similarly-priced computers.

Move on to the Basic-F cartridge, and you have scientific, technological and statistical computing power usually available only

on big computers with equally big price tags.

The FALC cartridge provides a tailor-made language for data management, spreadsheet accounts and business problems. Combine FALC with a disc and you could "turn the M5 into a small business machine." (Personal Computer Magazine, August '83.)

Now, take a look at the back of the M5.



Notice the sockets (usually an extra) for a standard

Centronics-type printer, the separate video monitor and hi-fi sound output.

Even the language cartridge socket has hidden potential:

"Unlike most such sockets, this one has 56 internal lines connected to it giving access to just about every function in the computer. This means that just about everything you can think of can be added onto the computer, ranging from a Prestel interface to second processor to use as an intelligent terminal on a timesharing computer..." (Electronics - The Maplin Magazine, March '83.)

Take a look at the home computer that will improve with age.

For a full technical specification of the CGL M5, details of the wide range of supporting software and to find out where to see a complete demonstration, send the coupon to: CGL, CGL House, Goldings Hill, Loughton, Essex IG10 2RR. Telephone number: 01-508 5600.

I'd like to know more about the CGL M5. Please send me a brochure and a list of dealers.

SR3

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CONTENTS

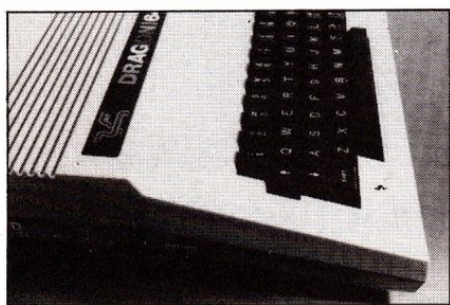
JANUARY 1984

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FEATURES

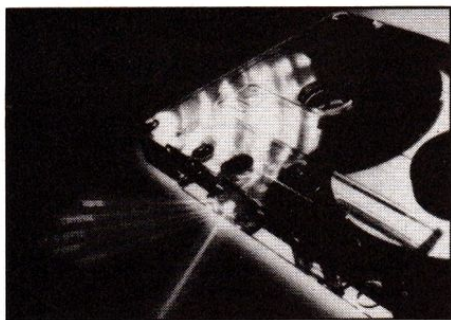


Dragon 64 31

With the Dragon now available in upgraded form, can the injection of more memory offset its ageing design?

So what else can a computer do? 44

Whether you are a newcomer who wants to know if there is life after *Space Invaders* or an old hand who thinks he's seen everything, there is something to open your eyes in this round-up of all the different things you can do with a home micro.



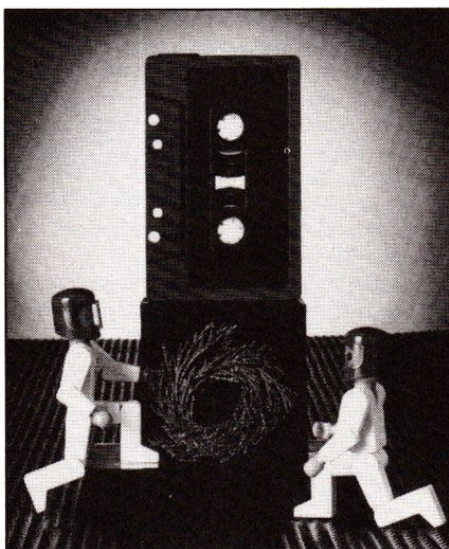
Writing software: will it make you rich? 64

Have you written a program which you want to sell? Our

unique round-up of software houses reveals how much you can really make.

Copying Programs 72

Controversy surrounds software which enables you to make back-up copies of 'protected' software. We look at some of the choices for the Spectrum owner.



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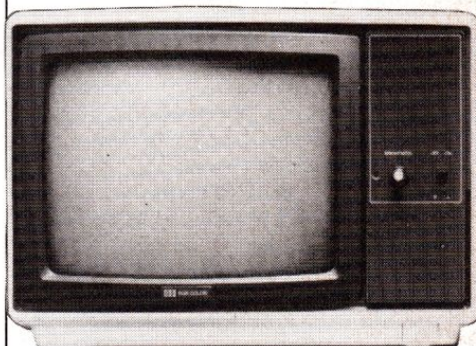
Win an Epson printer and ten Currah speech synthesisers to a value of over £500 in this month's test of wits.

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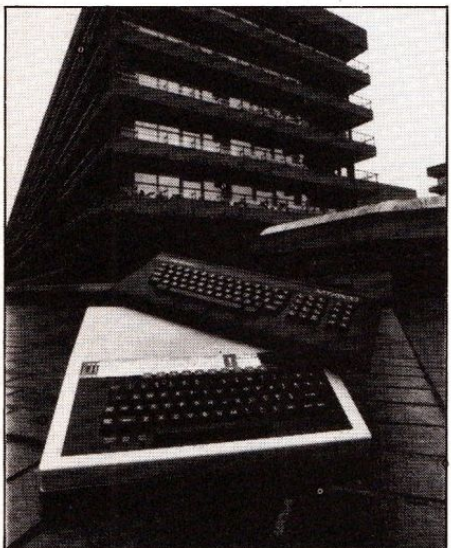
Buyer's Guide 116

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Memotech 36 MTX500

The Memotech rivals the best home computers on paper. We find out if reality matches up to the advertising claims.



MTX500 versus 38 the BBC

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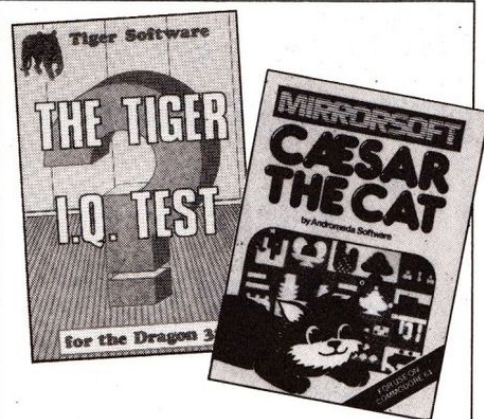
Our collection of programs and tips from you, the readers. This month we bring you:

Mission Impossible — Spectrum
Fruit Machine — BBC
Hangman — ZX81
Lunar Lander — Dragon

Soft Release 107

Need some software for your micro? Look no further than this month's reviews of the latest programs including:

Magic Window — easy Atari graphics
Patti-Pak — more maze munching



The Knife of Kishtu — mystery on the Dragon

Pool — hustle a few games with your Spectrum

Tiger Grand Prix — better educational software

Tiger IQ Test — beat Uncle Clive at his own game

The Last One — definitely not the last program you will need

Power Blaster — thud and blunder from Camsoft

The Lone Raider — hi-ho Silver, away!

Cruncher — lousy name, game not bad

UXB — a ticking time-bomb

Spelling Tutor — avoid those embarrassing mistakes

Puzzler — a quick Dragon Quiz

Fun to learn — fun to use?

Quick Thinking — Mirrorsoft's first offering

Venture — Protek's Spectrum compilation

Keys of the Wizard — the Dragon adventure

Practicalc 64 — put the Commodore to work

The Hobbit — now for BBC, Oric and 64

Caesar the Cat — Mirrorsoft magic

Hungry Horace — converted from the Spectrum favourite

Renaissance — Othello by micro

Radar Rat Race — remote rodent control

Road Toad — yet another frog game

Cover photograph by Pete Seaward

ABC 37,798

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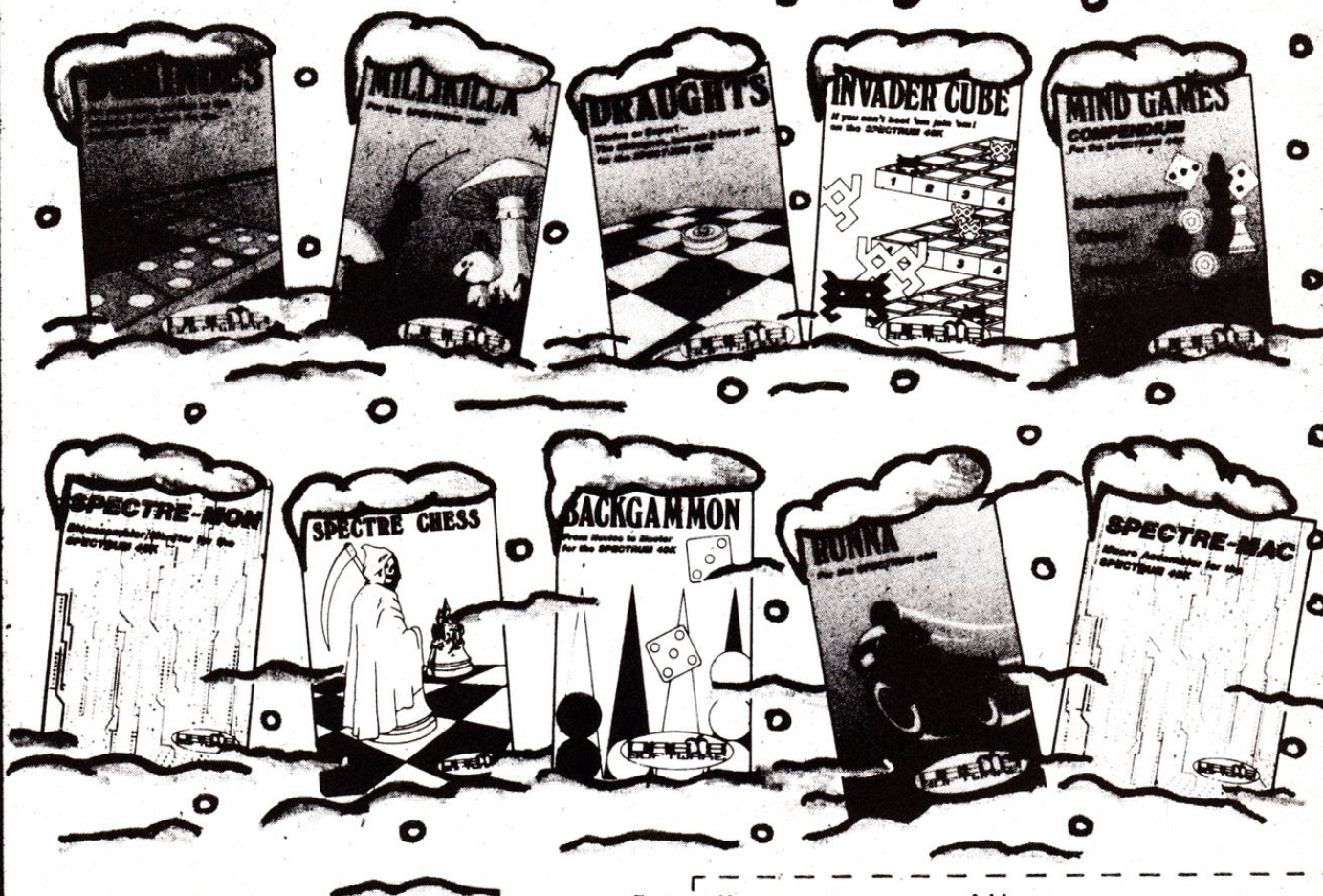
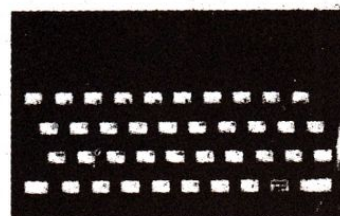
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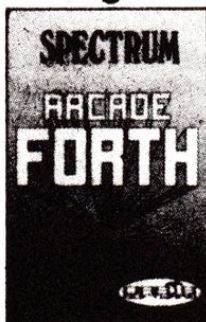
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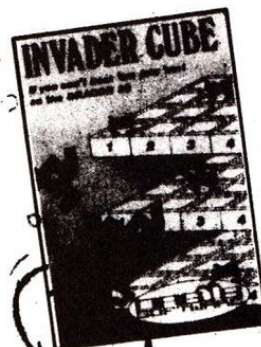
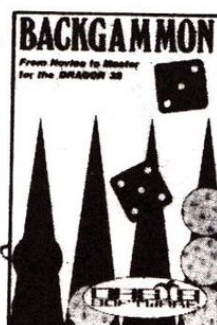
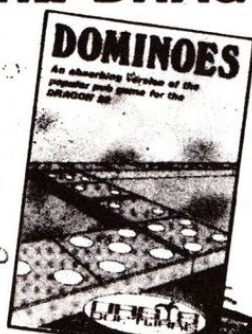
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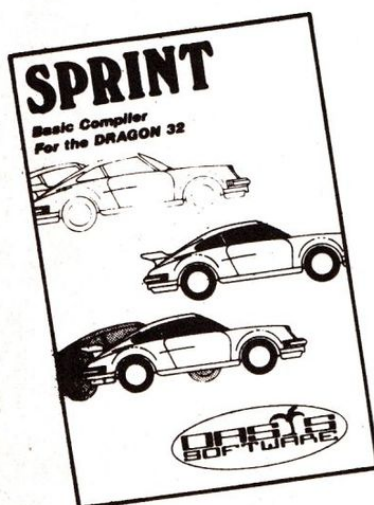


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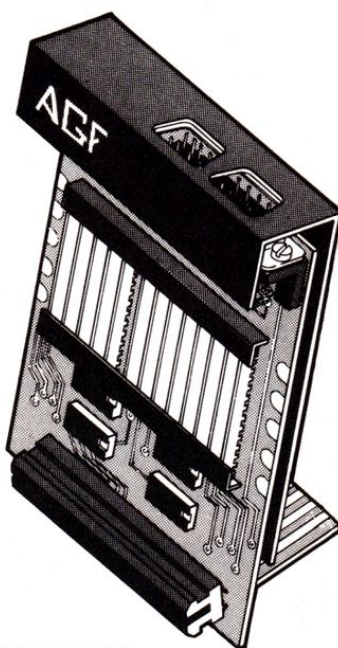
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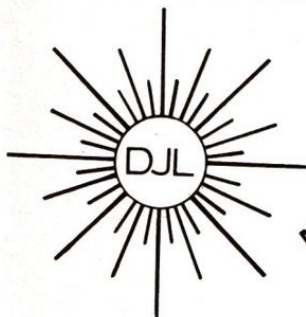
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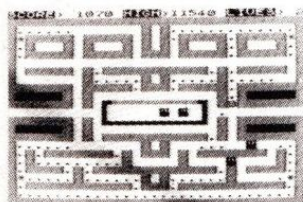
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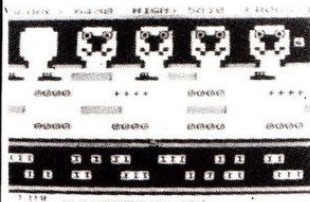


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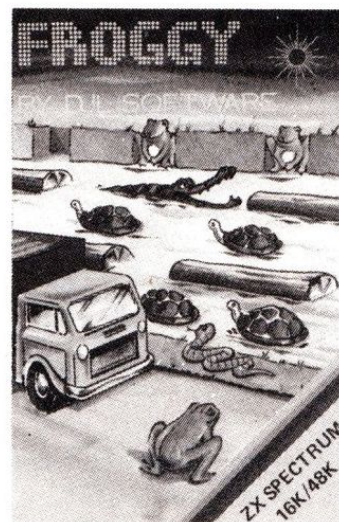
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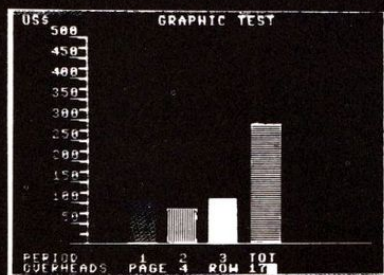
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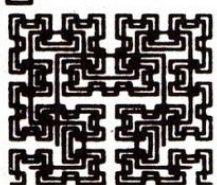
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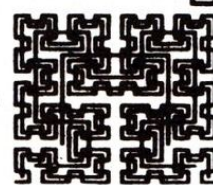
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Hisoft Pascal is also available under the CP/M disk operating system in a variety of formats. Sequential FILE handling is fully supported allowing the creation of database-type structures on disk. Compilation and execution are both extremely fast and simple to use. Hisoft Pascal 4D(isk) comes complete with a comprehensive user manual.

HISOFT DEV PAC 3T

"... DEV PAC is most highly recommended. The documentation is first class." *Your Computer May 1983*

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Two comments from reviews of earlier versions of DEV PAC — **now** we have DEV PAC 3 available: a powerful Z80 assembler with conditional assembly, assembly from tape (to enable generation of very large code files), ORG, EQU, DEFB, DEFS, DEFW, DEFM, labels of any length — in fact all you need for fast (3,000 lines per minute) and powerful assembly programming. But it doesn't stop there: DEV PAC 3 also includes an incredible debugger/dis-assembler giving you a 'front panel' display of the Z80 system and allowing extensive debugging of your machine-code program, including single-stepping programs **EVEN IN ROM!!** Open up the secrets of low-level programming with DEV PAC 3.

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Hisoft Pascal 4T (ZX SPECTRUM) £25 inclusive
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"My appetite has been whetted and I intend to get my own copy (of Snowball) to play."

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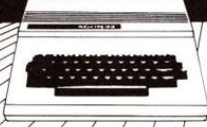
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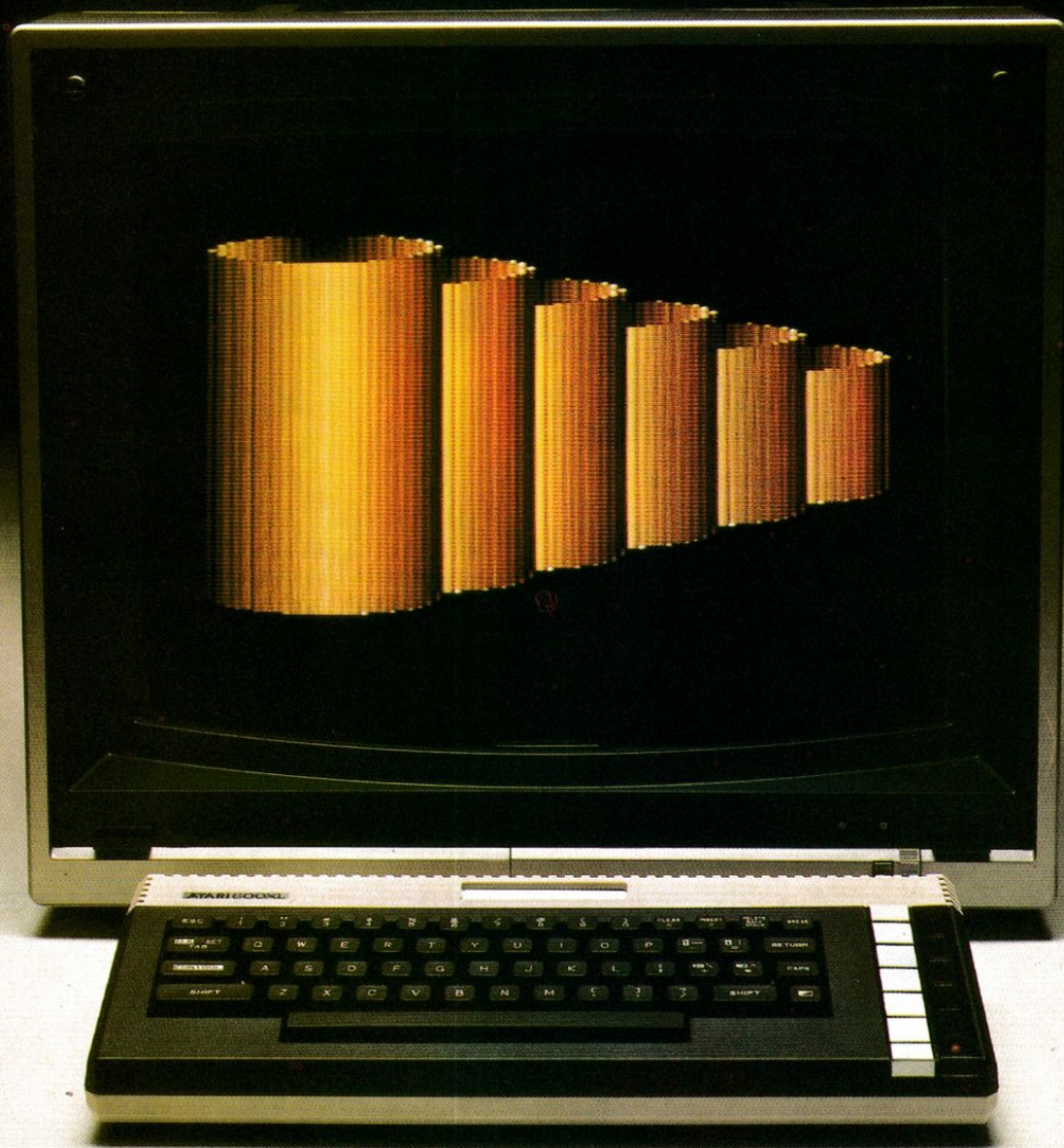
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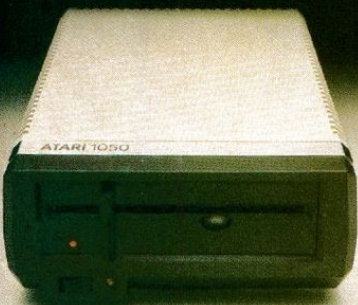
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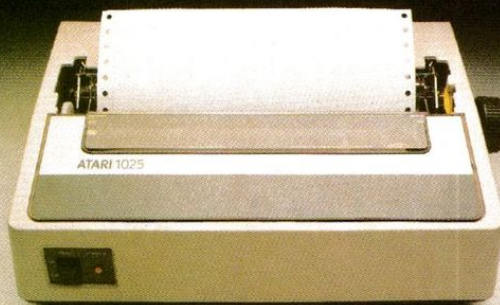
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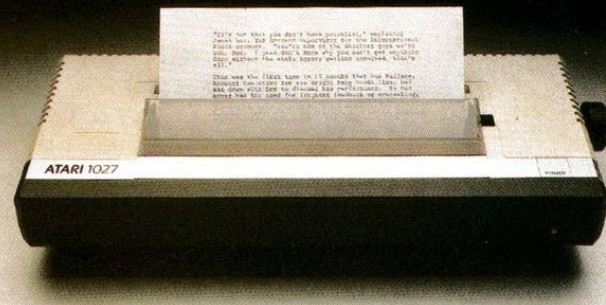
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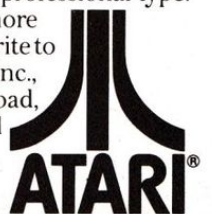
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If you'd like to know more about the ATARI 600XL, write to Atari International (UK) Inc., P.O. Box 407, Blackhorse Road, London SE8 5JH and we'll send you all the details.

The new Atari XL home computer system.



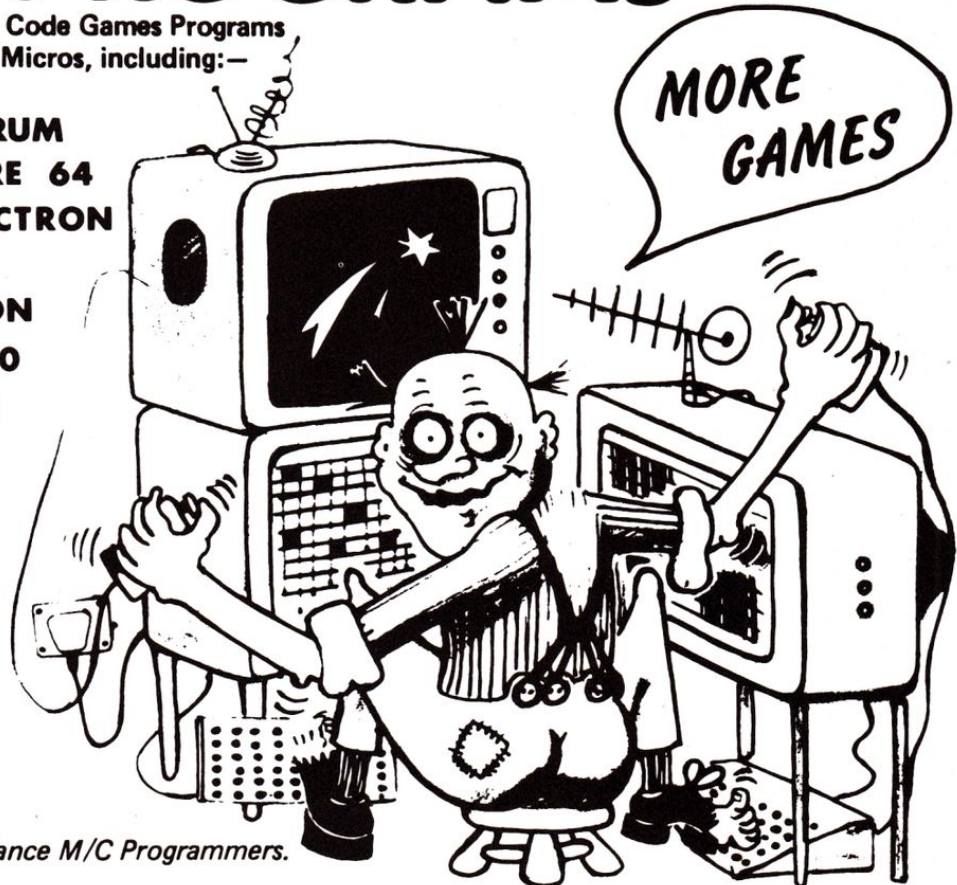
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REWARD

• NEWS •

Sinclair ZX84—is it the new BBC micro?

Say the words "BBC Micro" and the next syllables to come to your lips will almost certainly be "Acorn". After all, the BBC machine was certainly the fertilizer from which little Acorns grew. But all is not as serene as outward appearances might indicate.

The BBC's current contract with Acorn comes up for renewal this summer. Now, as we all know, a certain party was very upset when Auntie Beeb offered her bounty to Acorn instead of another manufacturer. That same party was even more upset when the Establishment in its wisdom selected the Acorn micro as the computer which would go into the schools, thus making it effectively the Government Recommended Computer.

That party is, of course, Sinclair Research. It now seems that the

renewal of the BBC contract will not be the formality which most of the industry has been expecting. Sinclair is planning a major bid for the respectability conferred by the magical name of BBC Micro 2. The weapon it has up its sleeves is the micro known variously as the ZX83 or ZX84. The specifications are now emerging — a 16-bit processor, either the Motorola MC68000 or a custom-designed chip, 128K of RAM, two Microdrives, and the operating system in ROM.

There will be more than one version of this machine. It is the mode aimed at the educational market that Acorn will have to beat. Its special feature will be in the provision of various high-level languages apart from the almost obligatory Basic. Micro-Prolog, just released on the Spectrum, is a

natural replacement for Basic as the *lingua franca* of the micro world, and it also seems likely that Logo (the full language rather than just the turtle graphics subset) will be implemented.

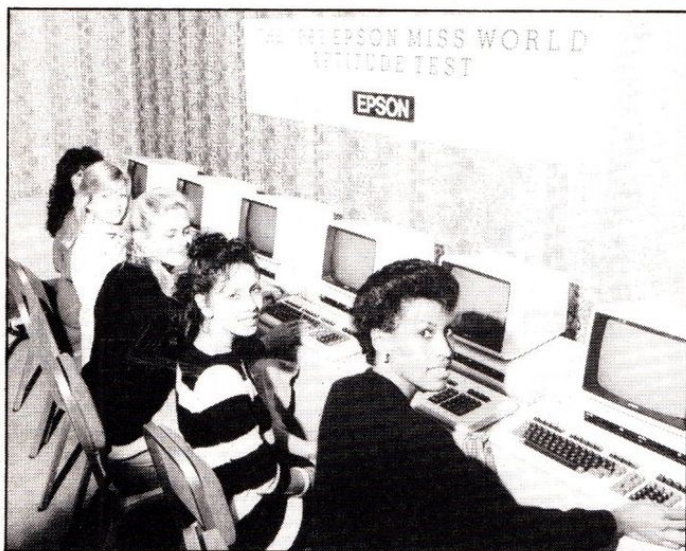
With its other model, Sinclair will be leading the way into the lower end of what looks like being the next big market in computer hardware — the so-called 'home/professional' sector. This type of machine fills the gap between the biggest and best home computers and the cheapest personal business machines. It is likely, however, to incorporate a couple of definable features. One is that it will run some existing business-orientated software like that currently found running under the famous CP/M or under MS-DOS. Such programs will be the 'simple' and direct business tools such as the spreadsheets and word processors — the sort of stuff the business person will want or need to run at home.

They will also run games-type programs, of course, because they will be at least as good at graphics as the existing home games-playing computers now available. This will make them available for use by the 'family' in all its guises.

The other feature the machines will have is that they are likely to be more expensive than existing home machines, and this is likely to change the shape of the marketplace.

Sinclair's particular slant on the professional machine includes the use of the increasingly fashionable CMOS architecture. One advantage of this is the very low power supply required — the whole system could easily be battery-powered, and a portable version would therefore be a natural path for Sinclair to take. As the 85K Microdrives are rather small to deal with a 128K computer, it is also possible that self-powered CMOS RAM packs will be used for mass storage.

The educational system is likely to cost around £300, and the more serious version around £400 — making Sinclair a market leader on price once again. There is also one last possible twist in the tail — as we go to press in early December our confidential and highly unofficial sources tell us that production is already building up at EMI's Feltham plant. It could just be that the ZX84 will surprise us all by sneaking in as a last-minute ZX83.



This month's winner of the think-of-a-silly-promotional-idea-to-get-in-the-papers competition has been won by that consistent winner, the Miss World Competition. Here we see some of the contestants for this event taking an 'aptitude' test as part of the general extravaganza.

The test was a simple maze that tested hand/eye co-ordination. It was run on a collection of Epson QX-10 machines used by the girls, thus demonstrating its prowess as a business machine. The maze test came at the end of a written paper testing logical reasoning, numeracy, spatial ability and accuracy.

The contestants had the last laugh at this bit of the competition, for once at least. Rumours have it that they all did infinitely better than the assembled journalists, who had come to witness the event and had been persuaded to have a go themselves.

Getting coverage

Every so often, not totally unconnected to when a company offers a new policy, we devote the odd column inch or two to an important, if boring subject — insurance.

Now, as everyone knows, nobody actually needs insurance until it is too late, and it is certain to be the last thing you think of as you unwrap your Chrissy pressies and start playing with your brand new home computer. It might be worth considering come Boxing Day, however, when the dog decides the computer looks like a bone and has it for breakfast. Then ... oh, then you will wish you had taken out an all-risks extension to your house contents insurance.

That at least is what General Accident hopes you might wish, for the company offers just such an extension to its own policies ... impressed, eh?

To be fair you should be, for though most policies will cover the 'normal' things like fire and theft, accidental damage or loss is not covered, and that is what is most likely to happen to most home computers (the ones that don't break down of their own accord, that is). Spilt coffee, electrical fluctuations and three-year-olds rank highly in the danger stakes.

General Accident, together with a wide range of other insurance companies, can be found at most insurance brokers.

Sir Clive never had it so good



The Rt Hon Harold Macmillan shows Sir Clive Sinclair how a Spectrum computer runs one of the new educational programs jointly produced by Sinclair and Macmillan Education.

Mr Macmillan, the prime minister who coined the immortal phrase, "You have never had it so good," and Sir Clive, the man who has set out to prove him right, were together to launch the software products. Aimed at 5 to 12 year olds, the programs cover such subjects as learning to read, and simple scientific concepts.

For example, *Survival* is a

program that models the natural world and the hazards that face wild animals in staying alive, while *Glider* makes the child into the pilot of a glider, balancing natural forces like wind and lift to stay in the air as long as possible. (Which *Micro's* own fly-a-kite glider pilot Simon Craven — Bradford's answer to the Red Baron — rated this program highly. He 'crashed' twice).

The programs are available for £9.95 each on mail order from Sinclair in Stanhope Road, Camberley, or telephone 0276 685311.

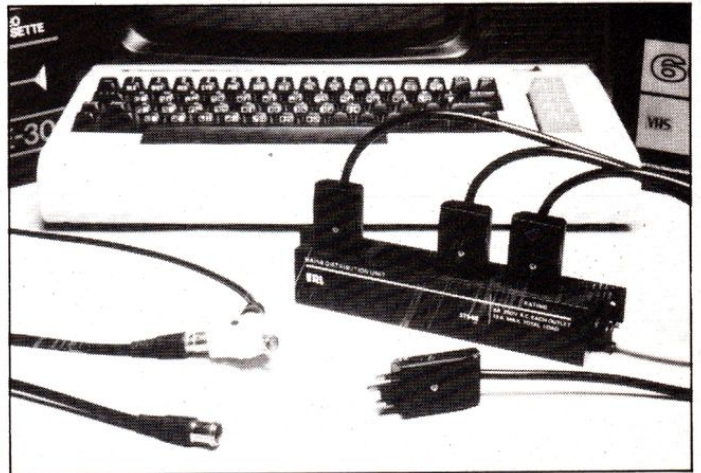
Computer shall speak peace unto computer



Well, why not? All this speech synthesis and speech recognition stuff that's now coming on the market should mean that it becomes possible to stick the two

together and effectively cut out the middle people, ie us.

Two new systems have recently come onto the market that demonstrate the possibilities really



Here's a thingie for all those who curse the endless miles of wiring, cabling, connectors and general dross that inevitably tend to hang round the back of home computers.

Sometimes known by its technical name, 'spaghetti', the stuff can be dealt with in several ways. One, of course, is to rip it all out and throw it away. Another is to use this, the Multiplug from ERL. It is a four-way mains adaptor and costs £7.95.

Also in the picture is one of those useful TV aerial adaptors, which costs £1.50. ERL can be found on 01-221 1614.

well. One is a speech synthesiser from Ireland, while the other is a speech recognition system from Brighton.

The synthesiser is the Commtalk unit from AndOr Systems. Designed to run on Commodore hardware, it uses the growingly popular technique of allophones to generate sounds and construct words from the character strings keyed in at the keyboard. This gives the unit an unlimited vocabulary, in theory at least.

It is designed to work with the Commodore 64 and Vic 20, and a version is available that fits the dear old Pet machine. It requires the acquisition and use of a few Basic commands to operate and with these a variety of tricks can be performed. For example, it becomes easy to build up a string of words, store them, and have the machine say the string on request.

The speech recognition unit comes from Orion Data down in Brighton. Called Micro Command, it plugs into a Spectrum to control its activities by voice activation. In operation, the user simply speaks a word into the system four times. This establishes a voice pattern in the system which is recognised subsequently. It has a vocabulary of 15 words and these will normally be simple commands suitable for use with games programs and the like — words such as 'up', 'down', 'left' and 'right', for example.

The unit comes as a pack consisting of the speech recognition unit itself, the instructions, a free microphone, and a free cassette which provides the loading instructions. This tape also includes a demonstration game called *Sheepwalk*. This has been modified from the Virgin Games program, *Sheepwalk*, and Orion is currently

negotiating with Virgin and other games houses such as Quicksilver, Melbourne House and Imagine on the development of new programs that will be specifically developed to make use of speech recognition in their playing.

One important factor for all those who are interested in things spoken is the price of these two items. The Commtalk synthesiser costs £39 (or £45 for the Pet version), while the Micro Command costs £49.95.

This of course means that, for under £100, the perfect communications interface between the Vic 20 or Commodore 64 and the Sinclair Spectrum can now be easily established: that is, of course, if you can stand the noise.

Burger and chips

Commercial sponsorship is a booming field, as those familiar with just about any form of organised sport will testify.

A new release from Ocean is one of the first examples to see the light of day. Charminglly entitled *Mr. Wimpy* it involves the burger giant's character in a game for the 48K Spectrum with the theme of making a hamburger from various ingredients.

Surprisingly, you won't be able to buy a copy of *Mr. Wimpy* from your local Wimpy. Nor can you expect to receive one as a reward for bolting down three super-double-half-pounders at one sitting. You will, however, find it in your usual software outlet at £5.90.

It's a high price to pay...

Just when you thought W H Smith had sewn up the market in cassette recorders, PAL, a division of Phone Aids Ltd, has introduced a new contender for the title of the world's most expensive computer cassette deck.

Yours for the newly-reduced bargain price of only £249 (yes, that's two hundred and forty-nine pounds) you get "a non-intelligent digital tape recorder requiring all formatting to be implemented externally."

It requires either four AA pencils or a mains supply, and the unit has an RS232 interface as standard.

Your signals ("data logging or program storage...") are recorded on a standard C60 audio cassette at rates between 110 and 1200 baud, the same sort of speed range as the £25 recorder you use with your Spectrum or BBC Micro, so don't expect the dizzy speed of 19200 baud offered by the Coleco



Adam's £200 digital tape drive.

Incidentally, the advantage of using digital recording rather than the analogue type is a much better level of reliability. Things like the tone setting and the playback

volume stop being critical.

Anyone who can't live a moment longer without the cassette recorder of their dreams should call PAL on 021-478 3084. Don't forget the £3 postage and packing.



Disc jockey Dave Lee Travis, who sometimes masquerades as a self-styled 'hairy monster', has apparently helped develop a new set of games with Twig Software Systems. He and the company are confident that the games will provide a challenge of not inconsiderable proportions. Indeed, that confidence has prompted them to run a competition for players of the games with a prize of £10,000 being dangled enticingly in the winner's face.

There are a total of six games in the set, which is compatible with the BBC, Dragon and Sinclair ranges of hardware. Each program costs £9, and the whole set will knock you back £45 plus post and packaging. Each purchase becomes a registered entrant in the competition, known as the DLT Monster Challenge.

They are available on mail order only, from Twig, at 6 High Street, Wendover, Bucks.

Mirror goes soft

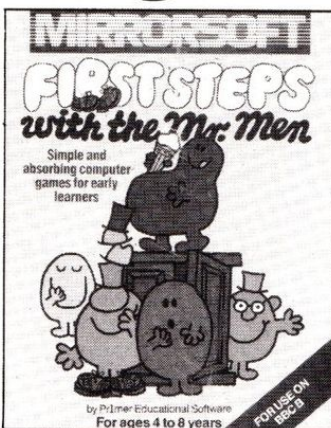
It is always interesting when a significant company in its own field decides to dangle a toe in the waters of home computing. Questions such as will a piranha come and bite it off tend to get asked. The latest company to become the subject of such speculation is Mirror Group Newspapers, not totally unknown for publishing the *Daily Mirror*.

The company has now launched Mirrorsoft, a new company that takes the group into the world of software publishing. As with many other companies, it will be interesting to see how they have got on in a year's time.

It is starting business with three programs, each written by different companies and each with an educational bias. They will be available, either now or in the near future, on the Spectrum, the BBC B, the Electron and the Commodore 64.

From Primer Educational Software come four programs aimed at children of four years old and up. These are all based on the cartoon characters beloved of small persons, the Mr Men. Each game is intended to help children develop the skills that will be needed in learning to read...

Quick Thinking is the overall title of two arithmetic games programs from Widgit Software. SumVaders uses addition and subtraction to rid the world of invading aliens, Ronald Reagan style, while Robot Tables



has the player using multiplication tables to build *Daily Mirror* readers,

sorry, robots.

Last of three early releases is *Caesar the Cat* from Andromeda Software, which features the aforesaid moggie in a hunt for mice which are eating your food. This teaches how to avoid hunger, and rodent extermination.

The latter game costs £6.95, while the other two are priced at £8.95, and they are both available on mail order, and through retailers.

More info can be had on 01-353 0246.

For full reviews of *Quick Thinking* and *Caesar the Cat* see this month's *Soft Release* section starting on page 107.

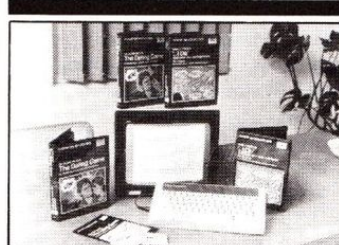
Auntie to launch new radio prog

The Beeb is taking to computers in a big way. After broadcasting television programmes and having a computer named in its honour, Auntie's Radio 4 is to get in on the act with a new series of half-hour programmes on the subject.

Fronted by Barry Norman, best known as the host of television's *Film 80* series, the programmes will cover the broad spread of interests that exist in computing.

For the hobbyist, this means such new-fangled exploitations of technology as broadcasting programs over the airwaves. There will also be features for business-people, and industry software and systems staff.

The programmes are due for a 10 week run, to be broadcast on Saturdays with a repeat on Wednesdays, from the middle of January.



Acorn has launched two rather tacky programs based on the if-it-got-sex-as-an-angle-it'll-sell approach to business.

These are *The Dating Game*, which is intended to help individuals find partners with whom they are likely to be compatible, and *I Do* which plays pseudo marriage guidance to help couples "assess the good and bad points of their relationships". Come back *VisiCalc*, the *Space Invaders* miss you.

Observers of the software industry will not be surprised to see the name Ivan Berg connected with these packages. His track record includes such Commodore programs as the *Robert Carrier Menu Planner* and *Know Your IQ*. These products have frequently generated great interest from the general public, who see them as ways of relating the esoteric micro world to Real Life, but rather less enthusiastic reactions from the computer press, which knows the limitations of present home computers in handling these tasks.

Letters TO THE EDITOR

THE EDITOR, WHICH MICRO & SOFTWARE REVIEW

SCRIPTOR COURT, 155 FARRINGDON ROAD, LONDON EC1R 3AD.

Best Basic

I have not seen any children's letters published. I think more children's letters should be published because we are the main computer users after businesses.

Anyway, could you please publish this letter as this would help considerably in persuading my dad to buy me either an Atari 600XL or the Acorn Electron. Which of these two computers have the best Basic and/or the best general functions eg. graphics, sound, colour, peripherals, etc? I also think you should do a comparison: Atari 600XL vs Acorn Electron.

Also, is it worth waiting half a year for the Elan to come out?
Farid Howladar, London E11

Both these computers have good sound and graphics, but the Electron's facilities are much easier to use. The Electron's BBC Basic is the best in its class. Electron software is generally cheaper than Atari software, but this is little use if you can't find an Electron to buy. Atari Basic is quite reasonable, especially with the revisions included in the 600XL. It can be difficult to use the graphics and sound if you are unwilling to delve into machine code.

As for the Elan, there will be many new computers available next year, notably

the new Sinclair machine. By waiting for newly announced computers to become available, you may well fall into the trap of never actually buying one. There is always something new "coming soon".

Educational software

I am prompted to write to you in response to the comment from a computer journalist (in the November issue, *Are you a computer junkie?*): "A lot of the copy I get is unusable . . . (People) often can't spell, punctuate or use decent English grammar."

I would be prepared to take up this challenge in writing a review of some good educational software if I could find some which was worth spending time and money on.

I have taught Maths, English and Social Studies for the last nine years in Middle Schools in Bedford, and am also a parent of two young children, one of whom is about to start school.

I am fortunate in the access I have to computer hardware — we have several computers at school and at home I have a 48K Spectrum.

By 'good educational software' I am thinking of software which prompts a teacher (who may not know a great deal about computers, and even less about

programming) to set up computers to run a program, for a group of children or a whole class, because that program is able to teach concepts or skills more effectively than would be possible by more traditional means.

I am aware of the argument that software manufacturers can make greater profits in the field of computer games. This still leaves two points. Firstly, do games have to be such an exclusive interest, given the amount of government money which has helped to provide so many schools with the machines which will run their software? Secondly, how long will parents continue to buy the latest game for their children (and thereby keep the manufacturers in business) unless there is some sign of something more 'educational' being provided as well?

M.L. Meakin, Bedford

Perhaps you've answered your own questions, Mr Meakin. Unless government money is directly poured into educational software most independent software companies will continue to produce those programs destined to make the best profit. And for the moment, at least, that means primarily games though the amount of educational software is now increasing greatly.

Short cut

D.E. Healy's game program *Damnation Alley* (Which Micro? October issue) can be shortened by 30 lines in the following way:

Lines 6215 to 6247 print on line 22 of the screen by poking each character into the display file. However, the two bottom lines are reserved by a routine using the system variable "DF-SZ" at 16,418. This is normally set at 2 but 'Poke 16418,0' as a program line allows you to then 'Print at 22,0' or 'Print at 23,0'. So lines 6215 to 6247 can be omitted and replaced by:

6215 POKE 16418,1 (this leaves line 23 for reports).
6220 PRINT at 22,0; "□ . . . □
□ . . . □ . . . □ . . . □ . . . □ . . ."
□ . . . "

Lines 6248-6250 could be replaced by a single print line, but in fact Mr Healy's FOR TO NEXT loop is less work.
Ewen F. Flint, Aberdeenshire

Down Under

Greetings from Western Australia, home of the cup, (that American one, remember?). Living in WA as I do, I don't expect to get the September issue of your magazine on September 1st. I get it on November 3rd and pay \$2.40

(£1.50) and am delighted with what I receive, with one exception.

There were some cheap software coupons on page 102 of your September issue that I would have loved to have used but they expired on September 30th, 33 days before the issue arrived here!

Why don't you extend the deadline for overseas customers? With the average Acornsoft arcade game retailing at \$35 to \$40, (£21 to £24) in sunny Australia, I'm sure many of us over here would use the opportunity if it was given to us.

I have also written some pretty good (so I am told) Basic educational/arcade programs for my BBC model B. What is your going rate for software submissions? Is it OK to submit software on 80 track single-sided double density disks and will these be returned?

Does your Martin Banks bear any relation to the one currently writing for *Australian Personal Computer*?
Ben Hyslop, Port Hedland, Western Australia

Unfortunately, we cannot hold these offers open any longer. But you could, of course, get in touch with the software houses directly using the addresses in Soft Release.

Payment for software listings printed in Which Micro? depend on length but average around £30.

We can only accept programs as printed listings preferably with a cassette but not on disk.

Finally, Martin Bank's legal department is currently investigating his world syndication contract to see if it is indeed himself.

Spectrum keyboards

May I please have your advice about add-on keyboards for Sinclair Spectrum machines? I am looking for my first micro, but would prefer to use a normal typewriter-style keyboard. I am considering a Spectrum and Fuller keyboard as a cheaper alternative to, say, Acorn's Electron.
D. Sinnott, Liverpool

The problem with add-on Spectrum keyboards is that although the feel and layout is much improved you still have to cope with the idiosyncratic 'hunt-the-keyword' method of entering Basic programs. However, they do make it easier to use the computer when programs are being run, rather than entered. Fuller Systems has had delivery problems in the past — check before ordering.





Confessions of a computerholic

I read with great interest and amusement Mike Gerrard's article on computer junkies. However, there is one essential area of computer addiction he failed to cover up. Giving it up.

I am a computerholic, as two months' separation from my beloved CPU have driven home to me, and therefore I can report from first hand knowledge all the stages of withdrawal encountered.

Stage 1: *The Day You Stop*. The most common reason is moving house. Lovingly you pack computer, drives, monitor, games, etc, in a stout packing case so no damage can occur. At this point you are reasonably calm, but looking forward to the unpacking.

Stage 2: *The Delay*. You are notified by the removals firm that because of strikes/bad weather/Customs work-to-rule/missing import or export documents (delete items not applicable) it cannot deliver your belongings to your new address as yet.

Stage 3: *The Delay is Officially Described as Indefinite*. You catch yourself furtively thumbing through magazines. As time progresses you become unduly fascinated by computer-shop windows and mail-order price lists. You write letters to 'Which Micro?'. Suddenly you realise that you are seriously considering buying another machine to tide you over until the Pride and Joy arrives.

This is the point at which the withdrawal symptoms become

acute, and sadly, so many crumble and give in. Bank overdrafts, computer magazines piled to the ceiling in every room, mail order peripherals and software arriving with each post — who has not experienced the 'Honeymoon Period Syndrome'? The second, third and fourth attacks are no milder than the first (remember when you first splashed out, trembling with excitement, on a ZX81!).

Stage 4: *It Arrives!* Hopefully, you have survived Stage 3 intact. Now you can really celebrate! Mail order peripherals and software arriving with each post, computer magazines piled to the ceiling in every room, bank overdrafts...

Haven't I heard all this before? Rose Humphrey, Garches, France P.S. By the way, I only scraped 105 in the Junkie Quiz.

Unfair to Orics!

I have recently received an Oric-I home computer, and I am becoming more and more aggravated.

Not, I might add at the computer, nor at the fact that it was five months late. But because in every magazine (sorry, but yours included) that I have bought, the adverts for Oric software have missed out one vital point.

What size of memory? Most ads — of course there are exceptions — go into great detail about the tremendous features their program has, but they neglect to mention whether the Oric 16K is compatible.

This is not only annoying, but time consuming. If I want to find out what size of memory is needed I usually have to write off to the company. This only takes me five minutes, but the reply usually takes two weeks.

This means that I cannot go out and buy the program until I have heard from the company, and after two weeks the prices have usually shot up.

So I can't really win, can I? To

be fair to all though, I am extremely pleased with both the Oric-I and the software. I also have a small tip for Oric 16K owners. If you have a 48K program that does not use the HIRES command type in GRAB. This will give you the extra memory used for the hi-res screen.

But be warned, if you use GRAB make sure that the HIRES command is not used in the program or else it will not run. To give back your extra memory type in RELEASE. You can make these commands part of your program, or type in GRAB before running and release at the end.

David Paton,
Aylesbury, Bucks



Joystick control for TI99/4A

In the last issue of *Which Micro? & Software Review*, it was said that the TI99/4A has no joystick control. This is untrue. The TI handbook is unclear on this point so here is a short program using the joysticks.

```
100 CALL CLEAR
110 CALL JOYST(1,A,B)
120 X=X-(B/4)
130 Y=Y+(A/4)
140 CALL HCHAR(12+X,
    16+Y,42)
150 CALL HCHAR(12+X,
    16+Y,32)
160 GOTO 110
```

I hope this program may help some people having problems. The fire button uses the call Key statement, the Key has a value of 18.

S. Gregory, Stoke-on-Trent

Computer Choice

I think your monthly buyer's guide article is simply excellent, also your points for and against are extremely fair, and totally unbiased and your conclusions are also very fair. One improvement could be made, though, by adding a column giving the best buys of the month, best buys under £100, £200, £300, £400, and so on. I feel that the inclusion of such a column would help a potential buyer no end, since I do not own a computer — yet! This should help me also.

From your magazine's most avid reader.

Stephen Baysted,
Wandsworth, London, aged 14

Hope last month's Computer Choice by price band was helpful. The problem with just recommending a best buy by price each month is that different computers have different advantages depending on the use that you the buyer wants to put them to.

Oric column?

I am about to buy an Oric-I 48K. I have only just started reading your magazine and when my brother first bought it from the shop I nearly thumped him. Good job I didn't though. Your publication is excellent. Readable articles, those great company updates (ZX Soft, Acorn Angle), all of the software reviews and all of those great cartoons. What I would like to know is if you are going to have an Oric company update. And also, what is *Hell's Temple*? I will continue to read your great magazine.

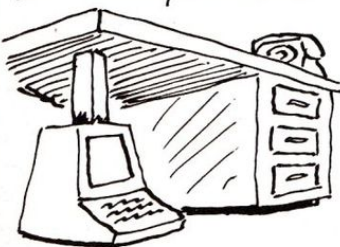
Chris Carr, Aged 15.
Preston, Lancashire

Hell's Temple is an Oric adventure game from Kenema Associates. We are introducing an Oric column next month and would welcome any other readers' views.

SILICON TIPS

Handy Hints for Micro Users
By Richard Howell

For some businesses a good robust micro is indispensable



So make sure you buy through a reputable dealer

MICROMARVEL



Who will lend you a replacement machine if yours breaks down



How to progra with a VIC 2



Judy's boyfriend, Bill, is extending his knowledge of BASIC with Programmer's Aid Cartridge. He also plays a mean game of Sargon II Chess.

For Judy it's all work and no play. Just GCE programs: History, Geography, English, Biology, Physics and Chemistry.

Grandad spends his time reliving his days in the RAF, with Mission Impossible, Alien and Omega Race.

Being pretty musical, Granny's favourite program is Type-a-Tune. But she also likes a good gamble, with Super Slot.

When he's forced to, Andy's into Teach and Test Arithmetic and Brain Builder. When he's not, then he enjoys Road Race and Super Lander.

Lucy plays a lot with Menagerie and Hopbit, and learns a lot with Alphabet, Vocabulary and Apple Tree (arithmetic).

m your family 0 computer.



Mum uses Robert Carrier's Menu Planner and feeds her brain with Mastermind and Quizmaster.

Dad escapes into another world with Cosmic Jailbreak but comes quickly down to earth again with Money Manager and Vicwriter.

The VIC 20 can please all of the people all of the time because it has, quite literally, hundreds of software programs.

Programs that are exciting, fun, educational, musical and always entertaining.

There's ROM software (they're the cartridges you simply plug into the back of the computer) for only £9.99, and cassette programs (for use with the cassette unit) starting at under £5.00.

No other home computer offers such a choice.

Or, to put it another way: who in your family would have nothing to do with the VIC 20?

We suspect that the answer is no one.

Please send me Vicsoft, the free colour catalogue of VIC software.

Name _____

Address _____

Postcode _____

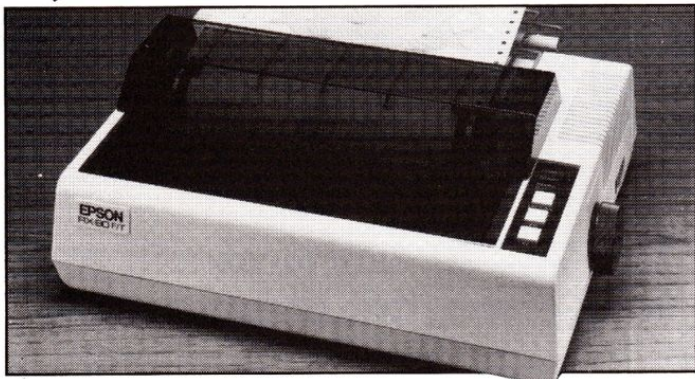
The Commodore Information Centre, 675 Ajax Avenue, Slough,
Berkshire SL1 4BG. Tel: Slough (0753) 79292.

 **commodore**

VSWHM0184

WIN

a superb Epson RX80 printer in our great printer competition



All you have to do is study the five features of the RX80 printer and arrange them into what you think is the correct order of priority. As a tie-breaker, complete the slogan in less than 15 words.

The prize

Epson's RX80 is one of the latest developments of its famous range of low-cost high-quality dot matrix printers. Normally retailing at over £300, the RX80 features high-speed, 80-column printing at 100 characters per second. There is a software-selectable choice of three print styles — normal, italic and elite — and the option of double-pass printing gives the Epson the ability to produce dense, easily readable text with true lower-case descenders on an 11 × 9 matrix. The widely-used Centronics parallel interface is built in.

The Competition

The following five features are characteristics which make the Epson RX80 printer stand out from its rivals. Using your skill and judgement, rank them in order of importance from 1 to 5. For example, if you think that feature A is the most important, put A opposite number 1 on the coupon.

- A. 100 cps printing speed
- B. Clear printing with true lower-case descenders
- C. Excellent value for money
- D. Attractive modern styling
- E. Excellent dealer/servicing network

The tie breaker

In the event of two or more entries choosing the right combination of features, the winners will be decided by the wittiest and most appropriate conclusion to the tie-breaker phrase, "I need an Epson because ...". Use no more than 15 additional words.

I think the order of importance of the five features is:

1.
2.
3.
4.
5.

"I need an Epson because

.....
.....
.....

Name:

Address:

.....
.....
.....

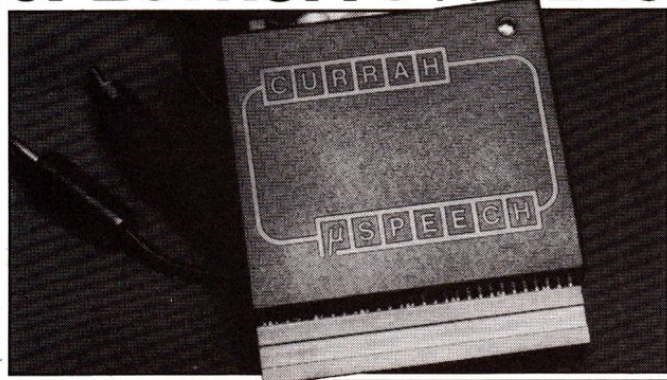
The rules

1. Your entry must be accompanied by the coupon from this issue of *Which Micro?*
2. All entries must be sent to:
Epson Competition
Which Micro? & Software Review
Scriptor Court, 155 Farringdon Road, London EC1R 3AD.
3. The judge's decision is final.
4. No employee of EMAP/Epson or member of his or her family may enter.
5. Closing date for entries is January 2nd 1984.

October Competition Winners

- 1. **M. Eyres**, Denton, Manchester. £200
- 2. **J. McKenna**, Skerries, Co. Dublin. £100
- 3. **S. Leck**, Whitby, N. Yorks. £50

PLUS SPECIAL OFFER FOR SPECTRUM OWNERS



Get a free Currah Speech Synthesiser unit worth £29.95 for your ZX Spectrum. Send this coupon in and the first ten readers to be picked out of the hat will win this new speech synthesiser that uses allophones to produce a vocabulary limited only by the user's imagination.

Name:

Address:

.....
.....
.....

Send this entry to: Currah Computer Concepts
Greythorpe Industrial Estate,
Hartlepool, Cleveland TS25 2DF.

Please Do Not send it to Which Micro?

PROBLEMS

Letters to: Hedley Voysey, Which Micro & Software Review
Scriptor Court, 155 Farringdon Road, London EC1R 3AD

WP on the Spectrum

I am suspicious of the Spectrum being able to do a reasonable job on word processing. How can it get away from the severe restrictions on the display in order to put an adequate number of characters on a line?

D. Crowe, Birmingham

There need be no fixed relation between the words displayed on a screen line and the words printed on a page. It does help in word processing, though, if you can see what is going to be printed.

The Spectrum can be given 64 characters per line by squashing them up and this is what is done in the Tasword word processor. There are other word processors for the Spectrum which handle a variable number of characters per line. The biggest difficulty is to store many pages of text. The Microdrives may help here.

I presume you are attaching a proper keyboard to your Spectrum and an interface for use with Centronics compatible printers. Most Spectrum dealers are able to demonstrate suitable software and interfacing hardware to adapt the Spectrum to word processing, but the absence of floppy disks does stop the Spectrum from being all that wonderful in this particular role.

Dialling for fun

Do you know of any computer games for two players which can be played over telephone lines? I am thinking of buying a Prism modem for my Sinclair and I wondered whether I could use it this way as well as using Prestel, which sounds rather dull.

J. Borden, Edinburgh

There have certainly been games produced in the US which work over telephone lines for two players. Generally speaking, the idea is to link up two users directly via modems which work at the same speed and in the same way. Reaction games which depend on the speed of a player are absolutely no good for this form of entertainment, but board and puzzle games can be good fun.

It is to be hoped that the Micronet 800 bulletin board, or

any other user forum for getting in touch with each other, will encourage the development of games in the UK. I should warn you that the phone bills can reach astronomic levels doing this kind of thing and I am not aware of much that is available over here yet, although some Apple users may have got round to gaming over telephone lines. I might add that using electronic mail can lead to cryptic messages being sent to and fro which are much like an endless crossword puzzle. It all depends on what turns on your sense of fun.

Digital TVs

I read somewhere that a digital television set is on the market. Would this be any better than ordinary sets for use with a computer?

B. Sears, Enfield

Not necessarily. The first thing to realise is that the people who design and build TV sets care mostly about your appetite for broadcasting. They are especially anxious that you should take up TV watching of satellite broadcasts. ITT is the firm which has a digital set out and it has listed the advantages. The biggest gain it seems is in the long life of this set while still working at peak performance. When things do go wrong for the digital set then it really boils down to entering new data into the controlling software (of sorts).

Another view of the advantages of digits in TV sets comes from Philips which has developed special memories for storing pictures. One way of using this memory would be to provide immediate access to several hundred teletext pages, but most likely it would be used to improve the picture by cutting out flicker and colour aberrations. Philips also wants to show you a mini-picture of what is on another channel apart from the main one you are tuned to.

However, what you may have heard is that some French engineers are suggesting a standard for 'peri-television'. This is effectively a 'domestic data bus' which will enable digits to lurch via the TV set to and from any old unit using digits that happens to be around the house.

This might involve your electricity meter as well as the French Prestel-like telephone

directory they are installing by the thousand. The rest of Europe did not invent the idea so they will probably stall about accepting the French proposal. In a few weeks' time the European society which groups all the consumer electronics companies is to discuss the matter.

When the time comes that TV set makers can make a bigger profit from selling high performance sets which happen to use digits and integrated circuits controlled by microprocessors — then you will hear more about how good an idea is the 'domestic data bus'. In the meantime think about organising a mass emigration to France of 500,000 home computer owners of British citizenship.

Increasing screen speed

Is there any way of getting faster movement on my screen without going to machine code?

L. Iver, London SE24

In principle you have the right idea. That is to say that you have to move away from slow interpreted Basic. Compiled Basic might be better but I am doubtful about this. The obvious route to take is via Forth, where the much faster execution of statements might be sufficient for whatever you have in mind.

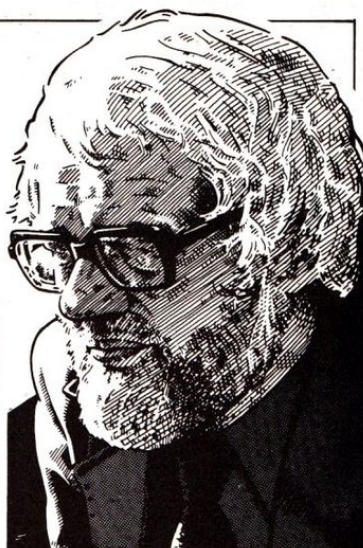
Forth is available for most home micros. If this is not good enough then I am afraid it will be necessary to grub around in machine code — but the results may well make it all worthwhile.

Why all the fuss?

I realise that mechanical things, such as printers and disk drives, do not get to be cheap as fast as electronic designs, such as the main boards. However, if this line of thought is followed through then the so-called price war in home micros is a farce, because the machines themselves will always be a small part of a truly usable system. Why is there all this fuss about price cutting?

H. R. Bond, London SE22

I have no real answer as to why there is less fuss over good printers and bigger disks at lower prices than over machines. First,



however, it should be realised that many buyers start with the minimum and so at that moment it is only the cost of the basic system that matters. Secondly, it is worth noticing that competition and mass production does work to bring down the cost of the more mechanical peripherals — even if it does happen rather more slowly and discreetly than with the boxed up processor boards.

As a matter of interest, the lower cost slice of the disk market is becoming much more attractive to the home user. The smallest capacity disks are dropping below previous levels, but at the old idea of low disk prices — around £200 or so — the new three inch units are chalking up much bigger capacities. The fuss you are complaining about is mainly about catching beginners.

Soft keyboards

Is there any machine with which I can make any key on the keyboard produce any character or value?

J. Thomas, Eastleigh

To use a completely programmable keyboard I think you will have to turn to a Sirius computer or the newer Apricot machine of which there should be a few around by now. These two designs both have a keyboard where tables can be used to assign any value to any key so that they are very adaptable to the varied alphabets in use around the world.

This also means that any key can actually be turned into a special function key by using that code to trigger some action. I do not think that is how they are meant to be used, however, as there are already some 'free' keys provided for this purpose. I gather that you want to use a cheaper home machine and I am not clear about your best course. Perhaps readers can provide the answer? For graphics shape generation you could find a Colour Genie perfectly suitable.

LARGE SCALE DRAGON

The long-expected Dragon 64 is here at last but, offering fewer features than Commodore's 64 for a higher price, was it really worth the wait?

Speculation about Dragon Data's second computer started almost as soon as the first had been successfully launched onto the market. Most industry pundits thought it would be a 128K machine, though this was as much influenced by what it was felt the Welsh company ought to be producing as on any inside knowledge.

Dragon Data itself gave little away, knowing that in the computer world there is not merely many a slip 'twixt cup and lip but that the cup frequently doesn't exist in the first place. But towards the end of last summer the company eventually said that the next model was a Dragon 64 and that it would appear by the end of September. The company produced it by the skin of its teeth in time for the PCW Show at the Barbican, promising models in the shops by the end of November.

The major addition is memory and in order to provide compatibility with existing software the 64 has been given different modes.

The 64's debut at the Barbican didn't raise too much excitement, and indeed some Show reports failed to mention it at all, even though it was the only new computer on view apart from the prototype Elan. It is difficult to judge something on a show stand, though, and now that a Dragon 64 has arrived at the *Which Micro?* offices we've been able to put it through its paces.

This didn't take too long (which is why our normally full-length review is rather abbreviated in this case) as the machine is little more than a 32 in 64's clothing. There are only three differences, apart from the change in colour of the casing to grey.

The major addition, of course, is the memory, and in order to provide compatibility with existing software the 64 has been given different modes. Switch on and you are automatically in 32K mode, seeing the same copyright notice on the same green screen, and a thorough test of Dragon cassettes and cartridges showed no problems. To gain the extra memory you make use of a bootstrap routine which transfers the Basic interpreter to the top of the 64K RAM by typing EXEC, or EXEC 48000 if you need to over-write a previous EXEC address.

The copyright notice updates to 1983, the cursor flashes blue instead of black, and rather more importantly it provides you with 41241 bytes for Basic programs, though this can be increased by about 4K if you don't want to make use of the graphics pages that are automatically reserved.

The second change is that you have



auto-repeat keys in 64K mode only, although most users needing this feature will by now have worked out their own routine for achieving it. What you are not told, rather surprisingly, is that the keyboard scanning routine has also been changed so that you don't get the problems of the 32, where even moderately fast typists were apt to discover that there seemed to be a letter-cruncher inside the micro which helped itself to some of their output.

Type RUN, for instance, and you may well get RN on the screen. This was caused by the scanning routine which examined the keyboard for presses a block at a time. Hit two keys in the same block too quickly and the second wouldn't register. On the Dragon 64, though, there is none of that and the quickest typist we could find experienced no problems at all. The keys also have slightly more of a bounce-back feel to them, so as a potential word processor the machine has obviously been improved and that extra memory and the appearance of several disk drives might well tempt some people.

The final change is comparatively minor in that there is now also an RS232 serial interface in addition to the parallel one. This is located next to the right joystick socket, but is hardly a great selling point as the existing Centronics-type interface will link you up to the majority of the best printers that are available.

And there you have it, none of the other features such as sound, graphics or the commands available having been altered at all. Buyers of the 64 don't even get their own manual, having to make do with the heavily criticised Dragon 32 manual and an eight-page supplement containing just five pages of text and a diagram of the DIN connections on the serial interface. Not even the omissions from the original manual have been corrected, such as the two missing error codes and the two missing editing commands.

If it had replaced the earlier machine and been sold for roughly the same price then it might have tempted more buyers.

It is extremely difficult to see Dragon having a success with this re-sprayed 32. Perhaps if it had replaced the earlier machine and been sold for roughly the same price then it might have tempted more buyers . . . though who knows whether this plan may be up Dragon's sleeve for the future? But with a recommended selling price of £225 (and Dragon doesn't encourage dealers to discount) and the Commodore 64 available for even less yet offering more, the arrival of the Dragon 64 seems to be something of a non-event, and a potentially costly one for Dragon Data. ■

THE BROTHER HR-15 DAISY WHEEL
PRINTER

£445 (EX VAT)

SEE IT AT:

COMPEC (NOV) STANDS 5185, 4186, S201
WHICH COMPUTER (JAN) STAND 2025



brother
BROTHER INTERNATIONAL EUROPE LTD.

 **THAME
SYSTEMS
LTD.**

All you require is a little peace and quiet.

By the time you've finished reading, you'll be convinced that the HR-15, from Brother International Europe Limited, is quite simply an outstanding printer at an exceptional price.

That's not to say it's basic. Far from it.

EVERYTHING YOU WANT FROM A PRINTER.

Daisy wheel, letter quality, and bidirectional printing at a speed of 13 cps (Shannon text), 18 cps maximum, is the platform upon which Brother have developed the HR-15. Making it an attractive proposition to business people and hobbyists alike.

Take the daisy wheel itself.

Available in a host of typefaces, it comes encased in a protective cartridge.

As much to guard it from manhandling and prolong its useful life as to save you from dirtying your fingers.

A small point, perhaps, but it's indicative of just how far Brother go into the planning of their machines.

Simple but ingenious ideas like a

the office than a lot of its competitors in the printer market. And, as with all of the Brother accessories, the price adds to the HR-15's economic performance.

SOPHISTICATED OPERATIONS AT YOUR FINGERTIPS.

As the functions, by necessity, become more complex, Brother have kept their operation as simple as possible.

At the touch of a button, the HR-15 can be set to continuously print whatever is stored in its 3K buffer. Making form letters and document duplicates no problem at all. It also leaves your computer free for other operations. To clear the buffer for new text, all you do is re-press the same button.

The HR-15 boasts proportional spacing which eliminates unsightly gaps between characters, giving a uniform appearance and highly professional finish.

For those finishing touches that give your print-out that something extra, the HR-15 can print in two colours, shadow print and underline.

All carried out automatically during the print run, as instructed by your program.

Should that program be of a scientific or unusual nature, the HR-15 can take it in its stride. Fractions, exponential or any other characters that require specialised treatment are dealt with by its super and sub script facility.

You don't need a computer tell you which printer to buy.

ribbon cassette that snaps into place, plus a separate red ribbon.

Ingenuity that extends as far as a family of compatible accessories.

More specifically, the TF-50 tractor feeder for continuous paper feed.

The CF-50 cut sheet feeder for word processing and letter use. It can automatically feed 150 sheets of A4 size paper, and the movable roller guide allows you to slip in a different sized sheet without removing the unit.

Finally, an invaluable attachment for all small businesses, the KB-50 keyboard.

It transforms the HR-15 into a sophisticated electronic typewriter.

Allowing the HR-15 to be of more use around

There's even an impact control to vary the character arm pressure on the paper, which is ideal for making carbon copies.

TAKING THE WORRY OUT OF INTERFACE.

An impressive array of capabilities which is equalled by interface and DIP switch options, thereby extending the versatility of its operation.

At no extra cost, the HR-15 offers a choice of either a Centronics parallel or an RS-232C interface and it's compatible with almost all the micro computers currently available.

There you have it; the Brother HR-15, its facilities, its simple plug-in accessories and its interface connections.

And for a price that gives you a lot more than you probably bargained for.

UK DISTRIBUTOR

Thame Park Industrial Estate,
Thame, Oxon OX9 3RS.
Telephone: 084 421 5471.
Telex: 837508.

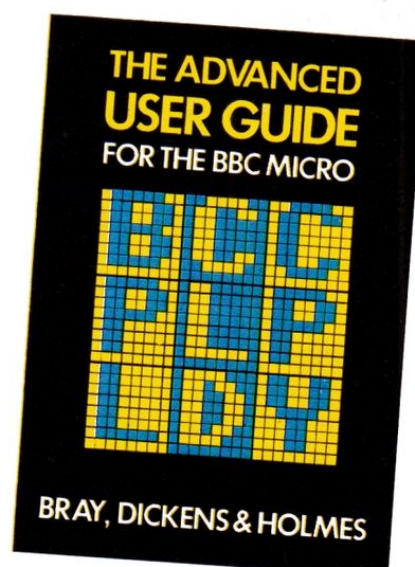
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Gt. Manchester: Micro House 061-834 8815 Hants: Computerland 0703 39571 Lancs: Pete and Pam Computers 0706 212321 London EC1: City Computer Centre 01-588 5537
EC2 City Microsystems Ltd. 01-588 7272 NW4 Davinci Computers 01-202 2272 SE14 Bennetts Electronics 01-692 4941 SW16 Pete and Pam Computers 01-769 1022 SW18
The Lyndon Co. 01-788 1234 WC1 Bonsai Ltd. 01-580 0902 WC2 Digitus Ltd. 01-379 6968 W1 Lion House Retail 01-580 7383 W14 Micronetworks 01-602 7405 Merseyside:
Agri-Plan Computer Systems 0774 733714 Middx: Twickenham Computer Centre 01-892 7896 N. Hants: Brian Bass Ltd. 02514 23900 Notts: Skytronics Ltd. 0602 781742
N. Wales: Tryfan Computers 0492 70802 Oxon: Maddison Computer Systems 0865 69468 Maddison Computer Systems 0993 73145 S. Hants: Personal Computer Connection
0329 230870 S. Yorks: Intac Ltd. 0709 547178/9 Staffs: Halls Peripherals 0782 20251 Strathclyde: Sculthorps Ltd. 041-332 6901 American Computers 041-248 2427
Teesside: Intex Datalog 0642 781193 Thames Valley: Bits and Bytes 06285 26535 W. Lothian: Penitronic Ltd. 0506 410041 W. Midlands: Q-Com Systems 021-622 7165

Christmas gifts from Cambridge!

The Advanced User Guide for the BBC Micro:

Over 500 pages of detailed information on commands, programming, interfaces and hardware, including the complete circuit diagram of the

BBC computer. We sold over 10,000 copies in 6 weeks; buy it and you'll see why! Excellent value at **£12.95**



**Word-processing:
a complete
package for £899—
including VAT**



Package comprises: **BBC Model B Microcomputer • TEAC disk drive 100K • SHINWA CP80 printer, complete with cables, ready to use.**

TYPE 'N' TALK SPEECH COMPUTER

Developed and manufactured in Cambridge, the Type 'n' Talk is a very powerful software package, optimised to convert any text into speech faster than it can be spoken. Connected to any computer via an RS232 or RS423 serial link, it allows you to type in words or numbers which are then spoken out loud over a powerful speaker. All in all, an amazing new concept in man/machine communication. **£171.35**

PRINTERS

EPSON FX-80	£395.00
EPSON RX-80FT	£315.00
EPSON RX-80T	£275.00
SEIKOSHA GP 100A	£220.00
SHINWA CP-80	£275.00
JUKI 6100	£395.00
BROTHER	p.o.a.

Delivery charge: £6.00 per item

DISK DRIVES

100K TEAC Slimline, complete with cables, etc.	£165.00
200K TEAC 40/80 switchable, complete with cables, etc.	£190.00
400K TEAC/MITSUBISHI 40/80 switchable, complete with cables, etc.	£250.00

Delivery charge: £6.00 per item

MONITORS

SANYO 14" green	£86.31
KAGA 14" yellow	£123.45
KAGA 14" green	£108.00
KAGA 12" colour	£300.00

Delivery charge: £10.00 per item

MISC. ITEMS

Printer cable for BBC	£16.50
Disk drive signal cable BBC	£9.75
Disk drive power cable BBC	£4.50
Diskettes:	
3M SS/DD set of 10	£20.68
DS/DD set of 10	£28.00
SS-96 TPI set of 10	£32.00
DS-96 TPI set of 10	£44.00

Delivery charge: £1.00 per item

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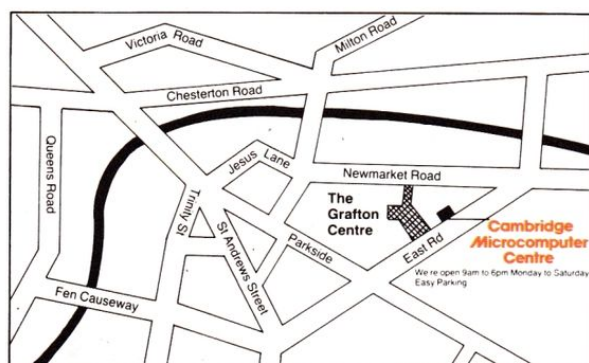
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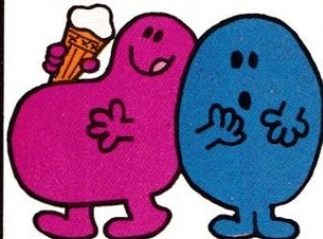
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by Widge Software

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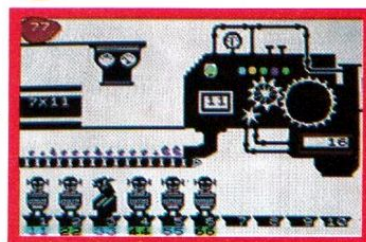
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MEMOTECH MTX500 HITS THE STREETS

With impressive hardware and software features, the new £275 MTX500 from Memotech looks a winner. And we run it against its nearest rival, the BBC B.

Memotech's first computer, the MTX 500, has been eagerly awaited for a number of reasons. The company's high-profile advertising campaign has been titillating potential buyers for many months, and on paper at any rate, the specifications have presented the £275 machine as the only direct rival to the BBC Micro.

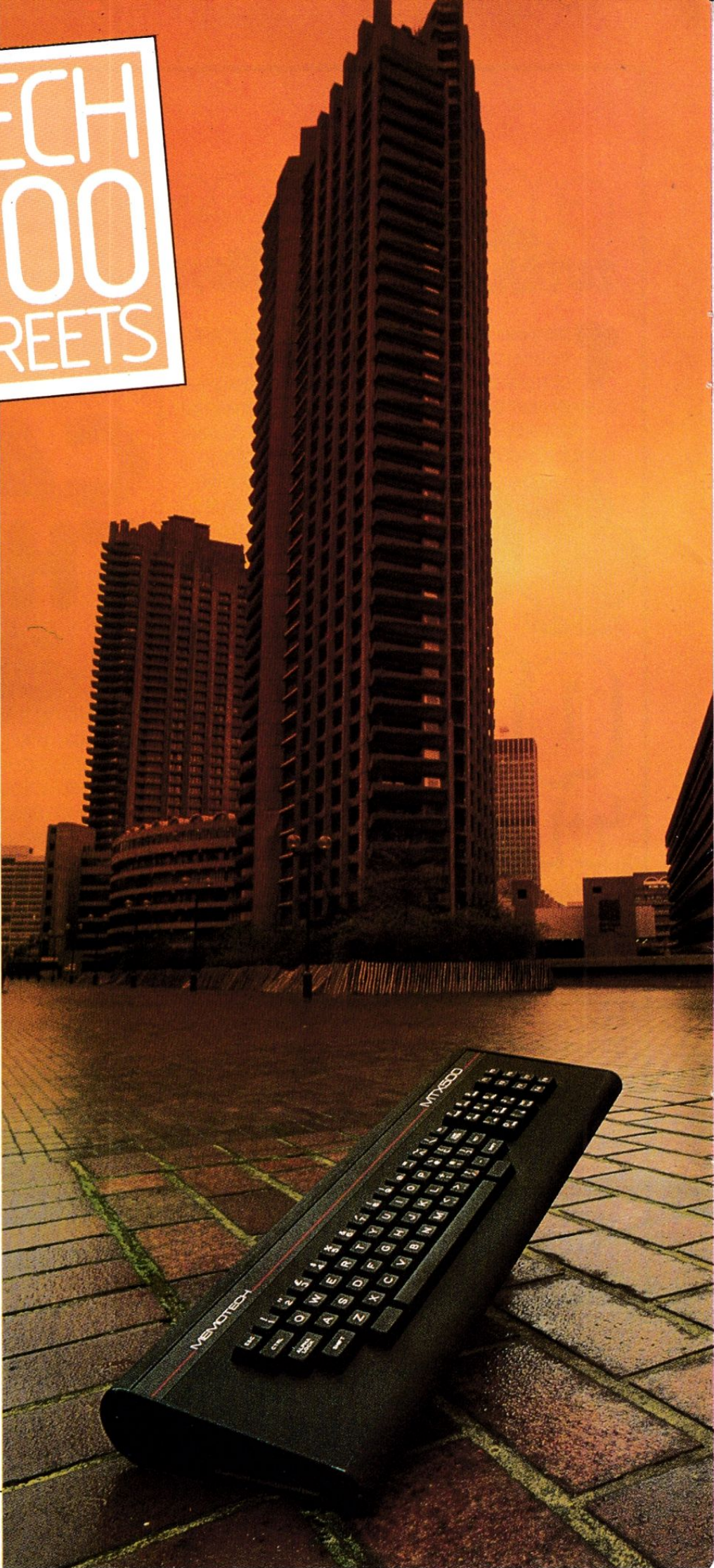
The best illustration of Memotech's serious intentions is the physical design of its new baby. Many home computers sell on little more than purposeful styling, and there is no doubt that the MTX has the most impressive appearance of any home machine. With a 12-key numeric pad and eight vertically-stacked function keys, only its relative thickness distinguishes it from the detachable keyboard of a top-flight 16-bit business micro.

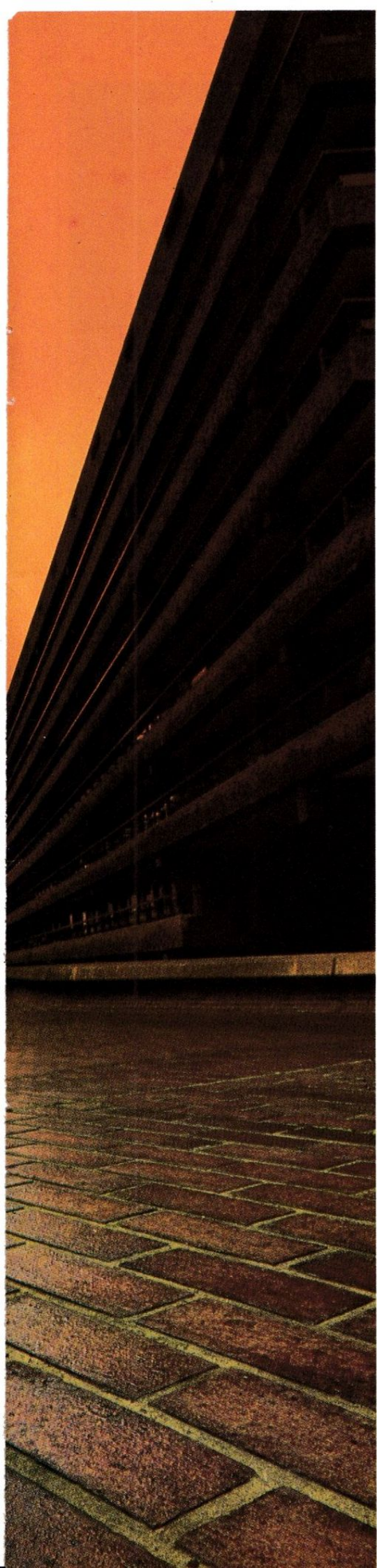
Any computer which aspires to
more than toy status must offer
plenty of facilities for interfacing

The quality of the external design extends to the power supply. Although this is regrettably of the external type, it is extremely neat and equipped with the necessities that some manufacturers regard as uneconomic extras (such as a switch and a reasonable length of lead).

Any computer which aspires to more than toy status must offer plenty of facilities for interfacing, and here the MTX strikes the middle ground between the inadequacy of the average home micro and the embarrassment of riches offered by the BBC machine.

Along the back edge of the smart black alloy case we first find a pair of 9-pin D-type joystick ports. Wisely, Memotech has wired these to the same specification that Atari and Commodore use, so any of the wide range of Atari-compatible joysticks may be used. Next in line there are





two jack plug sockets which make up the cassette interface (no provision is made for cassette motor control), a Centronics parallel printer interface, a UHF TV outlet and the power supply socket.

Two more unusual interfaces are an outlet for composite video monitors (definitely a good idea for any sort of prolonged serious use, from spreadsheet planning to programming), and a jack socket marked HI-FI. This enables the user to pipe the machine's sound facilities through suitable sound equipment, should the TV set prove insufficiently noisy (or, of course, when a 'mute' monitor is in use).

Two RS232 interfaces can be fitted, but Memotech has not seen fit to make even one of these standard equipment. We feel that few people in the MTX market will be able to do without them for long. The round-up of holes and protrusions ends at the left hand side of the case where a Sinclair-style edge connector shyly lurks.

The quality and design of the

keyboard is an important

generator of first impressions.

Give any journalist a new computer and the first thing he will do is start typing on it. The quality and design of the keyboard is an important generator of first impressions, so it was disconcerting to find a few small but significant flies clogging the ointment. After a lot of experimental bashing by various people in the office, all agree that *something* was not quite right. One of our freelance contributors put his finger on it, realising that the key travel seemed rather restricted. This defect has also been noted with the Computers Lynx and the Electron, so the MTX is not alone. Still, in the cost-cutting home micro market all these keyboards are infinitely preferable to a cheap rubber-key job, so no quibbles!

Fortunately for Memotech, the one serious problem with the keyboard should be relatively easy to fix. On each side of the space bar the attentive reader will have noticed two innocent-looking unmarked keys. Pressing one of these has no effect, but when both are down at the same time the effect is to reset the entire system. Make no mistake, a really brutal reset is sometimes necessary when a faulty machine code routine runs out of control, but if such a feature is provided, it should be tamed by requiring the depression of a tiny little recessed button right round the back of the keyboard where no one can touch it by mistake.

Making the simultaneous depression of two keys trigger the reset is not good enough when those two keys are of normal shape and size, normal spring weight, and right in the busiest area of the keyboard. Apple had to learn this lesson the hard way with the II — the IIe has been made more idiot-proof. We re-learned it the hard way when our test programs and data were blown away on a number of occasions. As a very minimum, double-

COMMENT

For £275 the Memotech is good value, currently occupying a vacant position in the market between the £200 Commodore 64 and the £400 BBC Micro. The hardware is particularly impressive in its design and quality (apart from the reset key blunder), and for the most part the system software is of similar quality. The Basic has its rough edges, but this could be improved without hardware changes. If the economic pressures of an exceptionally fierce and competitive market permit, the Memotech could develop into a strong contender for the computer buyer's money.

strength return springs should be fitted to these keys, and MTX owners would be well advised to consider the old Apple trick of taking the plastic caps off these keys so that they are less prone to accidental use.

Internally, the Memotech is reasonably conventional. It uses the Zilog Z80A processor in preference to that other mainstay of the personal computer scene, the 6502. The advantage of this chip for machine code programmers is the excellent instruction set which enables the Z80 programmer to get away with just a few instructions where many would be necessary on the 6502. Lights, music and action are handled by a pair of familiar Texas Instruments video and sound processors, and the programmer has 32K of RAM available. Unusually, there is no memory penalty for the use of high resolution graphics as the video processor has its own complement of separate RAM (16K). Internal upgrades of RAM are due to be available shortly.

It is unusual for any home computer to be supplied with more than one programming language, and Basic is normally the supplier's choice. Most popular machines have a variety of programming languages available as extras, some supplied on cassette, and some in ROM, but as far as we know the Memotech is unique in having Basic, Noddy and a Z80 assembler all built-in from the start.

The Basic is of rather variable quality. Those familiar with Microsoft's trusty interpreter will find MTX Basic reasonably easy to comprehend, but for a micro which sets out to challenge the BBC, MTX Basic lacks some fairly fundamental features. Line renumbering is not available, there are no definable functions or procedures, and an ON ERROR branch would have been nice.

The worst error messages

we have encountered on

anything since the ZX81.

We also found the interpreter extremely finicky about which spaces are and aren't allowed. But the main complaint about MTX Basic is its error messages. As the table shows, these are the worst we have encountered on any computer since the ZX81, and they let down the Memotech's ultra-modern,

advanced image very badly indeed.

On the positive side, Memotech has implemented full support for the machine's excellent sound and graphics facilities in Basic, something that many other manufacturers (notably Commodore) fail to do. Arcade gamers will enjoy experimenting with a wide range of sprite creation and handling commands, while backgrounds can be plotted with the usual Line and Circle commands. These are supplemented by a set of turtle-type graphics commands which call on many features of the Logo educational graphics language.

If all this leaves you confused, the upshot is that graphics are very easy to create and manipulate, even for beginners.

Editing Basic programs is another curiously old-fashioned feature. Instead of the screen editor you might expect, the MTX uses a line editor which is invoked by the command EDIT X where X is the appropriate line number.

The assembler is easily entered from Basic so that listings can include a mix of Basic and assembly language, and a

NODDY COMMANDS

B BRANCH
I IF
G GOTO

E ENTER
A ADVANCE
R RETURN
S STACK

P PAUSE
L LIST
O OFF
D DISPLAY

ERROR MESSAGES

Params
Incorrect or wrong number of parameters for a function or command.
Mistake
A
Dot outside virtual screen.
SE.A
Screen type not in type table.

SE.B
Invalid ESC sequence.
SE.C
Command not valid for this device.
SE.D
Switch to absent Virtual Screen.
SE.E
Invalid UDG/UDG type.
Symbol?
A symbol is missing, such as "=", "TO", "THEN", "...
Not numeric
A number is expected.
Not a string
A string is expected.
Boolean?
A truth value is expected.
Mismatch
An illegal relationship between different types of values.
BK
Break in tape **LOAD** or **SAVE**.
No data
No data for **READ** or No page for **NODDY**.

Overflow
Number too big.
Div /0
Out of range
Number is not in a valid range.

No space
To define an array
To expand a program
To assign a string to a character array
To perform a large operation.

Subscript
A subscript is out of range or there are too many.
Gosub
Too many **GOSUBS** (more than 34).
Undefined
A variable is being used before it exists.
Array exists
An array has already been defined.
No FOR
A next has been encountered without a matching **FOR**.



machine code monitor aids the diagnosis of faulty machine code sections.

The Memotech's other language, Noddy, is designed specifically for beginners. It is a simple language, with only eight commands (see table) which handle text to make question-and-answer programming very simple. We will be returning to this feature for a full evaluation in a future issue, but meanwhile it seems to be an ideal way of introducing newcomers to the logic required for successful programming while avoiding the detailed syntactical requirements of Basic.

SPECIFICATIONS

Memotech MTX 500

Price: £275
Use: Home
RAM: 32K
Colour: Yes
Language: Basic, Noddy
Interface: Serial
Supplier: Memotech Ltd, 0993 2977

MTX500 VERSUS BBC B

Ever since its introduction almost two years ago, Acorn's BBC Micro has generally been recognised as the best home micro around but many people have realised that £400 is an awful lot to pay for an essentially home micro. So, if you don't require such comprehensive facilities as the BBC offers straight away, is there a viable and cheaper alternative?

From first impressions at least, the MTX 500 is such an alternative. With an equivalent graphics resolution to the BBC, which is important to a surprisingly large proportion of the micro buying public, the Memotech immediately offers the games and graphic design programmers a great deal more at a lower price.

The BBC does not support sprites, and the ultra-high resolution modes on this computer use up a disproportionate amount of the machine's RAM. For instance, in Mode 0, where the resolution

(that is, the number of dots available) is 640 x 256, a whole 20K chunk of user memory is devoted entirely to the production and maintenance of this display. On the MTX 500, however, video (screen) RAM is entirely separate to processor RAM, and so this problem simply does not arise.

The sprites on the Memotech have no equivalent on the BBC, and games writers should find the provision of these delightful objects a great boon. By simply defining the shape and colour of each sprite, the direction(s) in which you want it to move, the speed and the sprite level it is on, the programmer finds himself with a million (OK, 32) space invaders ready for the zapping.

Of course, computers are not all graphics and sound, games and obliteration. There is also the generally overlooked aspect of 'user-friendliness',



which means is it simple to use and does it tell you what you've done wrong? In the case of the BBC the answers are yes and yes, very much so — Acorn has not scrimped at all on this front and the machine is a delight to use.

Memotech, however, assumes that everyone is already an exceptional programmer well versed in computer-speak as, frankly, the error reports are

pretty meaningless. During extended periods of use, we found that the only sensible way of ensuring that a programming session progressed with at least relative ease was to photocopy the relevant pages from the Memotech manual and sellotape them to the bench. A bad error, Memotech. Likewise, the BBC's fairly excellent screen editing facilities are liable to cause Memotech a

THE FINSBURY BENCHMARK

For the purpose of bench testing — i.e. comparing the speed of different machines by running identical programs through them — Which Micro? has tested both micros with a series of eight Basic routines.

TEST 1 — This is a very simple routine in which the machine is essentially asked to count from 1 to 10,000.

TEST 2, 3 and 4 — These tests gradually introduced well-used functions and state-

ments to involve loops, numeric calculations, plus variables and constants.

TEST 5, 6 and 7 — At this stage of the tests sub-routine calls are introduced as well as introducing the dimension statement to test how long specifying memory requirement takes. Arrays are also tested.

TEST 8 — On this final test the routines to perform such things as logarithms and sines are put through their paces.

Table 1: Benchmark speed tests — time in seconds

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8
MTX-500	11.4	4.6	11.1	11.0	13.6	23.7	43.6	44.5
BBC B	7.2	3.4	8.2	9.1	9.5	14.7	21.1	48.3

lot of embarrassment in comparative reviews like this, as its own system is very hard to get to grips with.

As far as programmers' aids go, both machines offer in-built assemblers for their respective machine codes, but the BBC's (especially in Acorn's new Basic 2 ROM) is rather more advanced and certainly a lot easier to use. This is rather a pity, as the Z80 chip contained within the MTX is so much more powerful than the BBC's 6502.

However, one thing that the BBC sadly lacks in this department is a monitor or disassembler, which is one of the MTX's scoring points. On entering this monitor, the Memotech displays a standard Z80 front panel screen, with the registers and their contents displayed along with sequential memory locations. All of these can be easily altered, and any machine code programmer will love this facet of the machine.

Both computers can have the current language ROM paged out and a new one paged in.

As for higher level languages, Acorn Basic owes a great deal to more structured languages, particularly BCPL (Procedures, Repeat-Until loops, in-direction operators) and is without doubt the best example of the language currently available. Memotech Basic is certainly worthy, with its extended commands for sound and graphics, but if we accept the apparent philosophy that the machine is a programmer's friend, then why provide Basic at all? Both computers can have the current language ROM paged out and a new one paged in, so that by simple commands the user has access to a wide variety of environments.

Naturally, the BBC has been on the street long enough now to have a reasonable complement of 'sideways' ROMs, as they have become known. In fact, the ROM-based languages available for this machine include Basic, BCPL, Forth, Pascal and a version of Logo. It is rumoured that Acornsoft intends to supplement this range very soon. Memotech, meanwhile, can offer Noddy and Logo (see main review), with Hisoft Pascal coming very soon.

This leaves us with interfaces. The BBC is famed for being equipped to talk to almost everything, with five ports underneath the machine (including the famous 'Tube'), and an RS423, cassette, RGB, composite video, Econet and television outlets on the back. The Memotech is at the moment unable to compete with this plethora of communication devices, with only a Centronics port, joystick port, cassette and TV as standard. However, it is £125 cheaper, and the extra interfaces should be available at a later date.

In conclusion, then, the BBC remains the machine of machines, but for more specialised tasks such as machine code development or graphic design, the Memotech fills a gap that even Acorn forgot. ■



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No Ordinary Type

ADD-ON
REVIEW

If you have baulked at spending over £200 on a low-cost printer, the Brother EP-22 offers an interesting, and cheaper, alternative.



Many home computer users haven't so far bothered with buying a printer — it's hardly surprising since the cheapest printer can cost as much, or even twice as much, as the micro itself.

But the latest release from typewriter manufacturer Brother offers an interesting — and cheaper — alternative. The new product, the EP-22, combines features of an electronic typewriter, a printer and a limited text processor at an impressive £169.95. What exactly will this walletful of notes buy you?

The EP-22 comes housed in a sturdy black plastic case, topped by a thermal dot matrix printer and a 16 character LCD. An RS232C is built into the left hand side of the machine, which means it can be used as a printer with a number of micros.

The Brother can accept and print text in more than one way: the mode is set using two three position switches. A type ahead buffer allows you to see what is about to be printed, and edit it if needed before it's typed, otherwise the unit can be used as an electric typewriter, printing directly onto paper, or directly into the text store. The memory will hold up to 2015 characters and retain these when switched off, but with such a low capacity this feature's usefulness is rather limited.

The built-in printer can be used either with thermal paper or with normal typing paper, but normal paper needs a carboned ribbon to be inserted. This is held in a plastic mini-cassette, so changing it is a simple process.

Thermally printed material comes out blue, while the ribbon produces a more conventional black. The instruction booklet recommends that 'shiny' smooth surfaced paper (such as duplicator paper) gives the best results.

The characters themselves are made up of a five by seven dot matrix, but don't have true descenders. So the print isn't letter quality but should be good enough for most home uses.

Threading paper in is no harder than on an everyday typewriter. Two buttons are provided to move the paper up and down, as are cursor keys which move the print head across the page. The cursors, when used with the insert and delete keys, allow the changing of text on the display, but won't alter anything which has already been printed.

Keys to set the left and right margins, as well as 'tab' positions are provided, and another three position switch sets the spacing of the text.

By connecting the EP-22 to a computer via its RS232C, it can, as we've already pointed out, be used as a printer. The manual details how to connect up eight different microcomputers including the Atari 400, Vic 20 and Sharp PC-1500. All the micros mentioned are either Japanese or American, but if the Brother catches on here let's hope that hardware and software to allow the connection of British machines may appear. Theoretically, anything with a 75 or 300 baud RS232C and an ASCII character set could be interfaced, although one

computer which can't be used with the Brother is the Apple II.

At £170, the price is around £50 lower than a Seikosha GPI00A or one of the cheaper Epson printers. However, the print rate of the Brother is only 17 characters per second, and it will only print 75 characters to a line. If you don't want to print lots of 80 column text, though, this won't be a great problem.

The fact that the EP-22 can be battery driven, together with its small size — only slightly larger than a copy of *Which Micro?* — and light weight also suits it to the mobile business user.

Text processing on the Brother is limited. You can't insert blocks into the middle of existing text or move blocks around. But you can add extra text onto an existing piece, and though the text store will only hold about 250 words, it is enough to write letters and duplicate them.

It is also possible to stop printing and insert further text at any time. This suits a pre-written document which needs personal inserts.

If you're looking for an electric typewriter alone, the price of the Brother machine is competitive. But where it just may make its presence felt is in the home as a printer for a home micro, or on the move as a letter writer. ■

SPECIFICATIONS

Printing speed: 17 cps
Characters per line: 75
Printing method: 5 by 7 dot matrix
Display: 16 character LCD
Power source: Four batteries (R20 or LR20) or AC supply
Dimensions: Width = 12.4 inches Height = 1.9 inches Depth = 9.3 inches
Weight: 5.3 lbs
Computers compatible with the Brother EP-22:
Atari 400/800
Commodore 64/Vic 20
TI 99/4A (Texas Instruments)
HX-20 (Epson)
PC-8201 (NEC)
PC-8801 (NEC)
Pocket Computer PC-1500 (Sharp)
M223 mark III (Sord)

Computers not compatible with the EP-22:

Apple II; TRS-80 models II & III, Colour computer; Sord M5; NEC PC-6001

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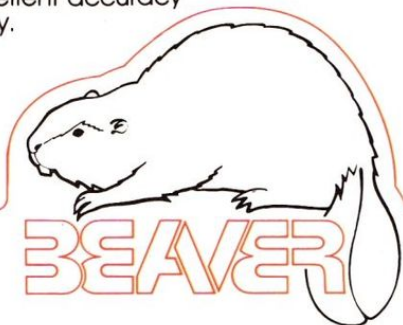
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So what else can

Are you getting bored with your micro? You'd be surprised just what they can do nowadays

It is often said that the only limit to the uses of a computer is set by the imagination and programming skill of the user. This is, however, a popular misconception. With such a vast store of ready-made programs as is available today on cassette tape or disk, imagination and programming skills are no longer really necessary. The computer user has an easy source of applications ideas and programs at his or her fingertips.

But you may find that not all off-the-shelf programs will meet your computing needs exactly. Your business, or the games you want to play, are probably unique in many ways, and so you might have to modify ready-made programs for your own use. This can easily be done, especially if your computer supplier is prepared to assist you.

For many computer users a shortage of cash with which to buy software (and possibly expensive hardware) is more likely to prove a greater limitation than any lack of programming skill.

Some software is, of course, cheap, coming in the form of cassette tapes with the programs pre-recorded. Cheaper still is to copy listings of programs from magazines or books. On the other hand, other software, in particular business software, is often expensive and may also require more sophisticated or additional hardware.

Even if you are not interested in business programs but only use your computer to play games, your expenditure on software can very soon mount up. Suppose your home computer costs, say, £200, and each game cartridge you buy costs £20. Before long you may have spent a fair amount more on software than on the actual computer.

Surprisingly, perhaps, most home computers are still bought in order to learn more about the machines and how to program them. As computers become increasingly important in industry and commerce, and in education and science, more and more people are keen to get to grips with this vital piece of technology.

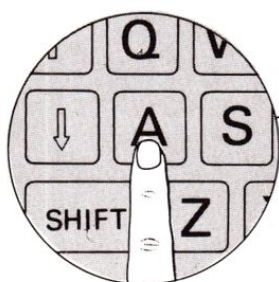
Appreciating the part that is played by computers in our lives is called 'computer awareness'. 'Computer literacy', so-called, includes both awareness and a knowledge of programming, which can only be achieved by hands-on experience and practice. Even in these areas, however, there is packaged software available to teach both subjects.

Education

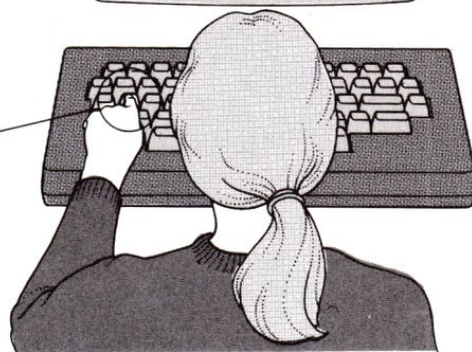
With the computer's help it is possible to realize the educator's dream of providing tuition at an individual level, with everyone working at their own pace. It

Computers in education

There is an enormous variety of educational software available to the microcomputer user. Here, a young science student is answering a multiple-choice question on physics. The question is displayed on the screen, and the student chooses her answer by pressing the appropriate key on the computer keyboard. The computer will then tell the student whether she has chosen correctly (in this case she has), and may in some cases display the correct answer for comparison.



CHOOSE ONE OF THE
FOLLOWING:
A PROTON
B NEUTRON
C ELECTRON



has been shown that children in schools enjoy learning from computers and readily accept this space-age teacher's helper.

The computer is of major assistance in three areas: drill and practice, simulations and in actually teaching. In some subjects, drill and practice are an important part of the learning process, for instance brushing up on tables in arithmetic, conjugating Latin verbs or doing spelling drill. The computer has an infinite store of patience, which is ideal for helping with these tiring and repetitious tasks.

Thanks to its powers of simulation the computer can explore situations that are too dangerous, too costly, too time-consuming or downright impossible for students to explore for themselves. These could be anything from simulating the breeding of fruit flies in a genetics experiment to the operation of a nuclear reactor or the flying of a jumbo jet.

A historical simulation can investigate 'what if' questions that cannot be approached in any other way. A wealth of experience can thus be gained from simulations, without leaving the classroom.

As teachers, computers are, in some ways, superior to humans. They can — quite painlessly — adjust to the level of understanding of the pupil without affecting anyone else's progress. Moreover, a computer equipped with graphics and sound capabilities, as well as the normal text display, can, for instance, draw a complicated diagram and display it in a matter of seconds and explain it directly to the pupil, using sound to reinforce learning.

Of course, before a computer can do

anything it needs a program, and before it can teach it needs a teaching program. There are, in fact, many computer assisted learning (CAL) programs, as they are called, that are now available for use in the home or in schools.

Very often the programs that teach subjects at an elementary level are written as games. For example, there is a game that is aimed at giving practice in spelling, which is loosely based on *Space Invaders*. There are also many Hangman-type games, which develop basic spelling and maths skills.

Many learning programs are available to home computer users on cheap cassettes. Computer magazines often advertise teaching programs for a very wide variety of subjects.

These include computer appreciation and computer awareness, foreign languages, sciences, mathematics, engineering, music skills, history, geography — in fact any subject for which there are teachers sufficiently enthusiastic and well trained to write and develop the necessary programs.

Business studies are, of course, another area where an understanding of the computer has become very important now that the electronic office has made its appearance.

The computer at home

The computer in the home, of course, has many uses besides formal educational learning. They all centre around the computer's ability to store and process information at great speed, with which we are familiar, but some of the applications may come as a surprise.

a computer do?

— this extract from 'Introduction to Computing' should give you some fresh ideas

Speech synthesis

Perhaps you would like your computer to speak to you. This is not so difficult to arrange provided that suitable software is available for the computer and it has the sound output channel required.

Speech synthesis programs work by breaking words down into small parts, or 'phonemes', and having the computer make an attempt at pronouncing each of the phonemes in succession.

There are generally about forty phonemes in the computer vocabulary, and each one is given a symbol, such as A for the sound of A in 'dAy', E for the sound of E in 'kEy', and so on.

The word 'eight', for example, could then be represented by the string of phonemes AAYT. By keying-in this string of phonemes we make a speech synthesis program pronounce the word when the program is RUN.

Of course, speech synthesis by this means is crude. It is often difficult to understand the speech produced and to reproduce accents and the rhythms of speech satisfactorily. For better speech synthesis, we have to turn to improved hardware and to the speech synthesis units that are available for some computers.

Typically, these units have a vocabulary of about 200 words built into ROM, while more words can be added using plug-in modules. Foreign-language synthesizers are also available, and these have applications in the teaching of languages.

Typing tutor

If you want to learn to type, using your computer, there are programs that will teach you. Alternatively, if you are already a touch typist, there are programs to increase your speed and proficiency.

Learning to type on a microcomputer is a natural extension of the computer's use since the keyboard is so similar to that of the typewriter.

Using a typing tutor program, the computer presents a series of lessons for you to work your way through, each one made up of drill exercises for you to type out. If you are a learner, the program keeps track of the keys you know, the keys you are learning and, of course, the keys you do not yet know.

It also records the mistakes you make so that it knows where you need more practice. This information is then used to create completely individualized typing drills that concentrate on those of your skills that are most in need of attention.

At the end of each lesson, you are given a summary of your performance — speed, number of mistakes and so on — so that

you can see exactly what progress you have made. In this way, you can learn to type in the shortest possible time.

Personal finance

Personal finance programs are available ranging from small systems that involve simple budget and expense analysis to comprehensive systems needing large back-up memories. What you choose to buy depends on how organized you want to be.

The small programs will reconcile your chequebook stubs with your bank statement, taking into account any standing payments that are made 'automatically' each month.

Kitchen recipes

These programs supply a choice of recipes, giving the correct quantities of ingredients for the number of guests you have invited, and take you through the cooking procedure step by step at your own pace.

Making music

Many home computers can produce sound effects through either the computer or the TV loudspeaker. In some cases, the effects can be quite spectacular — explosions, wolf whistles, laser 'zaps', and so on. Simpler systems, however, produce single musical notes only, or perhaps several simultaneous notes (chords) of specified pitch and duration.

The use of these notes is controlled by commands, such as SOUND or PLAY, given within the Basic application program.

For the musically inclined, however, there are a number of programs available which extend the computer's musical abilities. The simplest of these display the musical stave (the group of five horizontal lines that music is normally written on) and allow the user to write his or her own music on it, employing the usual musical notation for crochets, quavers, etc.

When you have finished writing your tune, the computer will play it for you.

Other music programs include music skills-trainers, which teach note recognition and rhythm with enjoyable exercises. There are also 'computer-organ' programs which let you use the computer keyboard as an electronic organ. When you press a key, a note of a certain pitch sounds.

If programming is a special interest of yours, as well as music, then there is much to be learnt by writing your own music programs. You can pick notes at random, from which the computer will form a melody, and then fill in the harmony

yourself by following the rules of harmony.

Interesting compositions can be built up in this way, but you should not expect philharmonic orchestra standards or you will be disappointed.

Data base programs

If you run a small club, all the club records can easily be kept on a home computer, using a 'data base' program. This is, in effect, a computerized card index, with a 'card' or record for each set of data.

Data base programs, because of their flexibility, are a very convenient method of storing information such as names and addresses, details of stamp or record collections, or warehouse stocks, and have a variety of uses in the home and at work.

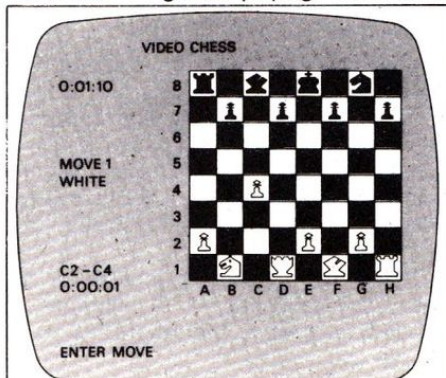
With a data base program, each 'card' is shown on the screen for you to enter the information you wish to store on it. There are a certain number of 'fields' in each record and each field holds one item of information.

For instance, if we were keeping the membership records of a club, we might have a 'card' for each member. You could then enter the member's name in field 1, his or her address in field 2, the telephone number in field 3, and so on.

Any field can be separately up-dated, as required (if a member moves house, for example), and the records can be sorted automatically on any field (name, address, etc.), alphabetically or numerically. We can thus easily produce lists of members in a given town, for example.

Games computers play

Computers have introduced a new dimension to games playing. With their



This computer chess display shows the position with Black to play, after White (the computer) has made the first move, advancing a pawn two squares, from C2 to C4. Also shown is how long the computer took before making this move — a mere second. The computer's human opponent is invited to enter his or her move at the keyboard. So far the opponent has spent one minute and ten seconds in considering a reply.

highly colourful and detailed screen displays, their sound effects and their ability to operate at amazing speeds, computers have brought into being many new games and rehabilitated many old favourites.

The range of games programs that is available, on cassette in particular, is indeed vast. Every computer magazine contains advertisements galore for games cassettes, sometimes with as many as fifty or more games on one tape.

The contents range from simple number-guessing games, used to drill children in arithmetic skills, to complex simulations of adventures on other planets or in fantasy worlds.

Some of these adventure simulation games are so large that they have to be recorded on several cassettes, and the user just loads the section of the game that is currently occupying him or her.

A complex adventure game can take a very long time to play and even longer to master. Many people find such games so absorbing that they become addicted to them.

Adventure games

Adventure games, with their make-believe worlds of monsters, dragons, beautiful princesses and medieval castles, are now a well-established part of the microcomputer scene.

In an adventure game, the computer presents you with a series of puzzling and challenging situations, and it is up to you to decide what you want to do and to instruct the computer accordingly.

You must bear the consequences of all your own decisions and if you make the wrong choice at a crucial stage you are likely to find yourself coming to an untimely end.

Adventure games were developed on large mainframe computers, which had plenty of memory space, so that the programmer was able to build in lots of traps and tricks for the unwary.

Since then, of course, computers have become both smaller and more powerful, making it possible to play adventure games on microcomputers.

A typical adventure game scenario

Your task is to enter the castle of King Minos, descend into the labyrinth, collect all the treasures you can find and bring them out of the labyrinth to score points. You can also score points for learning the magic spells used by the various evil (or friendly) magicians who inhabit the labyrinth.

There are fearsome monsters that roam the labyrinth — a minotaur, a troglodyte, a satyr, and others besides — so beware.

The commands or words you can use in these games are not at all obvious, and often a lot of time is spent in trying to find a word that the computer will recognize. Help is, of course, given in the brochure which comes with the program cassette, but, as with all good games, some secrets are held back.

Adventure games have exotic names such as *The Oracles' Cave*, *The Black Crystal* and *The Volcanic Dungeon*, and so on. They offer a wealth of situations with which to challenge you and a huge variety of make-believe worlds for you to enter.

Space Invaders

This compulsive game needs no introduction. Like many games that are now available on home computers, *Space Invaders* started life as an arcade game, in Japan, and very rapidly became popular world-wide. It is said that in the summer of 1979, the Japanese Mint had to make more 100-yen pieces as there were not enough in circulation to meet the demands made by the game.

Space Invaders and its variants require a combination of muscular co-ordination and strategy to play them well. The object of these games is to score points by shooting down flying saucers and advancing columns of 'invaders' that are attacking your forces.

Often 'joysticks' (handsets with controls that move like aeroplane joysticks) are used to control the position of your 'spaceship', creating the effect — according to some — of really flying your own spaceship.

Asteroids

The idea of this game is to destroy asteroids and enemy flying saucers by firing from your spaceship. Each time a large asteroid is hit by your fire it breaks into smaller fragments, which you then just avoid or destroy. Just to make the game harder the enemy can shoot back.

Gulpman, or eat them ghosts!

In another popular game, called by various names, the screen shows a maze containing a number of characters. One of them looks like a circle with a mouth that opens and closes. This is the 'gulpman', who moves around the maze, eating anything that gets in his way.

There are other characters, called ghosts, in the maze who try to gobble up the gulpman. He cannot fight back until he has eaten a power pill found at various odd corners in the maze.

Chess

Chess is one of the games often associated with computers, since it is thought by non-chess players to be a game of pure logic. Of course, the chess player knows better: chess is as much a game of blood and tears as any other.

Despite the irrational elements that creep into the game, however, when we humans play — or perhaps because of them — some computers now play a very reasonable game of chess, beating all but the strongest human players.

The best chess computer at the moment is called *Belle*. *Belle* can examine 160,000 possible positions every second and contains over 1700 chips.

The programs for small microcomputers are obviously of a much weaker standard, but are still good enough to challenge the average amateur.

All the information the computer needs to play chess goes into the memory when the chess program is loaded, either from cassette or ROM cartridge. This information includes the rules of the game and how the pieces move, standard sequences of opening moves and different strategies that can be followed.

At the start of the game, the computer loads the positions of all the pieces into its RAM. Then, for the first few moves it generally follows a set 'book' opening, that is, one of a number of variations that are universally considered to be among the best early moves for both sides in a game.

Once the computer's opponent deviates from the 'book', or the opening variation comes to an end, from there on the computer starts to analyse each move.

To find the best move, the computer examines three or four possible moves, looking several moves ahead to see the consequences of each, and awards points according to how advantageous each possibility is. For example, a move that leads to a capture might be given a higher score than one that does not.

The number of moves the computer can look ahead depends on the size of its memory. A small computer that can play chess has a memory of about 16K, but a very powerful one may have up to 200K of memory.

With most chess-playing computers you can set the skill level of the computer by limiting the number of moves it looks ahead.

The time the computer takes to choose its move varies according to the skill level, that is, how many moves it is looking ahead. Playing at its lowest skill level the computer's response will be instantaneous (and often naïve), but at higher levels it will take longer to consider its move.

When playing at the most skilful level, some computers can take several hours to decide their move or even carry on considering the position until you tell them to stop.

The latest chess programs usually have features to help shield us human players against the remorselessness of the computer if we so desire. For example, when we get into a difficult position, we can ask the computer to suggest what move we should make.

Also, on many computers we can instruct the computer to make its second-best move rather than the move it thinks is best.

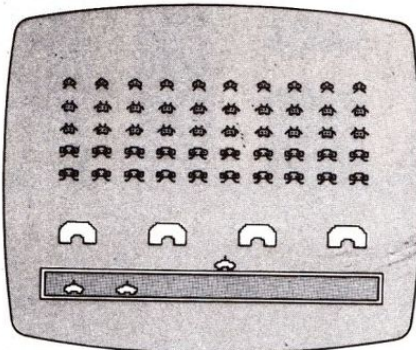
Finally, if this is not enough and we still find ourselves in trouble, we can change sides in the middle of a game and let the computer play the losing side. Most programs will allow this, in fact.

Chess programs are getting more sophisticated all the time and can now offer the chess player a fascinating alternative to a human opponent.

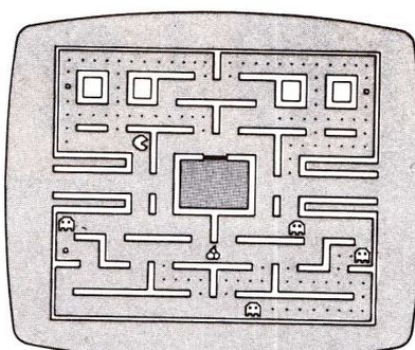
Other games

Bridge, whist, pontoon, backgammon, draughts, fruit machine, football, golf, darts, noughts and crosses, snap, solitaire

Microcomputer games



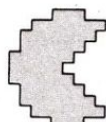
Space invaders type



Gulpman type

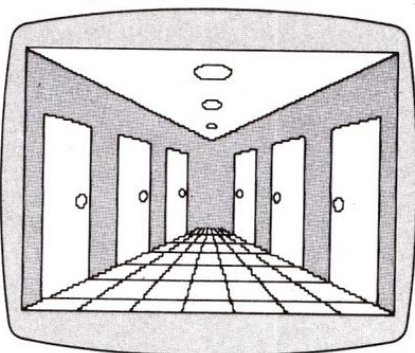


Space Invader



Gulpman

Many of the games that can now be played on a microcomputer were originally developed on other hardware. Adventure games, for example, were invented by programmers on mainframe computers. The Space Invaders and Gulpman type games, on the other hand, first made their appearance on dedicated hardware in the amusement arcades. As microelectronics developed these games became available to the microcomputer user.



Adventure games

and Othello are some of the other games which have been adapted for playing on the computer.

Getting down to business

One-person businesses, and small businesses in general, are beginning to be affected by the wider electronic revolution that is taking place in office practice and business methods.

Small shopkeepers and others are discovering the advantages offered by the personal computer — for instance, that of having information at one's fingertips that could mean the difference between making or losing a sale.

Furthermore, as an investment a personal computer is cheap, it is easy to use and to install, and, unlike the larger business computers — the mainframes or minicomputers — it does not require a special environment.

A personal computer can be used in the shop, the car, the study or wherever. Some can even be used in the bath!

The standard business packages

Every business whether large or small must keep records and financial accounts, and there is now software available to handle most of these routine book-keeping chores.

The most common packages are ledger programs and — for businesses that employ staff — payroll programs.

Sales ledgers can be complex, depending on the system of book-keeping required by the company's accountants. Moreover, systems can vary quite considerably in the way that sales tax, invoicing and cash transactions are handled.

The purchase ledger, which lists all purchases, and the nominal ledger, which

summarizes purchases and sales, together with other financial aspects of the business, also have their own complications.

In all these cases, packaged software can, albeit with a few minor modifications, save the business person a lot of time and energy.

There are many payroll programs available, devised to provide easy-to-use weekly or monthly payroll systems. These usually include several rates of pay (normal and overtime, for instance), holiday pay and various deductions, such as for repayment of loans, insurance and pension contributions.

Some packages will also produce payslips, year-to-date totals, and department cost analyses and calculate revenue to be paid to the government.

Other packaged software available to the small business person includes order and stock control systems.

They check the availability of any item that is ordered, keep a running balance of the stock of each item, check the credit-worthiness of the customer, draw up an invoice, and so on.

One of the beauties of using business software is that the systems can, via the computer, be fully integrated. Thus, when an order is accepted, an invoice can be raised immediately, the corresponding entry made in the sales ledger, the stock balance adjusted, etc.

In this way, packaged programs can offer the small business person a complete accounting system.

Word processing

Another very important use of the computer in business is for word processing. Word processing programs combine the very considerable power of

the computer and its memory with that of the typewriter.

A typical program will display what is typed at the computer's QWERTY keyboard on the screen, allowing the user to correct mistakes immediately.

Complete paragraphs can be added or repositioned, headings can be inserted or centred as required, and usually the text can be 'justified' — i.e. aligned against the right-hand margin. Some programs will also check the spelling of words and spot grammatical errors.

Once corrections have been made and the page or report finalized, it can be printed out using a special printer.

The text can also conveniently be stored on tape or disk, and re-run at a later date with, say, new sales figures inserted.

Perhaps a solicitor might want to produce a standard legal document, but with a few minor amendments; or a freelance journalist make some last-minute changes to the copy before sending it off to be published; or a mail-order firm send out a circular letter to a number of different customers at different addresses. All these operations could be handled very easily using word processing techniques.

Other business programs

Data base programs, which were discussed earlier, are useful for filing information in a form that is easily accessible.

There are also available diary and indexing programs to help with the general organisation and day-to-day running of a business, as well as so-called report generator programs, which will extract, or produce a report from, information already held on computer file.

Very useful for planning purposes are programs like *Visicalc*. With these 'spread sheet programs' the computer screen acts like a large sheet of paper on which you write column headings, such as 'sales' and 'cost of production', and enter into the columns the corresponding numbers together with any formulae that connect the various entries.

The program will organize the information and display it on the screen for you. If you make a mistake with any of the figures, or wish to see the effect of altering them, the program will automatically recalculate everything from scratch, or as required.

This feature of the program, answering 'what if . . .' questions, is important, enabling sales forecasts and balance sheets to be produced with ease.

In addition to these general-purpose programs, there are many specialised programs available for use in particular businesses.

Accountants, printers, retailers, engineers, designers, farmers and doctors — to name but a few — all have their own computer packages to cater for their specialist needs.

Introduction to Computing by Peter Lafferty is published by Windward and costs £4.95.

NOUGHTS

Noughts and Crosses is a perennial favourite, probably because it is a simple game of strategy. The method used simple three-by-three grid. This particular program is taken from *The Oric Book of Games* by

```
10 REM Noughts and Crosses
20 GOSUB 1020
30 GOSUB 780
40 GOSUB 920
50 GOSUB 630
60 IF FIN=1 THEN GOTO 1260
70 IF FIN=2 THEN GOSUB 920
  :GOTO 1220
80 IF DR=1 THEN GOTO 1240
90 GOSUB 920
100 GOTO 30
120 FOR Z=1 TO 4
130 X(Z)=0
140 Y(Z)=0
150 NEXT Z
160 FOR L=1 TO 3
170 S=0
180 T=0
190 FOR K=1 TO 3
200 IF A(L,K)=1 THEN S=S+1
210 IF B(L,K)=1 THEN T=T+1
220 NEXT K
230 IF S=0 THEN Y(T+1)=Y(T+1)+1
240 IF T=0 THEN X(S+1)=X(S+1)+1
250 NEXT L
260 FOR L=1 TO 3
270 T=0
280 S=0
290 FOR K=1 TO 3
300 IF A(K,L)=1 THEN S=S+1
310 IF B(K,L)=1 THEN T=T+1
320 NEXT K
330 IF S=0 THEN Y(T+1)=Y(T+1)+1
340 IF T=0 THEN X(S+1)=X(S+1)+1
350 NEXT L
360 GOSUB 430
370 GOSUB 530
380 IF X(4)=1 THEN FIN=1:RETURN
390 IF Y(4)=1 THEN FIN=2
400 E=128*Y(4)-63*X(3)+31*Y(3)-
  15*X(2)+7*Y(2)
410 RETURN
430 T=0
440 S=0
450 FOR K=1 TO 3
460 T=T+A(K,K)
470 S=S+B(K,K)
480 NEXT K
490 IF S=0 THEN X(T+1)=X(T+1)+1
500 IF S=0 THEN Y(S+1)=Y(S+1)+1
510 RETURN
530 T=0
540 S=0
550 FOR K=1 TO 3
560 T=T+A(4-K,K)
570 S=S+B(4-K,K)
580 NEXT K
590 IF S=0 THEN X(T+1)=X(T+1)+1
600 IF T=0 THEN Y(S+1)=Y(S+1)+1
610 RETURN
630 M=-256
640 DR=1
650 FOR J=1 TO 3
660 FOR I=1 TO 3
670 IF A(I,J)=1 OR B(I,J)=1
  THEN GOTO 740
680 DR=0
690 B(I,J)=1
700 GOSUB 120
710 IF FIN=1 THEN RETURN
720 IF E>M THEN M=E:A=I:B=J
730 B(I,J)=0
740 NEXT I
750 NEXT J
760 B(A,B)=1
770 RETURN
780 REM GET INPUT
790 INPUT "Your move (row col)
  ";A$
800 IF LEN(A$)<>2 THEN FING
  :GOTO 780
810 J=VAL(MID$(A$,1,1)):I=VAL
  (MID$(A$,2,1))
820 IF I<1 OR I>3 THEN FING
  :GOTO 780
830 IF J<1 OR J>3 THEN FING
  :GOTO 780
840 IF A(I,J)=1 THEN GOTO 890
850 IF B(I,J)=1 THEN GOTO 890
```


& CROSSES

for the computer to play this game is based on a simple technique from artificial intelligence and is based on a Mike James, S M Gee and Kay Ewbank which is published by Granada Technical Books at £5.95.

```
860 A(I,J)=1
870 REM INPUT OK
880 RETURN
890 PRINT "Position already
    occupied"
900 FING
910 GOTO 780
920 FOR J=1 TO 3
930 FOR I=1 TO 3
940 IF A(I,J)=1 THEN CURSET
    I*18+80,J*24,3:
    CHAR ASC("X"),0,1
950 IF B(I,J)=1 THEN CURSET
    I*18+80,J*24,3:
    CHAR ASC("O"),0,1
960 IF A(I,J)+B(I,J)=0
    THEN CURSET I*18+80,
    J*24,3: CHAR ASC(" "),0,1
970 NEXT I
980 NEXT J
990 RETURN
1020 DIM A(3,3)
1030 DIM B(3,3)
1040 DIM X(4):DIM Y(4)
1050 INK 7
1060 PAPER 0
1070 HIRES
1080 CURSET 109,10,2:DRAW 0,80,2
1090 CURSET 127,10,2:DRAW 0,80,2
1100 CURSET 90,40,2:DRAW 55,0,2
1110 CURSET 90,64,2:DRAW 55,0,2
1170 FIN=0
1180 DR=0
1190 RETURN
```

```
1220 PRINT "I WIN!!"
1230 GOTO 1270
1240 PRINT "DRAW!!"
1250 GOTO 1270
1260 PRINT "YOU WIN!!"
1270 INPUT "Another game Y/N";A$
1280 IF A$="Y" THEN RUN
1290 TEXT
```

The problem with playing Noughts and Crosses against a computer is that the computer can be programmed so that the person challenging it can never win. However, this program makes your Oric an opponent who can be beaten. The Oric will make sensible moves but it is not infallible so it is worth playing on until you beat it. It's actually a very good way of learning about game-playing strategy.

How to play

This game is played on a simple three-by-three grid in the traditional way. You have the 'X' and play first. To make your move you have to specify which square to place your mark on. Type in the row number first, then the column number.

For example, type 11 to place your nought in the top, left-hand corner. If you type a number in the wrong format or a number that does not correspond to a position on the grid, the Oric won't accept it and will beep at you. If you type the number of a position that is already occupied a message to that effect will be displayed. Once you've made your move the computer replies with its 'O' and you make your next move. At the end the Oric will display 'I WIN' if

it has been successful, 'YOU WIN' if you've been successful and 'DRAW' if it's stalemate. The board has to be completely filled for the game to be over.

Typing tips

A capital 'O' is used in this program — look out for it in the CHAR statement in line 950.

Subroutine structure

- 20 Main play loop
- 120 Evaluates computer's move
- 630 Tries each move
- 780 Gets player's move
- 920 Displays moves
- 1020 Sets up screen and plots frame
- 1220 End of game

Programming details

The program only looks one move ahead when deciding its move — in other words it does not try to take account of the next move you'll make — which is why it slips up sometimes and allows you to win!

The board is drawn in high resolution graphics and the Xs and Os are placed on the screen using the CHAR command. The messages and input are all accommodated in the two text lines at the bottom of the high resolution screen.

Personal and Profes



MTX512: 64K RAM - £315
MTX500: 32K RAM - £275

Please phone for the address of your nearest Dealer

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ssional

The All-Purpose System

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below - you'll see what we mean.

Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program, which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

The Disc Based Computers from Memotech

Designed to use the full power of the MTX computers the FDX and HDX make perfect business systems at prices which make perfect business sense. Both feature the CP/M operating system, giving instant access to a wide range of proven application software. Available in October these feature:

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FDX—Floppy Disc System

1 or 2 5 1/4" Qume drives 500K unformatted, 347K formatted,

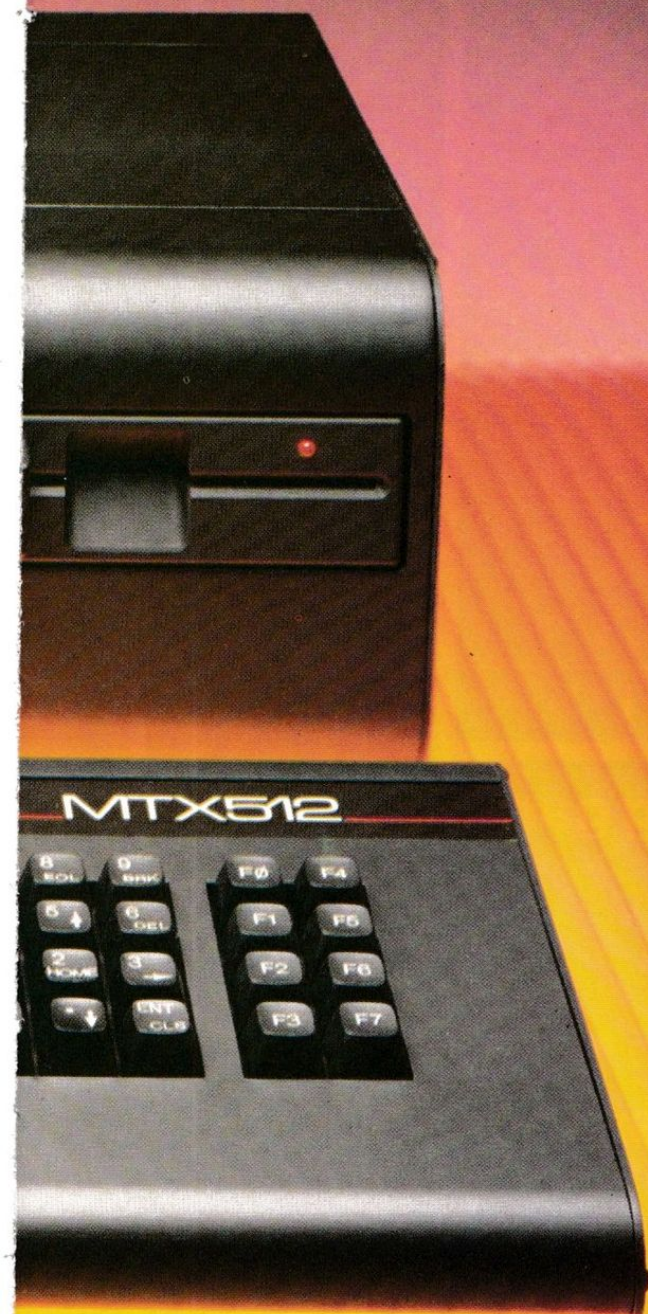
HDX—Hard Disc System

5 1/4" Qume drive, 500K unformatted, 347K formatted,
5 1/4" Winchester which may be 5, 10, or 20 Mb

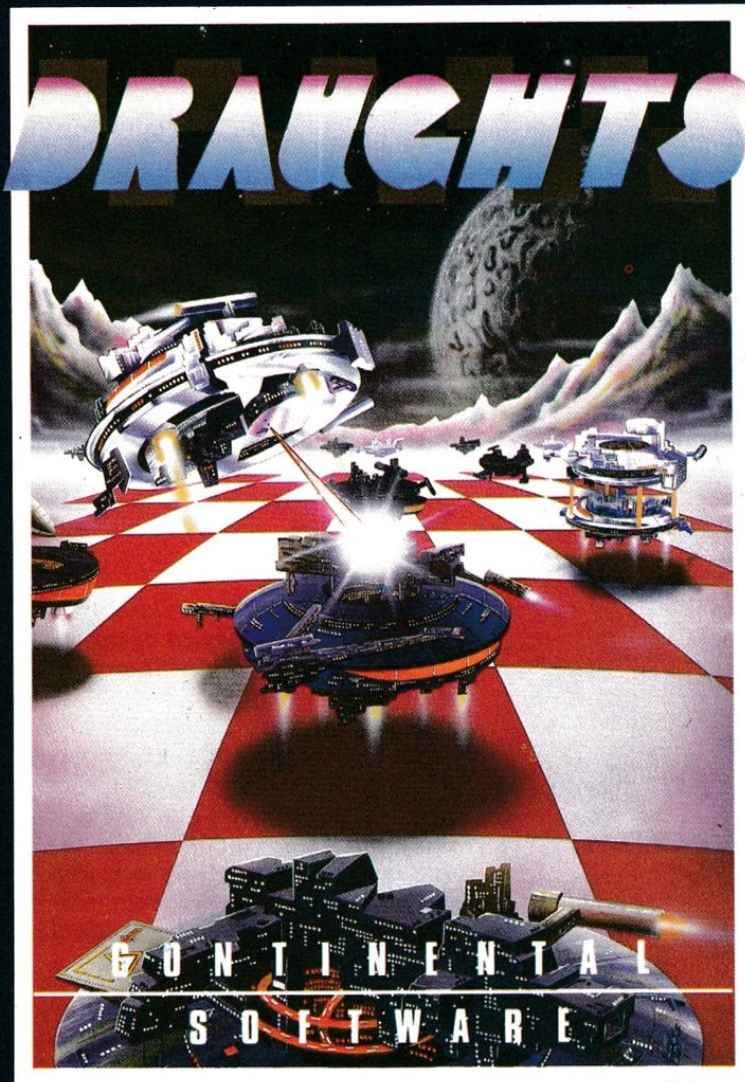
All Memotech products are designed and manufactured in Oxfordshire, England

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ACORN ANGLE



MONITORING THE SCENE

Clive Williamson reviews low-cost colour monitors and reveals some little-known FX calls for the BBC and Electron

Anyone who has tried to use their computer when the rest of the family wants to watch *Top of the Pops* or *Coronation Street* will know that there are problems using a micro on a domestic colour television set!

Fortunately, a number of companies can now bring express relief with a range of RGB Monitors, which sell for somewhere between £180 and £300. So acquiring a second colour set especially for use with your micro needn't cost an arm and a leg. And there is the added advantage of the sharper, steadier image and excellent colour saturation by way of the RGB connection available on the BBC Micro and the Electron.

The picture seen on a domestic TV, or even via a 'PAL' video connection, always suffers because of the way the colour information is encoded, and any UHF conversion of the signal also causes degradation of the image.

Using the RGB output from the computer, the red, green and blue 'guns' in the colour tube can be

driven individually, thus avoiding both fuzziness and the associated eye-strain.

Cabel's Answer

Cabel's CE 370A monitor has a 14 inch screen which is tilted back by 10 degrees, to make it easier to read. The pale beige case is very robust, is easy to carry and has been designed very much with the education market in mind.

All the cooling vents and most of the controls have been well-hidden from tiny prying fingers and the electronics are designed to require a minimum of 'setting up'.

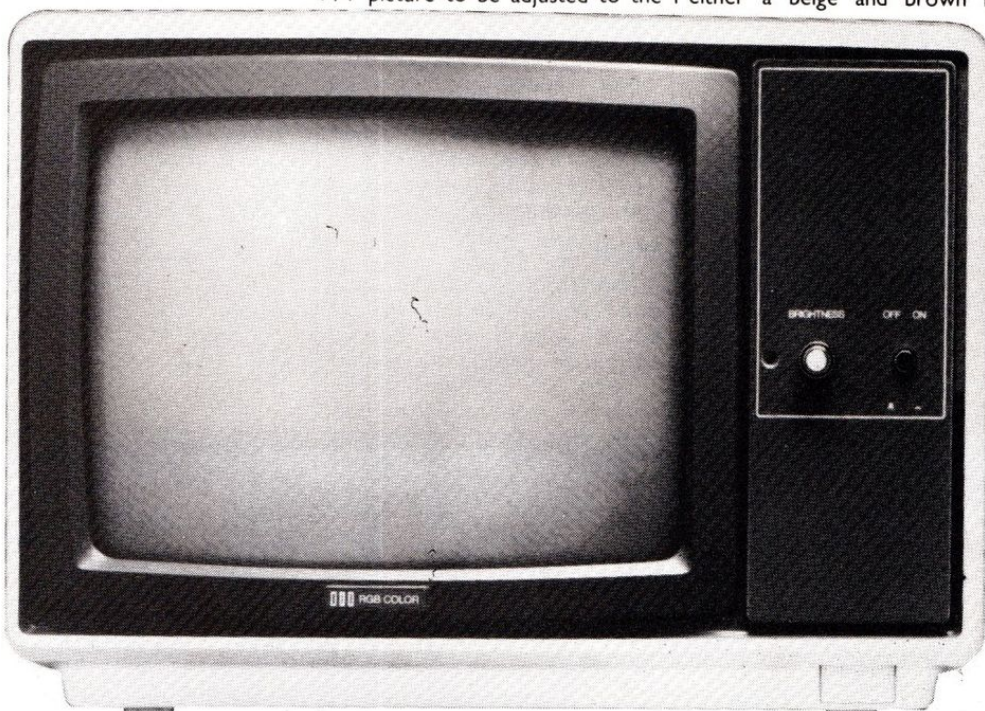
The front panel carries the on/off switch, a socket for the RGB input and a brightness control. There is an additional knob which allows the 'interlace' between successive frames of the TV picture to be adjusted to the

includes full servicing back-up.

Like the Cabel sets, Microvitec's range has a very robust and safety-conscious design. In fact they have no controls on the front of the set at all, making them suited for use in displays and school environments. The on/off and contrast controls are both at the back of the set, and each monitor is 'lined up' in the factory to give the best results.

Microvitec's high resolution 14 inch set, which has a 0.31mm dot pitch, is very sharp, and has a rock-steady image which makes it ideal for prolonged use with an 80 character display. However, at just under £550 it is more suited to 'professional' use with a BBC Micro than a coupling with the £199 Electron!

The Cub range comes with either a beige and brown high



Two RGB Monitors suitable for the BBC or Electron; JVC from Opus Supplies (above), and the Lion Cub from Microvitec (below)

optimum setting for the computer in use.

If your bank balance will stretch further than £230, a second version of the monitor is available which has audio and PAL video inputs as well as the RGB. Designated the CE370B, it sells for £295 inclusive, and will probably find a market among schools and people with an interest in video as well as computing. The prices include an RGB lead suitable for the BBC Micro.

Microvitec Monitors

Another British company, Microvitec, has a range of RGB monitors suitable for use with the BBC Micro and the Electron. These are all in the Cub series, available with 12 inch, 14 inch or 20 inch screens in standard, medium or high resolution. The 14 inch standard resolution set costs about £295 inclusive. The price

density structural foam case, or a metal one in the same colours, and a plinth is available as an optional extra.

Opus Supplies

Opus Supplies has entered the monitor market with two JVC monitors.

These are standard and medium resolution, although confusingly Opus calls them medium and high resolution, but they sell at a surprisingly low £187.39 and £279.39 respectively, including cable, VAT and carriage.

The Opus sets are slightly more bulky than the other two brands, and have more of a homely look about them, but the picture quality is certainly acceptable in both cases, and the price seems to be compatible with even the thinnest of wallets. The so-called high-res set is particularly interesting, providing a fairly economical way of

obtaining an acceptable display for word processing or mode 0 graphics.

Suppliers:

Cabel Electronic, 19, High Street, Tewkesbury, Gloucestershire, GL20 5AW. Tel: 0684 298840.

Microvitec Ltd, Futures Way, Bolling Road, Bradford, BD4 7TU. Tel: 0274 390011.

Opus Supplies Ltd, 158 Camberwell Road, London SE5 0EE. Tel: 01-701 8668.

Acorn's pricing confusion

Acorn's policy on the price of its goods seems to be generally clear — sell the product for what it will fetch. Thus the BBC Micro still goes for the original price of £400, when most other computers have benefitted from precipitous price cuts over the same period.

Acorn's reasoning is that since the BBC machine is still disappearing off the shelves at an amazing rate, why on earth does it need a price cut? This attitude certainly seems more logical than that of Commodore, where it is apparently *de rigueur* to slash prices by 50 per cent every six months, regardless of the very strong demand already enjoyed by the machines.

The relatively high price of the

stripped-out Electron (£199 where Sinclair or Commodore would probably have gone for £149) indicates that Acorn has no intention of undercutting its rivals.

However, as regular readers will remember, we were amazed at the £225 tag on the BBC Micro's teletext adaptor (a figure which will buy you the complete set of a 48K Sinclair Spectrum together with the Prism/Micronet Prestel adaptor), and recent press reports of the pricing of the much-delayed second processors for the BBC seemed to indicate a new level of rash confidence in the company's marketing division.

We contacted Acorn to enquire about the reported figures of £900 for the Z80 processor and £400 for the add-on 6502, both of which put in an appearance at the Compec exhibition. Although as we go to press the final levels had not been fixed, our unofficial source indicated that they would undercut the post-Compec report by about 50 per cent — in other words, the tags would resemble those we have mentioned in previous editions of *Which Micro?*

New FX calls

Many users may not be aware that both the Electron and the BBC Micro fitted with a 1.2 operating system contain a large number of extra *FX calls which do not appear in their respective User

Guides from Acorn. *FX calls are special commands which help you to reach those parts of your micro which other commands cannot reach. Some calls relating to things like printers, the RS423 interface and the 'Tube' are only implemented on the BBC Micro, as it is fitted with all the necessary interfaces, but there are some interesting new *FX calls which work fully on both machines.

*FX119 Closes any *SPOOL or *EXEC files.

*FX142,n Selects sideways ROM socket number 'n'. The BBC Micro has four ROM sockets on-board, which are numbered 12 to 15. The Electron will be able to use this call if it is fitted with a ROM expansion board. Calling a socket with nothing in it will cause either machine to crash.

*FX200,n Governs action of Escape and Break keys.
n = 0 NORMAL
n = 1 Disables Escape key
n = 2 Clears memory if Break key is pressed
n = 3 Disables Escape and pressing Break clears memory

*FX201,n Switches the keyboard on and off

n = 1 ON
n = 0 OFF

*FX202,n Electron: n = 32

Caps lock on
n = 48

Caps lock off

BBC: n = 0

Shift and Caps lock on
n = 16

Shift lock on

n = 32

Caps lock on

n = 48

Shift and Caps lock both off

Using 'Shift' with the Caps lock on the Electron results in lower case letters. This can be achieved on the BBC Micro by pressing 'Shift' then Caps lock, or using *FX202,160. The only way to get reversed shift lock for the whole BBC keyboard is with *FX202,144, which will shift all the keys unless the 'Shift' key is pressed, when lower case letters, numbers and symbols will result.

*FX220,n Redefines the character which generates 'escape' condition. 'n' is the ASCII number of the new escape character. *FX220,0 turns the escape key off.

The following will be no surprise to 'Beeb' owners, but they are also available on the Electron:

*FX137,n Controls the cassette motor

n = 0 MOTOR OFF
n = 1 MOTOR ON

*FX138,0,n Inserts a character into the keyboard buffer, where 'n' is the ASCII number of the character

*ROM

This command is implemented on the Electron, and will work when a sideways ROM board is fitted. It enables the micro to use ROMs as a filing system for Basic programs, instead of the cassette filing system.

The Cardiff company SIR Computers is working on an extension ROM board for the Electron which will take up to eight sideways ROMs. It also plans to release a printer and joystick interface board. The prices of these add-ons have not been fixed at the time of writing.

Acorn has distant plans for an Electron extension board of its own, but the SIR boards are bound to take the lion's share of the market if Acorn does not get its skates on! ■



Acornsoft has joined forces with Applied Systems Knowledge Ltd (ASK) in order to broaden its range of software for the education market.

Ten titles are being published for the BBC Micro and the Electron which are intended to create imaginative problems for various age groups from three to 11 years.

The programs are equally suited for classroom or home use, and many take the form of non-violent games which are intended to improve children's literacy and numeracy.

Titles include Cranky, a number game for children aged seven and over, based on the idea of repairing a faulty

calculator, and Hide and Seek, where several objects are put into boxes and hidden by shutters. As the number of objects increases, it becomes more difficult to remember their whereabouts.

Each program is sturdily packaged, with brochure and notes, and all the titles are available on cassette for £9.95.

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Softek reserve the right to determine that submissions to the Whiz Kid competition fail to meet a minimum quality, in which case the competition will be voided. The judges decision is final. The above competitions are not open to employees of Softek International Ltd. or any under contract to them. No correspondence shall be entered into regarding the results of the competition.

GROBBIT ADVENTURE

Kevin Bergin puts some of his Vic Tricks into action with the first instalment of this two-part feature teaching the rudiments of adventure programming on the Vic 20, either unexpanded or with an extra 3K. More next month!

Mini Adventure

This 'small' adventure game for the unexpanded Vic is really just a sample of what is possible in this game. The game has only 20 rooms, whereas most adventure games have over 100 rooms.

The Scenario

The game is called Grobbitt. Grobbitt is a nasty creature that lives in a maze of caves where the player is trapped. The object of the game is to find the way to freedom and home. Each of the 20 caves has three exits.

Hazards

In one of the rooms there is a pit, and if

you stumble into this you are a goner. Occasionally you'll stumble into bats which terrify you and cause wild flight, while the final hazard is Grobbitt who will suddenly appear and threaten to devour you. You have a gun with only six shots which can be used to keep Grobbitt away. But you must beware — when you have fired all your shots the only escape is to run or find the exit.

Setting It Up

The game is fairly short as are most programs for the basic Vic, but it should RUN with minimum alterations on the 64. If you do this, there is of course scope for improvement and enlargement of the game with the 64's elephant-like RAM.

There would also be room for improvement with an expanded Vic.

At the start of the game the player has the option of reading the plot or going headlong into the game. Once the game is started the player is told the current position and the exit options, also any hazards that are in that room.

The Game

The first statement on line 10 sets the screen and border colours to red. The other two statements put the Vic into lower case and the statement PRINT CHR\$(8) locks the Vic in lower case. Lines 20 to 30 are the title and a message asking whether or not the player would like to read the plot. The routine in line 40 to 60 consists of a GET statement to accept only Y or N and branch to the appropriate routines.

At line 70 and 80 is an error trap that prints a message and returns to the input routine. The GOSUB in line 90 is a branch to display the plot on the screen, whilst the GOSUB in line 100 jumps to a routine that prints a 'please wait' message whilst the caves are set up. The GOSUB on line 110 jumps to the routine to initialise and set up the caves. The test on lines 130 and 140 is checking for the end of the game if the variable X is set to zero.

The plot is contained in lines 270 to 520. There are two screens for the plot although this could very easily be changed. Any characters in the program printed in italics are SHIFTED characters. The game is set up by the routine from line 770 to 830. This routine reads in the data for the

```

10 POKE36879,42:POKE36869,242:PRINTCHR$(8)
20 PRINT"[CLR][WHT] WELCOME TO GROBBITT"
30 PRINT"[5 CD] WOULD YOU LIKE THE PLOT!! (Y/N)"
40 GETA$:IFA$<>"Y"AND$<>"N"THEN40
50 IFA$="N"THEN100
60 IFA$="Y"THEN90
70 PRINT" DON'T YOU KNOW???"
80 GOTO20
90 GOSUB270
100 GOSUB1460
110 GOSUB530
120 GOSUB840
130 IFX<>0THEN120
140 IFY<>0THEN180
150 PRINT"[4 CD]YOU ESCAPED TODAY !!"
160 PRINT"BUT TOMORROW ??"
170 GOTO200
180 IFY<>0THEN210
190 PRINT"[5 CD]YOU FELL INTO THE PIT,"
200 PRINT"SO LONG....."
210 FORDE=1TO5000:NEXT
220 PRINT"[CLR][CD] ANOTHER GAME (Y/N)"
230 GETA$:IFA$<>"Y"AND$<>"N"THEN230
240 IFA$="Y"THEN100
250 PRINT"[CLR] BYE FOR NOW!!!!"
260 END
270 PRINT"[CLR] [ON]GROBBITT[OFF]"
280 PRINT"[2 CD]YOU ARE LOST IN A CAVETHAT HAS";
290 PRINT" 20 CHAMBERS. ALL CHAMBERS HAVE";
300 PRINT" TUNNELS TO THREE OTHERS. ONE
";
310 PRINT"TUNNEL GOES TO THE MOUTH OF THE ";
320 PRINT"CAVE. IF YOU FINDIT YOU GET ";
330 PRINT"HOME FREE."
340 PRINT"GROBBITT LIVES IN THE CAVE.";
350 PRINT" HE'S A NASTY KNOBBLY CREATURE"
360 PRINT"THAT WILL GRIND YOUR BONES AND";
370 PRINT" COOK YOU FORSUPPER IF HE GETS YOU.";PR
INT
380 PRINT"[CD][ON]PRESS F1 KEY TO CONT."
```

```

390 GETA$:IFA$<>"[F1]"THEN390
400 PRINT"[CLR][2 CD]GROBBITT WILL RUN TO ANOTHE
R";
410 PRINT" CHAMBER IF YOUSHOOT HIM. YOUR";
420 PRINT" GUN ONLY HAS SIX SHOTS, SO USE";
430 PRINT" THEM WISELY.";
440 PRINT" SOME CHAMBERS HAVE BATS IN THEM";
450 PRINT" THEY PETRIFY YOU AND COMPELYOU";
460 PRINT" TO RUN INTO THE NEAREST TUNNEL.";
470 PRINT" ONE CHAMBER HAS A DEEP PIT!!!";
480 PRINT" IF YOU FALL INTO IT YOU'LL NEVER";
490 PRINT" GETHOME."
500 PRINT"[CD][ON]PRESS F1 KEY TO CONT."
510 GETA$:IFA$<>"[F1]"THEN510
520 RETURN
530 S=6
540 GOSUB770
550 E=R3
560 B1=R1
570 GOSUB770
580 P=R1
590 B2=R3
600 IFP=ETHEN570
610 IFP=B1THEN570
620 IFP=B2THEN570
630 IFB1=B2THEN570
640 GOSUB770
650 B3=R2
660 IFB3=ETHEN640
670 IFB3=PTHEN640
680 IFB3=B1THEN640
690 IFB3=B2THEN640
700 GOSUB770
710 W=R1
720 Y=R3
730 IFY=PTHEN700
740 IFY=ETHEN700
750 X=1
760 RETURN
770 R=INT(RND(1)*100)+1
780 FORI=1TOR
```


caves, bats, Grobbitt and the player. It is called four times at the start of each game, the first time by line 540 which gets the exit number.

The variables R1, R2 and R3 are loaded with the interconnecting room numbers. On line 550 R3 is placed into the variable E as the Exit number and on line 560 R1 is placed into the variable B1 which is one of the tree bat caves. The second time the routine is called is from line 570, and this time R1 is placed into P (for pit) on line 580 and a second bat is placed into B2 on line 590.

This part in the program (lines 600 to 630) checks that the Pit is not in the same place as the exit, the pit is not in the same cave as the bats and both bat caverns are not the same. If any of these tests are true the read routine is entered again. A third branch to the read routine is done from line 640, and this time the third bat cavern is set up (line 650).

Another series of checks are carried out by lines 660 to 690. The checks are all on B3 to see if it is in the same place as the exit, the same place as the pit or the same place as the first two bat caves. Again if any of the checks are true the read routine is re-entered.

The fourth branch to the read routine is performed on line 700. This time R1 is placed in the variable W (the Grobbitt) and R3 is placed in Y (the player). There are two more checks on lines 730 and 740 to ensure that the player is not placed in the pit or the exit. The variable X on line 750 is set to 1, but if this is passed back to the calling routine as zero, the

end of game routine is entered. The read routine is on lines 770 to 830.

The routine at lines 840 to 1210 does the work whilst the player is moving around the caves. Lines 840 to 890 check for the player being at either the exit, in the pit, in the same room as Grobbitt or in one of the bat caves. Lines 900 to 950 inform the player of the current room number and the exits available. The routine at line 960 to 990 checks the adjoining rooms for the exit — if it is there a message is printed by line 1000, if not a jump to line 1010 is executed.

The message at line 1010 is printed and the program branches to the input routine at line 1490. Lines 1020 to 1050 check for a correct input and line 1060 to 1090 prints a message and returns for another input if the first was illegal.

Lines 1120 to 1140 branch to the bat and gun routines (providing any bullets are left). Lines 1140 to 1180 is the no bullets left and X is set to zero before branching back to the main body of the program. On line 1190 the gun routine is entered and line 1200 returns to the routine to move the player should he or she choose to run rather than fight.

The bat routine is at lines 1220 to 1260 and the gun routine is at lines 1270 to 1410, which also decreases the number of shots left, 'S', and moves Grobbitt. The room, bat, Grobbitt and player data is at lines 1420 to 1450. The routine at lines 1460 to 1480 prints a message on the screen whilst the game sets up the caves.

The final routine in the program at lines 1500 to 1570 is an input routine. Line

1490 sets IN\$ to a null string and line 1500 prints a reverse field asterisk and moves the cursor back onto it. Line 1510 gets a character; if no character then stay put. Line 1520 converts the input into its ASCII value — if it is greater than 95 then ignore it and go back for another character.

Line 1530 checks the length of IN\$; if it is greater than 12 then it branches to 1550 because that is the limit for the input. Line 1540 checks the value of A; if it is greater than 31 then it's legitimate, PRINT it and return for next character. Line 1550; if return is pressed and the length of the string is greater than zero then return from the subroutine. Line 1560; if the space-bar is pressed and the string is greater than zero then the input string becomes the left side of the string taking AL-1 first characters. Print the character. Line 1570; jump back to line 1500 and get next character.

This program was printed on an Epson FX-80 and all the control characters have been stripped from the program and replaced, shorthand-style, with the characters enclosed within []:

SHIFT/CLR	= [CLR]
HOME	= [HOME]
CRSR DOWN	= [CD]
CRSR UP	= [CU]
CRSR RIGHT	= [CR]
CRSR LEFT	= [CL]
COLOURS	= [CTRL & n] (where n is a number from 0 to 7)
FUNCTION KEYS	= [Fn] (where n is a number from 1 to 8)

```

790 READR1,R2,R3
800 IFR2<>16THENB20
810 RESTORE
820 NEXTI
830 RETURN
840 IFY=ETHEN1100
850 IFY=PTHEN1100
860 IFY=WTHEN1140
870 IFY=B1THEN1120
880 IFY=B2THEN1120
890 IFY=B3THEN1120
900 PRINT"[CLR][2 CD]YOU ARE IN ROOM: "Y
910 RESTORE
920 FORI=1TOY
930 READR1,R2,R3
940 NEXTI
950 PRINT"[CD]EXITS ARE: "R1;R2;R3
960 IFR1=ETHEN1000
970 IFR2=ETHEN1000
980 IFR3=ETHEN1000
990 GOTO1010
1000 PRINT"YOU CAN FEEL A DRAFT"
1010 PRINT"WHERE TO [12 CL]";GOSUB14
90
1020 Y=VAL(IN$)
1030 IFY=R1THEN1110
1040 IFY=R2THEN1110
1050 IFY=R3THEN1110
1060 FORD=0TO3:PRINT"[3 CD] WHAT ?? TRY AGAIN."
1070 FORDE=1TO3000:NEXT
1080 PRINT"[5 CU]";
1090 GOTO1010
1100 X=0
1110 RETURN
1120 GOSUB1220
1130 GOTO840
1140 IFS>0THEN1190
1150 PRINT"YOU'RE OUT OF SHOTS AND";
1160 PRINT" GROBBITT HAS YOU."
1170 FORDE=1TO3000:NEXT
1180 GOTO1100

```

```

1190 GOSUB1270
1200 IFA$="R"THEN910
1210 GOTO1110
1220 PRINT"[3 CD]THERE ARE BATS IN HERE,"
1230 PRINT"SO HAVE TO MOVE!!!"
1240 Y=R1
1250 FORDE=1TO2000:NEXT:GOSUB900
1260 PRINT"[CLR]";RETURN
1270 PRINT"[CLR]GROBBITT IS IN THIS ROOM"
1280 PRINT"WANT TO SHOOT OR RUN.":PRINT"[CD] (S
OR R)"
1290 GETA$:IFA$<>"S"ANDA$<>"R"THEN1290
1300 IFA$="S"THEN1350
1310 IFA$="R"THEN1340
1320 PRINT"ANSWER QUICKLY!!!"
1330 GOTO1280
1340 RETURN
1350 PRINT" [ON]BANG....":PRINT" HE RAN OUT."
1360 FORDE=1TO3000:NEXT
1370 S=S-1
1380 W=R2
1390 IFR2<>ETHEN1410
1400 W=R1
1410 RETURN
1420 DATA2,3,10,1,4,5,1,4,14,2,3,7,2,7,8
1430 DATA12,18,19,4,5,12,5,12,18,13,18,19,1,14,16
1440 DATA14,15,16,6,7,8,9,17,20,3,10,11,11,17,20
1450 DATA10,11,20,13,15,19,6,8,9,6,9,17,15,16,13
1460 PRINT"[CLR][5 CD]PLEASE WAIT....."
1470 PRINT"[2 CD]JUST SETTING UP!!"
1480 RETURN
1490 IN$="";
1500 PRINT"[ON]*[OFF][CL]";
1510 GETA$:IFA$=" "THEN1510
1520 A=ASC(A$):IFA>95THEN1510
1530 AL=LEN(IN$):IFAL>10THEN1550
1540 IFA>31THENIN$=IN$+A$:PRINTA$;GOTO1500
1550 IFA=13ANDALTHENPRINT" ";RETURN
1560 IFA=20ANDALTHENIN$=LEFT$(IN$,AL-1):PRINTA$;
1570 GOTO1500

```


Mr. Chip

Software

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This is it, the ultimate Fruit Machine for the VIC with nudge, hold and respin, 100% machine code. "Overall Jackpot is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this program makes Commodore's Fruit Machine cartridge look unbelievably cheap and nasty." *Home Computer Weekly*, No. 20 19.7.83£5.50

KWAZY KWACKS

Accuracy and speed are required for this Shooting Gallery, superb use of colour and graphics in this new and challenging game from the author of **Jackpot**. 100% machine code, joystick or keyboard control£5.50

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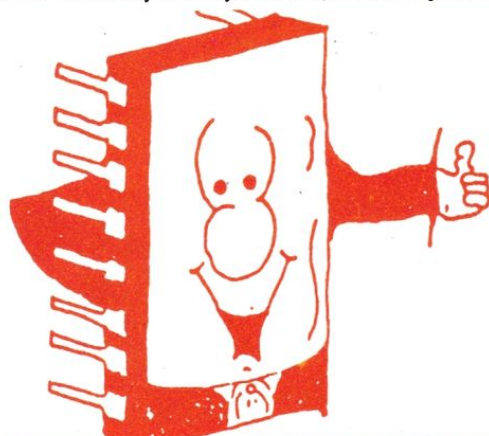
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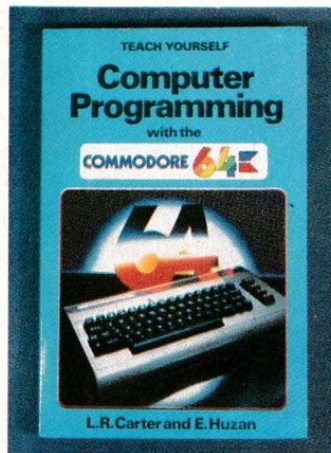
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MANUAL OVERRIDE

Nicky Trevett recommends some reading for those long winter evenings ahead.



The Dragon Trainer — a Handbook for Beginners

by Brian Lloyd, Sunshine Books, £5.95

Books of this kind seem to be pouring off the presses in ever increasing quantities; books geared to a specific machine, claiming to provide the sort of guidance and instruction the manuals should do. Unfortunately, they all too often don't.

The *Dragon Trainer* is a combined manual and beginner's course on the power of Dragon Basic. That is what is claimed, that is exactly what it is, and it does it rather well. You can tell from the cover, definitely above average, that some thought has gone into presentation and content.

The book is aimed at the complete beginner, and I mean complete. Everything it covers is all familiar and well-trodden ground — the principles of programming, followed by a conscientious catalogue of the programming features available on the Dragon.

Towards the end it moves into second gear with a look at more advanced tasks, like programming in high resolution graphics, and ends — surprise, surprise — with a series of games to key in and play. Why must it always be games? Are we really such a frivolous mob? But there again, I suppose that games are as painless a way as any other to test out newly learned programming skills.

And that's it. The new and inexperienced Dragon owner should find it of use, both as a course in programming and as a handy reference — there is quite a useful jargon guide at the back. But I suspect the dedicated hobbyist will quickly outgrow it.

Getting Started with the Epson HX-20

by Stan Corlett and John Cain, Phoenix Publishing, £5.95

The Epson HX-20 is a neat little business machine that really deserves a better cover on a book devoted to it.

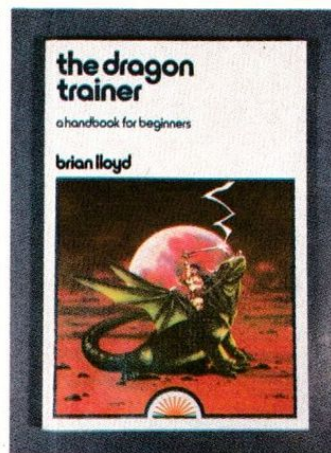
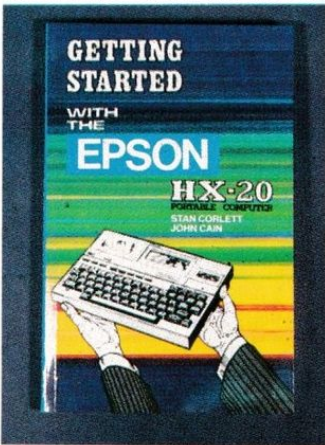
Well, this is another book about Basic programming, slanted towards Epson HX-20 Basic. This is in spite of the fact that the HX-20 comes equipped with an operation manual and a Basic reference manual.

The idea seems to be that this should complement these two manuals and whet the appetite for more advanced Basic programming.

The HX-20 is marketed as a business micro, with a typical user being, presumably, the travelling executive. Anyone facing the prospect of a lengthy association with the HX-20 will no doubt find it useful to find out how to program the thing, although a fair amount of software is becoming available. If this is the case, I suppose you could do worse than take a peek at this little book.

Instruction starts, logically enough, with switching on. The novice, having mastered that, is then guided through the fundamentals of programming and Basic, including variables, branches and loops, programming aids, formats and displays, arrays, data files and error messages.

The book will, in other words, get you started. There are a few programs to help you along, plenty of diagrams, the usual sort of thing. You won't learn everything about Basic, and you won't have been introduced to all the functions available to HX-20 users, but then the authors don't pretend you will.



Teach Yourself Computer Programming with the Commodore 64

by L. Carter and E. Huzan, £2.75

The beginner is promised, "A practical grounding in Basic," and with a bit of patience and application that's what you will get. But this is a serious book and one of the few teach-yourself manuals that does not base itself on games programs. Come to that, there are no games programs whatsoever; applications covered include colour effects, animation and sprite graphics, sound effects and Morse trainer, cost calculations and mortgage calculations, stock file processing and simulation, processing scientific and engineering data, and mathematical calculations.

This should all appeal very much to the small business user, the mathematician and whoever pays the household bills. But there is also a great deal of valuable reference material in the book which makes it a good buy for any Commodore 64 user.

You get lots and lots of tables, on any subject from machine code instructions to coloured mosaic patterns, a serial plotting routine to a two-tone siren. Appendices include a number of short programs, ASCII and CHR\$ codes, colour codes, screen display codes, screen and colour memory maps, sound registers and control settings, music note values, and more.

The text itself covers a huge amount of ground — arithmetic operations, program development, POKE, PEEK and colour, arrays, subroutines, sound, using peripherals, and the like. This is a welcome aid for the sometimes neglected serious user.

Sixty Programs for the Sinclair ZX Spectrum

by Robert Erskine, Humphrey Walwyn, Paul Stanley and Michael Bews, Pan Books, £4.95

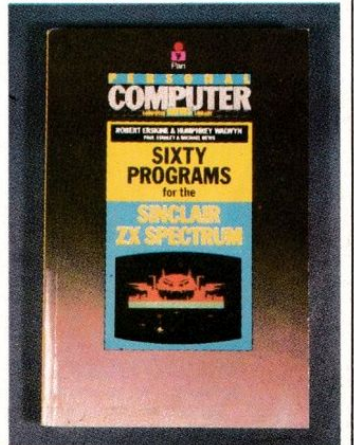
This offering to the altar of the Sinclair Spectrum comes from the Pan/Personal Computer News Computer Library, and, well, what can I say? If you are a Spectrum owner, you can't really afford not to acquire a book of 60 programs, consisting of games, graphics and utilities from four software writers, all designed to exploit your Spectrum's potential.

Not that there is any lack of books on the subject. But this book does give you quite a lot for your money. In fact, so keen are the authors to cram everything in that they have extended the line of the listings to 45 characters (the Spectrum, of course, goes to 32). This will require extra care when keying in.

Games include *Minelay*, *Newmarket*, *Flying Bomb*, *Alien*, *Grand Prix* and, well, you get the picture. Other programs include *Critical Path Analysis*, *Holiday Expenses*, *Asset Stripper* (an investment simulation), a numbers conversion program, anagram unscrambling... I can't list them all. There are plenty of opportunities to experiment with your graphics capabilities.

Don't be misled — by far the majority of these programs are games and puzzles of one sort or another. It will take you some time to get bored with this book, if only because of the sheer length of time it will take you to work through all the listings.

All programs are listed as dumped to printer, so they should work. What more can a Spectrum owner ask?



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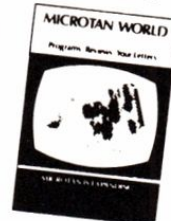
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Some others ask you to compare the technical facts. Well, to give them all a surprise we've published some of 32K Colour Genie's most important features.

But for the less technical, here are a few other important questions and answers.

WHY YOU CAN'T BUY A COLOUR GENIE AT THE CORNER SHOP

You see, ALL computers are more complex than they first appear.

So when you start computing, you do need a bit of help. A Saturday shop assistant is NOT the right person to go to.

To ensure that you obtain the answers to any doubts or questions you may have about computers, a list of the many Genie specialists appears below. But if you have any problem whatsoever, get in touch with us at Lowe Computers — we're here to help.

- Design efficiency. 95% of RAM is available for user memory.
- 16K ROM with Microsoft Colour BASIC Extended
- Forth (optional)
- 256 predefined characters with 128 more you can program yourself. A massive 256 can be displayed at any one time
- Repeat operates on all 63 keys
- 4 function keys giving 8 user programmable statements
- Full editing and tracing facilities for de-bugging
- Screen resolution of 320 x 200 with text and graphics
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WHY OUR 32K CAN MEAN A LOT MORE THAN EVEN THE MOST RECENT COMPETITORS

It's easy to quote big memory numbers like 32K. In many other popular computers of that size, it is not so easy to use it all.

Even some of the newest models let you use little more than two thirds of the user memory. The other third is snatched away to drive the computer.

- Screen display, 25 rows of 40 characters
- 16 colours (8 full, plus 8 tints)
- 80 commands plus more than 40 graphics, arithmetic and special functions
- 8 octaves, independent on each of 3 separate sound channels with independent volume, duration and envelope on each channel
- Full synthesised sound effects via separate T.V. or Hi-Fi output ports
- Cartridge based software
- Prestel/Viewdata modem. Software cartridge loaded for fast system access
- Floppy disc system
- Superb digital joysticks, with numeric pads and two fire buttons.

Colour Genie has the type of "drive" facility that you would expect to find on a computer costing around £400. It uses less than 5% of RAM - giving you as much as 30K for more exciting games and more useful applications.

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Many other computers offer several modes. These give high resolutions but at a cost.

On some, high resolution uses so much RAM that you get only 2 colours, and very little memory left to play with.

But Colour Genie has got other ideas to let you have the good quality picture effect of high resolution (320 x 200 for the technical). AND FULL COLOUR

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WRITING SOFTWARE WILL IT MAKE YOU RICH?

Many home micro users hope to strike it rich with their programming efforts. But, as Neville Ash discovers, it's no easy way to make a fortune.

Ever since a 16-year-old hit the headlines when he said he was being paid £30,000 a year for writing games software, went home by mini-cab but couldn't even open a bank account, things just haven't been the same. Every single owner of a micro-computer must have thought, "If Eugene Evans can do it, so can I . . .".

On the surface it's a logical thought. When you play games it soon becomes simple to reach a fairly high score. Then you see the drawbacks of the game and say to yourself, "I could write a far better game, then I can make my fortune . . .". Just make a few changes here and there, change the name and you're on your way to emulating the now-famous Eugene Evans.

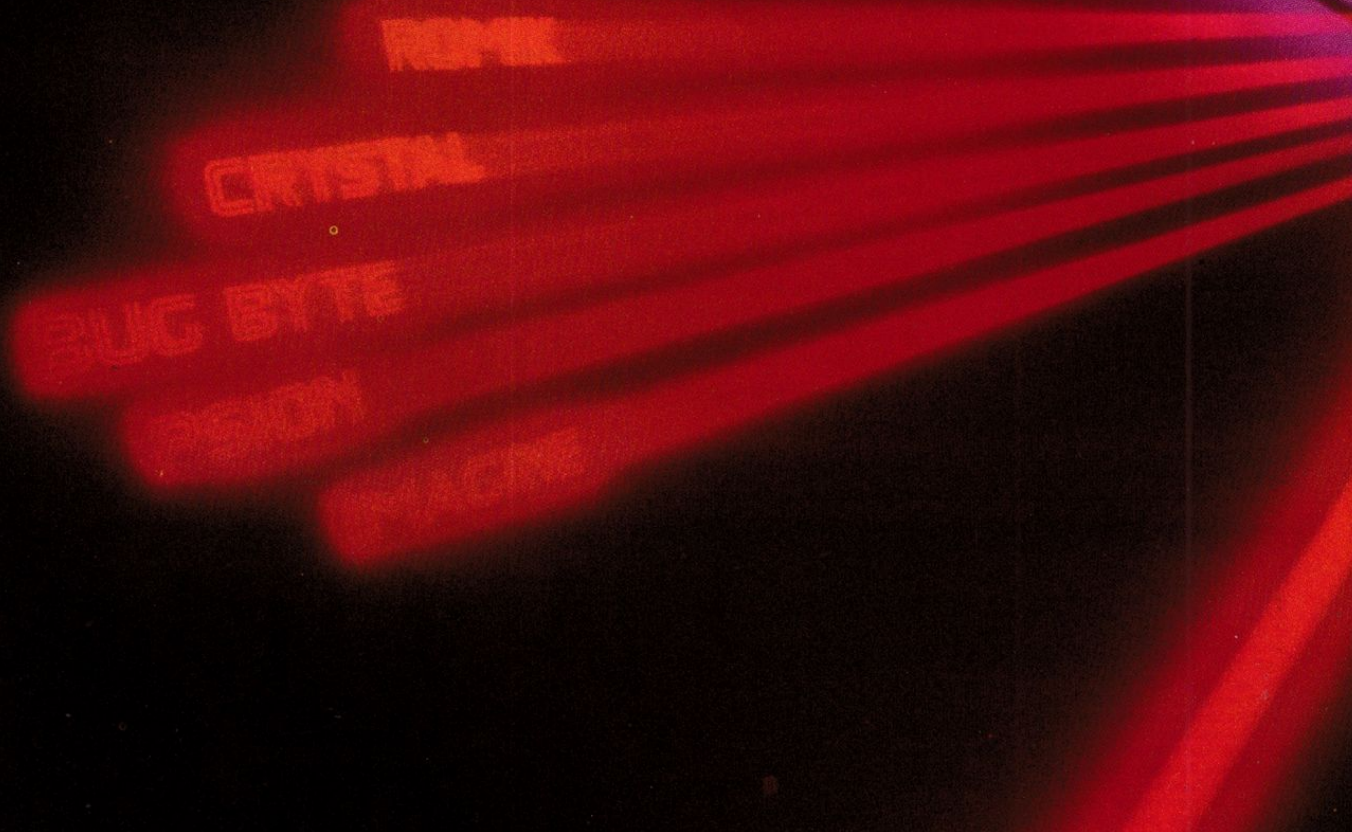
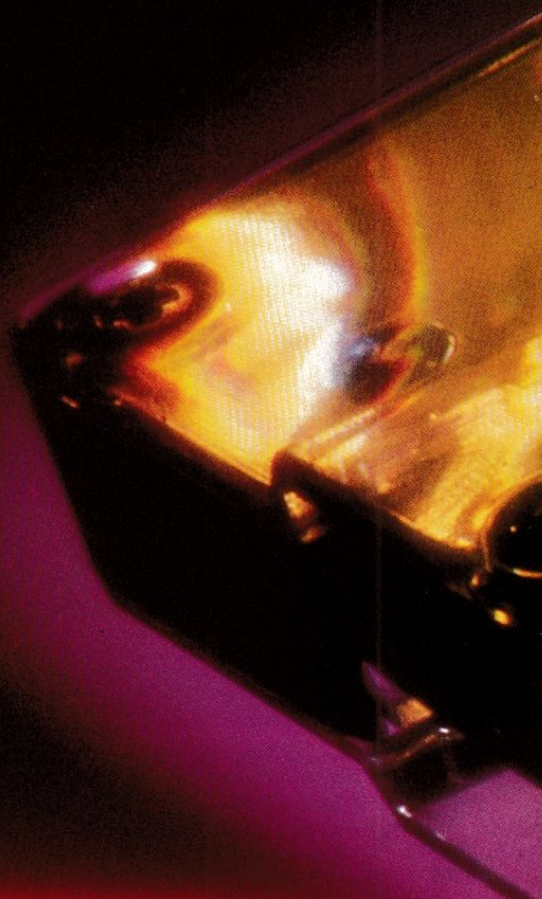
Is it really as simple as that? Where do you start? Is it just a case of taking a small ad in *Which Micro?* and letting the profits

roll in? Do you deal with one of the top names in the software business — or a lesser name who provides far higher royalties? And after all this work, will you be ripped off? Will someone else just copy your program and make all the money?

One thing is certain, for all the people around writing programs for micro-computers, Eugene Evans is the tip of the iceberg, an example of someone at the top. As with all icebergs, most of the rest is well below the surface. So hundreds if not thousands of people are beavering away and getting nowhere.

Many potential programmers fall at the first hurdle because they don't understand the rules of the game. And whatever anyone tells you, it really is just a game. Out of all the complaints in the press about harsh treatment by software companies, most can be included under one heading —

continued on page 84





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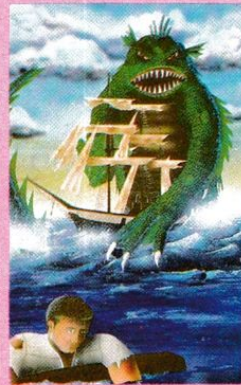
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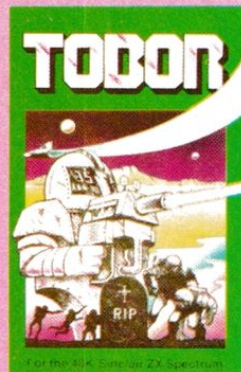
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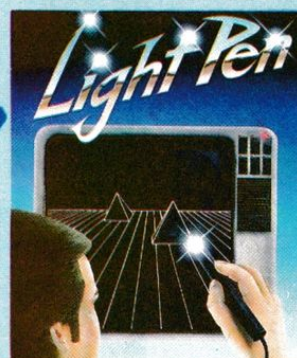
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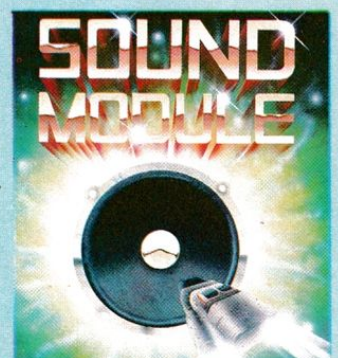
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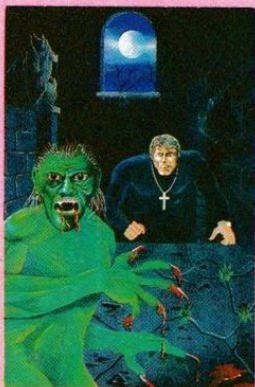
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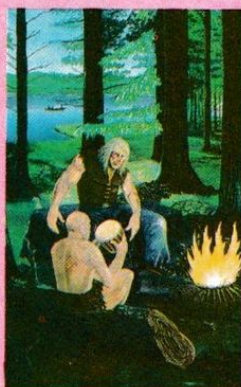
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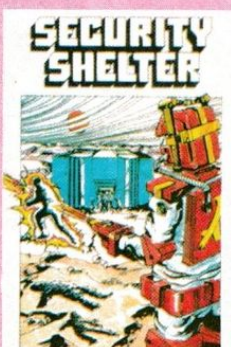


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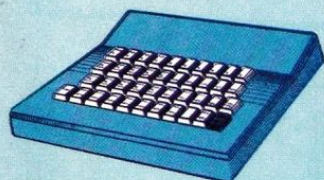


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FRU

If you've ever played the board game *Frustration*, then you'll know all about this version for the Commodore 64. If not, the basic idea is to move four coloured playing pieces around a square board to 'home'. The frustrating part comes when an opponent's piece lands on top of one of yours: your counter is removed from the game. And you can bet that this will happen when you're inches away from home.

Each player — and there can be between two and four — can choose to move any one of their four counters which are currently in play. You can't land in the same square as another of your pieces, but you can jump over them.

Lines 400 to 450 dimension the arrays and set up the variables which are going to be used, while lines 460 to 530 set up the graphics for the die rolls. The playing board is printed by lines 1020 to 1270, and remembered in four matrices set up by lines 580 to 930.

Once everything has been initialised, lines 1280 to 1550 allow each of the player's to enter his or her name. Pushing the space bar rolls the die and starts the game — the routines to do this are called in lines 1660 and 1690. As the game goes on, lines 1770 to 1860 put the current player's route into two temporary matrices so that they can be changed without altering your past moves. Checking where a player's counter will land and deciding what should be done happens in lines 2640 to 2780.

Even though the game was written for the Commodore 64, it could be modified to run on any computer with a memory mapped screen.



```

1120 PRINT"
1130 PRINT"
1140 PRINT"

1160 PRINT"
1170 PRINT"
1180 PRINT"
1190 PRINT"
1200 PRINT"
1210 PRINT"
1220 PRINT"
1230 PRINT"
1240 PRINT"
1250 PRINT"
1260 PRINT"
1270 PRINT"

1280 PRINT"
1290 PRINTTAB(28); "HOW MANY"
1300 PRINTTAB(28); "PLAYERS"
1310 GETB$ : IFS$="GOTO1310
1320 B=VAL(B$)
1330 IFS=2ANDB<=400T01310
1340 IFS=2ANDB<=400T01360
1350 GOTO1310
1360 FORA=1TOB
1370 P$(A)=" " : IP$(A)=" "
1380 PRINTTAB(25); "NAME"; A;
1390 INPUTP$(A)
1392 IFS$=" " THENPRINT"IT":GOTO1380
1394 IFLEN(P$(A))>50GOTO1820
1395 IP$(A)=LEFT$(P$(A),1)
1400 IP(A)=ASC(IP$(A))+64
1410 NEXTA
1420 FORA=1TOB
1430 ONAGOTO1440,1450,1460,1470
1440 PRINT"XXXXXXXXXXXXXXXXXXXX"CHR$(129);P$(A);"" :GOTO1480
1450 PRINT"XXXXXXXXXXXXXXXXXXXX"CHR$(130);P$(A);"" :GOTO1480
1460 PRINT"XXXXXXXXXXXXXXXXXXXX"CHR$(131);P$(A);"" :GOTO1480
1470 PRINT"XXXXXXXXXXXXXXXXXXXX"CHR$(132);P$(A);"" :GOTO1480
1480 NEXTA
1485 PRINTCHR$(149)
1490 FORA=1TOB
1500 ONAGOTO1510,1520,1530,1540
1510 POKE1428,IP(A) : POKE1350,IP(A) : POKE1272,IP(A) : POKE1194,IP(A) :GOTO1550
1520 POKE1198,IP(A) : POKE1280,IP(A) : POKE1362,IP(A) : POKE1444,IP(A) :GOTO1550
1530 POKE1838,IP(A) : POKE1760,IP(A) : POKE1682,IP(A) : POKE1604,IP(A) :GOTO1550
1540 POKE1588,IP(A) : POKE1670,IP(A) : POKE1752,IP(A) : POKE1834,IP(A)
1550 NEXTA
1560 GOSUB1580
1570 GOTO1630
1580 PRINT"XXXXXXXXXX"
1590 FORK=1TO16
1600 PRINTTAB(25); "
1610 NEXTK
1620 RETURN
1630 FORK=1TOB
1640 PRINT"XXXXXXXXXX";TAB(26);P$(K);"" :S MOVE."
1650 GOSUB2950
1655 FORSX=1TO10:GETM$:NEXTSX
1660 PRINT"XXXXXXXXXXXX";TAB(26);"PRESS SPACE."
1670 PRINTD$;D$(0)
1680 GETS$ : IFS$="GOTO1680
1690 IFS$=" " THENGOSUB2340
1700 IFS$="" :GOTO1680
1710 FORL=1TO4:REM HAS PLAYER STARTED
1720 IFPP(X,L)=0THENHGOTO1770
1730 NEXTL
1735 IFT=6THENHGOSUB6000
1740 IF T<6THENHGOSUB2430:PRINT"XXXXXXXXXXXX";TAB(26);C$:GOSUB5500:GOSUB2490
1750 IFT=6GOTO1770
1760 GOTO1630
1770 ONHGOTO1780,1790,1800,1810
1780 FORL=1TO44:R(L)=C1(L):NEXT :GOTO1820

```

70


```

2570 D=0
2580 NEXT Y
2590 RETURN
2600 E=0:FOR S=G+1 TO T+G-1:E=E+1:POKE(S),A(E)
2610 NEXT S
2620 E=0
2630 RETURN
2640 H=0
2650 H=H+1
2660 IF W=IP(H)GOTO2680
2670 GOTO2650:REM H=PLAYER NUMBER
2680 REM FIND PIECE NUMBER
2690 O=1
2700 IF PL(H,0)=R(F+T)GOTO2720
2710 O=O+1:GOTO2700
2720 POKE PL(H,0),32
2725 GOSUB5000
2735 ONHGOTO2740,2750,2760,2770
2740 POKEP1(0),IP(1):POKECL+(P1(0)-1024),CL(1):PP(1,0)=0:PL(1,0)=0:
GOTO2780
2750 POKEP2(0),IP(2):POKECL+(P2(0)-1024),CL(2):PP(2,0)=0:PL(2,0)=0:
GOTO2780
2760 POKEP3(0),IP(3):POKECL+(P3(0)-1024),CL(3):PP(3,0)=0:PL(3,0)=0:
GOTO2780
2770 POKEP4(0),IP(4):POKECL+(P4(0)-1024),CL(4):PP(4,0)=0:PL(4,0)=0
2780 RETURN
2790 REM HAS GAME BEEN WON
2800 V=0
2810 FOR T=1 TO 4
2820 V=V+PP(X,T)
2830 NEXT T
2840 IF V=170 THEN GOSUB8000:GOSUB2470:GOTO2860
2850 RETURN
2860 REM GAME OVER
2870 GOSUB1580:GOSUB5000:GOSUB5500
2880 PRINT"*****";TAB(26);C$:GOSUB6000
2890 PRINT"*****";TAB(26);"BY ";P$(X):GOSUB6500
2900 PRINT"*****";TAB(26);"PLAY AGAIN":GOSUB5000
2910 PRINT"*****";TAB(26);"Y OR N?":INPUTN$
2920 IF N$="" THEN RUN
2930 IF N$="N" THEN PRINT"J":END
2940 GOTO2920
2950 POKE55788,0:ONXGOTO2960,2970,2980,2990
2960 POKE1516,79:GOTO3000
2970 POKE1516,80:GOTO3000
2980 POKE1516,122:GOTO3000
2990 POKE1516,76
3000 RETURN
4000 FORC=1 TO 4
4010 IF PP(X,C)=0 AND T=6 THEN RETURN
4015 IF PP(X,C)+T=44 THEN RETURN
4020 NEXT C
4030 FORC=1 TO 4
4040 IF PEEK(R(PP(X,C))+T)=160 THEN RETURN
4050 NEXT C
4060 GOSUB2480
4070 GOSUB1580
4080 PRINT"*****";TAB(26);C$:GOSUB5500
4090 GOSUB2480
4100 NEXT X
4199 REM KNOCK OFF SOUND
5000 FORSD=1 TO 0 STEP-1
5010 POKE54296,30
5020 POKE54277,15
5030 POKE54276,129
5040 POKE54273,40:POKE54272,200
5050 NEXT
5060 POKE54276,0:POKE54277,0
5070 POKE54273,0:POKE54272,0
5080 RETURN
5499 REM ERROR ALARM
5500 POKE54296,15
5510 POKE54277,15
5520 POKE54276,33
5530 POKE54273,8
5540 POKE54272,147
5550 FORDL=1 TO 0 STEP-1:NEXT
5552 POKE54273,4
5554 POKE54272,139
5556 FORDL=1 TO 0 STEP-1:NEXT
5560 POKE54276,0:POKE54277,0
5565 POKE54273,0:POKE54272,0
5570 POKE54296,0
5580 RETURN
5999 REM GET A SIX SOUND
6000 POKE54296,15
6010 POKE54277,15
6020 POKE54276,33
6030 FORCR=1 TO 150 STEP5
6040 POKE54272,18
6050 POKE54273,CR
6060 NEXT CR
6070 POKE54276,0:POKE54277,0:POKE54272,0:POKE54273,0
6080 POKE54296,0
6090 RETURN
6500 POKE54296,15
6510 POKE54277,15
6520 POKE54276,33
6530 POKE54272,37
6540 POKE54273,2
6550 FORDL=1 TO 500 STEP-1:NEXT
6560 POKE54276,0:POKE54277,0
6565 POKE54273,0:POKE54272,0
6570 POKE54296,0
6580 RETURN
7000 REM CAN MOVE SOUND
7020 POKE54277,15
7030 POKE54276,33
7040 FORC=1 TO 10
7045 POKE54296,15
7050 POKE54272,149
7060 POKE54273,68
7070 FORDL=1 TO 0 STEP-1:NEXT DL
7075 POKE54296,0
7080 NEXT EC
7088 POKE54276,0:POKE54277,0
7085 POKE54273,0:POKE54272,0
7090 POKE54296,0
7100 RETURN
7500 POKE54296,15
7520 POKE54277,15

```

```

7530 POKE54276,33
7540 POKE54272,43
7550 POKE54273,137
7560 FORDL=1 TO 0 STEP-1:NEXT DL
7570 POKE54276,0:POKE54277,0
7575 POKE54273,0:POKE54272,0
7580 POKE54296,0:RETURN
8000 REM WIN SOUND
8010 FORWS=1 TO 2
8020 POKE54277,15
8030 POKE54276,33
8040 FORSU=1 TO 150 STEP3
8045 POKE54296,15
8050 POKE54272,18
8060 POKE54273,SU
8070 NEXTSU
8072 FORSD=150 TO 1 STEP-3
8074 POKE54296,15
8076 POKE54272,18
8078 POKE54273,SD
8079 NEXTSD:NEXTNS
8080 POKE54296,0
8090 POKE54277,0:POKE54276,0
8100 RETURN
8200 REM TEST FOR 'CANT MOVE'
8210 F1=0:FORCM=1 TO 4
8220 F=PP(X,CM)
8222 IF PP(X,CM)+T>44 GOTO8240
8225 W=PEEK(R(F+T))
8226 IF W=128 AND W<155 THEN RETURN
8227 IF T<6 AND PP(X,CM)=96 GOTO8240
8230 IF W=32 OR W=96 OR W=160 THEN RETURN
8240 NEXTCM
8250 GOSUB5500:GOSUB5500
8260 F1=1:RETURN
READY.

```

```

10000 REM "■" = BLACK IE CTRL 1
10010 REM "□" = WHITE IE CTRL 2
10020 REM "■" = RED IE CTRL 3
10030 REM "■" = CYAN IE CTRL 4
10040 REM "■" = PURPLE IE CTRL 5
10050 REM "■" = GREEN IE CTRL 6
10060 REM "■" = BLUE IE CTRL 7
10070 REM "■" = YELLOW IE CTRL 8
10090 REM "■" = ORANGE IE COMM 1
10100 REM "■" = BROWN IE COMM 2
10110 REM "■" = L/RED IE COMM 3
10120 REM "■" = GREY 1 IE COMM 4
10130 REM "■" = GREY 2 IE COMM 5
10140 REM "■" = L/GREEN IE COMM 6
10150 REM "■" = L/BLUE IE COMM 7
10160 REM "■" = GREY 3 IE COMM 8
READY.

```





TAPE COPIERS

Adam Denning explores the murky waters of copying 'protected' tapes.

If home computing was originally a cottage industry, the Sinclair Spectrum and other successful computers have certainly altered this situation, and now big business is very much in control. This has lead many observers to draw certain comparisons with the record industry, as there are parallels between the two.

The keyword here is vice. This does not mean that the average Spectrum owner will be found on a street corner selling his wares, but it does bring to mind the fact that there are more software cassettes in circulation than have been sold.

A similar situation in the music industry has caused many records to carry a true symbol of paranoia, the 'Home taping is killing music' message with accompanying motif of skull and crossbones on a cassette. To date, the generally more urbane computer software scene has not plumbed these depths, but a huge proportion of the companies involved have begun to show signs of worry.

Back-up copies

Despite copyright notices on every cassette warning of consequences should the purchaser choose to duplicate it, it seems a fairly natural course of events for the purchaser to want to protect his investment, and this means backing up the cassette.

If a copyright owner's hand were forced, he would probably agree that there's no harm in the purchaser doing just this.

However, it's clear that if you can easily produce a back-up copy of a cassette, then there is nothing to stop the more unscrupulous from repeatedly copying and selling

someone else's software. This is, of course, illegal.

Most companies take more practical steps than mere copyright notices to protect their software, which means that anyone who wants to take a security copy will have to acquire a certain amount of knowledge to overcome these barriers.

These protection methods tend to fall into four categories, but before describing these, it is worthwhile considering the way software used to be copied before these methods came into use.

Although this article is specific to the ZX Spectrum, the general techniques apply to most other machines.

Before it was widely realised that software was such big bucks, the normal method of saving software onto cassette involved saving a short auto-running Basic program which automatically loaded the game's machine code. This Basic program generally followed these lines:

```
1 BORDER 0: PAPER 0: INK 0:
CLEAR 24575: LOAD "" CODE:
RANDOMIZE USR 24576
```

The addresses and colours specified are, of course, entirely arbitrary, and are totally program-specific.

This program would then be saved with a
SAVE "name" LINE 1
statement, and the machine code block would be saved immediately after this.

People soon discovered how to 'break' into these sort of programs — either to MERGE the Basic program, or more simply, stop the tape immediately after the Basic part has been loaded. From this



The easy solution to backing up your programs

stage, it was easy to LOAD the code section, bypass the RANDOMIZE USR statement, and produce a back-up (or illegal pirate) copy, by re-saving the Basic loader and following this on the second cassette with the machine code.

The problem here is that only an estimate of the length of the machine code section can be made, and this estimate has to be on the positive side. So, if the program was originally intended to fit into a 16K Spectrum, you would save the block of code from the CLEAR address +1 to 32767, the top of physical RAM on a 16K machine. Unfortunately, if the program could only fit into a 48K machine, saving the code from the CLEAR address +1 to 65535 (the top of RAM on a 48K machine) was in general rather inefficient, as most programs intended for 48K machines are a lot shorter than this.

Straight away, then, a method was needed for working out the length of a block of code as originally saved, and this fostered a whole generation of tape header readers. It is only necessary to decode the header, as this very short section contains all the information needed. In fact, the header on the Spectrum system is 17 bytes long, and these 17 bytes are arranged thus:

Byte 1: file type; 0 = program, 1 = number array, 2 = character array, 3 = code.

Bytes 2 to 11: filename (if the name is less than 10 characters long, the remaining bytes are filled with 32, the ASCII code for 'space')

Bytes 12 and 13: length, if file type 0 (Basic program), then this length is the length of the program plus any variables saved with it.

Bytes 14 and 15: the start address from which the code was originally saved, except in the case of a Basic program, when these bytes represent the start line number for any program saved under the LINE statement. If no

auto line was specified when the program was saved then these two bytes are given values that correspond to impossible line number (0 or greater than 9999).

Bytes 16 and 17: in the case of a Basic program, these two bytes represent the length of the program only, ie without its saved variables.

Reader program

So from this information it is very easy to write a very short program to read tape header details. On the Spectrum system, the ROM routines that load data from tape require that the IX index register contains the address at which the data is to be loaded, and the DE register pair contains the number of bytes to be loaded.

So to use as little memory as possible, it seems most convenient to place the short machine code section of the tape header reader program in the printer buffer, which is 256 bytes long, and starts at 23296.

ORG 23296: This tells the assembler to place the code, and set all addresses for this address. (See below if you have no assembler)

```
LD A,2
CALL 1601
LD IX,5BEE
HEADER: PUSH IX
LD DE,0011
XOR A
SCF
CALL 0556
POP IX
JR NC,HEADER
LD A,(IX+0)
LD DE,09C0
CALL 0C0A
PUSH IX
POP DE
LD, B,OA
PRNTNM: INC DE
LD A,(DE)
RST 10
DJNZ PRNTNM
RET
```

(If you do not have an assembler, either use a standard Hex loader to

Program: Header

Bytes: headcode
Start tape...

Program: Header
Length: 271
Start line/Address: 1
Program only length: 271
Start tape...

Bytes: headcode
Length: 45
Start line/Address: 23296
Start tape...



enter the bytes into memory starting at location 23296, or use Appendix A in the Spectrum manual to convert the Hex codes into decimal, and manually POKE each one into its requisite location. In Hex, this program is:

```
3E 02 CD 01 16 DD 21 EE 5B DD
E5 11 11 00 AF 37 CD 56 05 DD
E1 30 F2 DD 7E 00 11 CO 09 CD
OA OC DD E5 D1 06 OA 13 IA
D7 10 FB C9)
```

Accompany this with the Basic programs below, and save the program and the code together on a cassette with the line:

```
SAVE "Header" LINE 1: SAVE
"headcode" CODE 23296,45
1 DEF FN P(X) = PEEK X + 256
"PEEK(X+1): LOAD""CODE
10 PRINT "Start tape...";
RANDOMIZE USR 23296
20 PRINT : LET A = PEEK 23534
30 PRINT "Length: "; FN
P(23545)
40 PRINT "Startline/Address:
";FN P(23547)
50 IF A = 0 THEN PRINT
"Program only length: ";
FN P(23549)
60 POKE 23692,5: GO TO 10
```

Describing the machine code section first, the routine at address 1601 opens the channel specified by the contents of the A register. Therefore, 'LD A,2 : CALL 1601' opens channel 2, which is the television screen. This means that anything printed out using the RST 10 instruction (which prints to the channel currently open the character specified by the contents of the A register) is printed on the screen.

Following this, the IX index register pair is loaded with the address at which we want to load the header, 5BEE. This address is comfortably within the printer buffer, but above the main code, so there will be no conflict. At the address labelled HEADER, the contents of IX are pushed onto the stack, so that the value stored can be restored easily. The DE register pair is then loaded with the number of bytes to be loaded, 17 or 11

Hex, and the A register is cleared with the XOR A instruction. The ROM routine which actually loads the bytes requires that the carry flag be set when LOADING, and reset when VERIFYING, so the SCF instruction sets the carry flag as we are loading bytes.

The routine itself, at Hex address 0556, is then called, and this returns with the carry flag set if the bytes have been found and loaded. Therefore, if on return from the routine, the carry flag is reset, the program loops back to the label HEADER and continues to look for the header. At the same time, the IX register pair is popped off the stack in order to keep the machine stack balanced — a common cause of crashing!

Handy utility

Having successfully loaded the header, the A register is then loaded with the first byte, the file type byte, and DE is loaded with 09C0, the base address of the tape message table in ROM. By then calling the ROM routine at 0C0A, the message 'Program: ', 'Bytes: ', etc is printed. Following this, the address contained in the IX register is transferred via the stack to DE, and the PRNTNM loop prints the 10 characters that constitute the name. A return is then made to Basic, and the short program takes over.

The defined function, FN(PX), is a very useful one that returns the contents of the two addresses X and X+1 in such a way that the result forms a 16-bit address in the standard Z80 manner.

Using this function, the length of the program, its start address or line number and its length without its variables are then displayed on the screen, the SCRL-CT system variable is POKEd with 5 to ensure continuity, and the program jumps back to line 10 to repeat the process and read as many headers as you require.

This is a very useful utility and should be kept for later use.

That used to be the normal method of saving programs onto cassette. However, as so many people quickly discovered the technique of breaking into cassettes thus saved, the multifarious software companies came up with more devious means of protection.

One method, quite commonly called the 'Quicksilver' method, as that company used it more than most, saves the program in an altogether different manner. Instead of having a Basic loader to reclaim the machine code sections from tape, a short Basic program consisting of something along the lines below was written:

```
1 RANDOMIZE USR 24576
2 SAVE "GREATGAME" CODE
23500, Length:GOTO 1
```

The 'Length' in this example is a

lot longer than normal, as it includes not only the Basic program and the machine code, but it also saves all the system variables. By issuing a RUN 2 command, the entire program would be saved in such a way that when it is loaded again (WITH 'LOAD "" CODE'), it automatically jumps to LINE 1, and therefore auto-starts the game.

This is quite a useful technique, as pressing 'BREAK' at any time during the loading process simply causes the system to crash, especially as some companies also poke the ERR_SP system variable with some value that causes the system to crash on any error. Nasty!

So, how can you take back-up copies of programs saved by this method? Well, there are two or three techniques one can try. Firstly, if you suspect that the program is entirely Basic (which despite its 'LOAD "" CODE' status, is quite possible), then try pressing BREAK once the program is running. If this causes the program to crash, then try lowering RAMTOP to about 24999, and loading the code above here with a LOAD "" CODE 25000 statement.

From here, you could use a high-quality disassembler/monitor to move the code-only section back to its normal location (or even disassemble it!). Likewise, you could create a back-up copy by reading the header to find the length, and then saving the code back to the cassette again.

The third and fourth techniques for protecting tapes are quite simple to overcome, and their methods of operation are so similar that they will both be discussed together.

As already mentioned, POKE-ING the ERR_SP system variable causes the system to crash on an error, and pressing the BREAK key is considered to be an error. Therefore, some companies, notably Melbourne House, do just this in the Basic loader program. As already discussed, this is easy to overcome. Simply MERGE the Basic program and change the relevant lines.

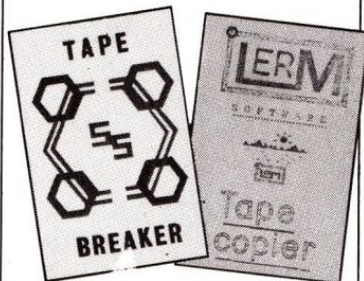
The Imagine method

The other method, used by companies such as Imagine and Bug Byte, actually contains a few instructions within the machine code program that test the contents of certain specific system variables, and if the contents are not what they should be, the program jumps to location 0, in other words, a total system restart is effected. To get around this, the easiest method is to use the tape header reader to load and then save all the blocks of code, as one of these normally contains the relevant system variable values.

Finally, and most effective of all, the 'headerless' technique. Here, a Basic program is loaded that not only contains a RANDOMIZE USR instruction, but also contains a machine code routine to load the machine code in such a way that there is no header saved with it. Here, it is essential to have a tool like MONS to disassemble the code and find the values of IX and DE, as this will then tell you the length of the code and where it was saved from.

Programs that use this technique are Imagine's *Jumping Jack* and Crystal's *Halls Of The Things*. This is definitely the most difficult method to overcome.

Of course, many computer users don't have the time to do all this work, and this is where the various proprietary tape breakers come in. Which Micro? reviewed four different products:



Tape Copier from LERM, 16 Stonepit Drive, Cottingham, Market Harborough, Leics.

Replicate (48K only) from J R Ball, 7 Moorefield Road, Woodbridge, Suffolk.

KopyKat from Medsoft, 61 Ardeen Road, Intake, Doncaster, Yorkshire.

Tape Breaker from Spectrasoft, Capital House, Market Place, London W3.

All of them work satisfactorily, and all contain copyright notices saying that this program must not be used to infringe copyright. All of them also rather strangely claim to be better than any similar products on the market, but extensive tests show that they all do exactly what they are supposed to do — properly and efficiently. The only unusual one of the four is *Replicate*, which actually occupies user memory, and therefore in theory cannot copy quite as much as the others. However, as very few games occupy all of a 48K Spectrum's memory, this is not really important.

As a final word, then, it seems that breaking into Spectrum tapes for purely legal means is in most cases extremely easy, and one can always resort to a proprietary cassette breaker as above if required. However, it does not really seem worth the effort, as the simplest process of all again takes us back into the realms of the record industry. Simply use a double cassette recorder or two cassette recorders! ■

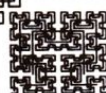
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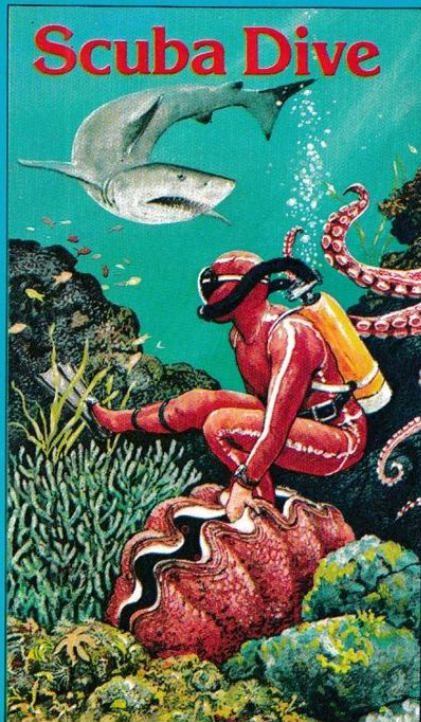
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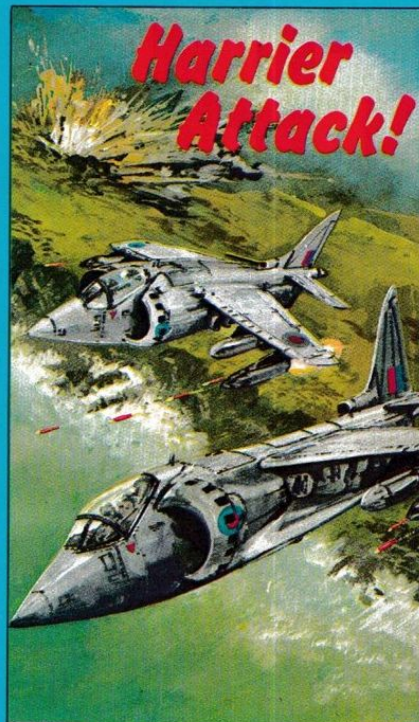
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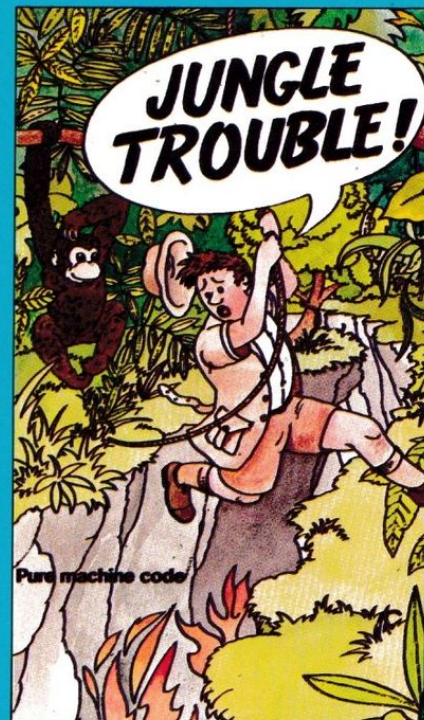
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DEATH OF TH

Cassette-based software has long been the cheapest source of programs for home micros, but



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It's funny isn't it, but you do seem to get used to all this technological stuff, given time. It may seem a little bewildering at first, even a little scary maybe, but once you have found out what it's all about and how best to use it, technology can be quite fun.

An example of this process at work, historically speaking, has been the telephone. Imagine for one second the feeling of wonder and, perhaps, horror when those first users were told that a funny looking machine that was nailed to the wall would let them speak to another

person in another town; or even another country. What demonic trick was this?

Now, we use the telephone so naturally that many of us no longer actually think about it as a 'machine' or 'technology'. You were talking to your brother? So he lives in California, so what?

That same attitude can be seen again with the television set, radio, and more recently, the personal computer. Once the scepticism has been overcome that such a thing is possible, any technological gizmo stands an equally good chance of being generally accepted.

The real trick becomes one of actually knowing and understanding what to do with a technological gizmo — what it can do, and what you can do with it, which are not necessarily the same thing. The gizmos already mentioned have passed this initial obstacle to acceptance. A new one (and one that makes considerable use of those already mentioned) is about to shape up for the same test, and we are now going to have a go at guessing whether it will succeed or fail.

The gizmo? Well, the gizmo is cable, or to be more specific we are talking about

E CASSETTE?

1984 offers some interesting alternatives in the shape of Prestel, teletext and possibly cable

cable and the personal computer.

'Cable' for the three people left in the country who haven't seen all the hype about it on television and in the papers, refers to cable television, a method of providing a TV signal direct to a user's box without all that blast-it-through-the-airways nonsense. The cable is laid, quite literally, down the street to connect houses to central sources of audio/visual material. There will also be extensive high capacity links between towns and cities so that the big companies which supply the programs and/or services can squirt their programmes around the country. There are people who suggest that the building of these links is the real reason why the Government is so keen on promoting cable TV.

A much wider choice

One reason why they should think this hinges on the question of whether the technology has a marketplace at all. We should first address this particular problem before considering what can be done with cable in the home computing area.

The objective of the cable operators, stated simply, is to provide an environment where the consumer, i.e. you with your TV switched on, is no longer restricted to having just four television stations watching only what the programme controllers say he can watch, at a time they feel is convenient. As most people know, as each station struggles to wrest the accolade of top attraction with the viewers, it has become the viewers who suffer. You know the type of thing — a whole week of dreadful television and then the four programmes you really want to see all on at the same time.

Cable TV would be able to offer a much wider choice, 40 stations or more, thus giving the consumer a much better deal. There is also the prospect of having interactive TV, where the subscriber can press buttons on a handset to respond to what is on the box. This can be used in cases like voting for the type of ending a programme should have (with the majority getting their way) or more importantly from the industry's point of view, responding to advertisements.

Such a system costs money to set up however, and there are grave doubts as to whether the consumer will be willing to pay for it. The main problems of TV choice have already been overcome with the video cassette recorder, where the user can select what is seen, and when. The range of material available on cassette, coupled with what is already on TV and what is coming up in the form of the video disc machine, has lead several pundits to suggest that cable TV could

well be a non-starter as an economically viable alternative.

This could be sad for the home computer user, for it is a technology that offers a number of interesting possibilities, especially for the games playing freak.

As has been found with ordinary broadcast television, if you can send a TV programme, you can also send other things, such as information or computer programs. It is here that the fun can start, for it is possible to develop a system where the user can gain access to such items as new games programs and large databases.

Systems of this type already exist (though not exactly of the cable TV variety). One is Ceefax, which is broadcast simultaneously with the BBC television programmes, and the other is Prestel, British Telecom's information system based on the telephone and television. Compared to proper cable TV, both have disadvantages (see panel), either relating to interactivity (or lack of it) or to speed of operation (or lack of it).

A couple of companies in the UK have already declared their interest in the coming cable market for computer freaks and hope to exploit in particular the penchant us Brits have for playing computer games. The WH Smith offering comes from America. The Games Network provides a selection of games programs each month for the user to choose from. The least popular are dropped and replaced each month.

The pros and cons

For the games freak this has some advantages, and some disadvantages. On the plus side is the fact that it is a 24-hour system that will carry games of good quality at an initially low cost. The disadvantages are that, in order to overcome the problem of programming for different computers, the Network uses its own machine. Subscribers therefore have to rent this additional computer from Smiths, to get on the system at all. The initial low cost also starts to mount up. Smiths states the system could save an avid games player up to £100 a month in tapes and cartridges, and in the first month or so of use this would be so (20 games at £5 approximately).

But in subsequent months this advantage would disappear. For a percentage of users, their favourite game would also disappear if it was amongst the least popular. Not surprisingly, the Network is designed to prevent copying of the programs.

The other declared runner so far is Thorn EMI, which is planning to have up to 100 games available, both from its own

catalogue and from other suppliers. This will provide software covering a range of different computers, including the Sinclair Spectrum, the Atari 400/800, the TI99/4a, the Vic 20 and Commodore 64, and the BBC and Electron from Acorn.

Interactivity

The main disadvantages of systems such as these are that they are non-interactive and are, therefore, primarily just another means of selling software. In the end analysis they offer little advantage over going to a store and buying a tape, except perhaps the ability to 'rent' the game for a while to see what it is like.

By the same token, non-interactivity means that the system is missing its best advantages for games player and, perhaps more importantly, potential users with other ideas or applications. This is one area where the existing Prestel service, and in particular Micronet 800 that runs on the British Telecom system, is showing the way.

Here, the user can answer back to the system, either to request more or different information, or to play a game, or to place orders for goods or services and, just like the others, 'rent' software.

It is here that cable can offer advantages over what otherwise would be just another form of getting to play a game. The ability to interact with the controlling system and/or other systems on the cable could make the whole set-up far more interesting. With such a facility the applications could become limitless (or nearly so). There could be, for example, the ability to communicate using the system, establishing an electronic mail operation. More importantly from the point of view of the owners of the system, it would be possible to interact with other subscribers in suitable revenue-earning ways.

An example of this is in teleshopping. This is already possible in a small way using Prestel, but it can be done properly using a home micro. Imagine a program that would allow the home system to be used to respond to advertisements on the box so that you could order goods direct. It would then automatically use the cable network to contact another advertiser, your bank, and inform its computer of the transaction, check your credit, debit your account and still play three-dimensional *Space Invaders* on the old TV.

That is getting to be nearer the mark of what all this computer stuff is actually all about. But even in the games playing area it could, and hopefully would be better utilised than just a method of dumping software on users. Games programs, especially those that involve strategy, are

often better if there is more than one player at the helm. The potential for interactivity in cable TV could be used to set up interactive games programs that several people could play together, against each other and/or the system.

One drawback of cable in this respect is the fact that it is likely to be predominantly parochial in operation. Each town could have several cable networks that serve that one area, plus some that are bigger, possibly national. The chances are that all will have some level of access to satellite communications systems so that each cable network can take programs from sources other than their own tape players.

It will probably be done this way because satellite communications provides

the bandwidth needed to transmit vast blocks of information around the world at very high speeds. This way, only a few satellites in geostationary orbit will suffice to provide most of the TV needed for all the cable TV networks. It is also an excellent two-way communications medium.

With each cable station hooked into the satellite system it will offer the chance to communicate data and information across national boundaries (a factor that many Governments are now concerned about). This is a capability of enormous potential that could be used in a variety of ways.

Such a system could be used to set up a game program that everyone and anyone in the world could play simultaneously. The complexities and potentialities of

such a game are both intriguing and mind-boggling. Quite what the rules of the game would be is open to speculation, though it would have to be pretty alien from everyday living, otherwise people would assume it was the real thing.

Even that speculation is, however, speculative, for such possibilities are some way off into only a possible future.

The cable TV business has yet to start operating properly, let alone emerge as an economic or culturally acceptable proposition. There are those who would suggest that the prognosis for cable is not good, and that it could even yet be still-borne.

But should cable reach its adolescence, then we could be in for some fun on a really grand scale.

THE ALTERNATIVES

Ceefax/Oracle

These are the names of the two information services broadcast by the television services. Oracle comes from the Independent Broadcasting companies, while Ceefax comes from Auntie Beeb. It is this one which is the more significant in the current discussion.

Both operate on the basis of broadcast data steams interlaced into the transmitted picture signal. Unused lines in the normal picture are utilised to carry digitised data which is decoded by special circuitry built into the television, and stored there. The lines can be seen as flashes across the top of the picture when it is adjusted so the top can be seen on screen.

Each service sequentially transmits the data for a number of pages. This means that the user has to wait for the sequence to run its course before a selected page appears on the screen. To get a page, the user calls it up on the accompanying keypad and waits while the transmission sequence of pages gets to the one requested. Then the decoder recognises the page number, accepts the data and stores it, and the page is displayed on the TV screen.

The BBC is using this system to transmit programs direct to micro users. The correct interface has to be bought, and it is advisable to have a BBC Model B micro available, as this is the only machine catered for. The Beeb is using some of the pages available on Ceefax to store programs for this machine. These can be accessed using the computer and the transmitted pages can be stored, used and manipulated in the same way as any other program.

The main disadvantage of this system is slowness. It takes about a fifth of a second to transmit one page, but a program can be several pages long. Because of the sequential nature of page transmission, it can be 15 seconds or more before the next page appears. This can be a particular problem with some programs, if the user

calls up a transmission half way through the sequence.

Each program comes as a 'page' on the system, but because the code is longer than can be contained in a real Ceefax page, it is in practice broken up into sub-pages. With a Basic program, the computer will store the first sub-page it receives, for example, page five of eight, and cycle through until all eight pages have been stored. For machine code programs or textual data, however, it will often have to wait for sub-page 1 to come round and then start.

The main advantage of Ceefax is that it is broadcast. Once the interface adaptor has been bought, the service costs the user nothing in access charges and the like.

Prestel/Micronet 800

These are essentially the same beast — data transmitted down a network that normally utilises the existing facilities of the telephone system. Prestel is the trade name of the teletex service operated by British Telecom, and Micronet is a service aimed totally at microcomputer users.

Here, pages of data are stored on one or more centralised computer systems that can be accessed via the telephone, on a dial-up basis. The standard system has been intended for use with the domestic telephone and a modified domestic TV, and carries all sorts of useful information. Pages are called up on a hierarchical menu basis with the user predominantly in 'receive' mode. There is, however, some facility to interact with the system so that such tricks as 'teleshopping' can be performed.

Micronet 800 is a service dedicated specifically to micro users and combines with the Prestel pages to provide both a 'magazine' and directly accessible programs.

Micronet's advantages tend towards the theoretical. It is possible to use this type of service as an electronic mail system, information system, database and program source and in time it will probably develop into all these. At

present it is just an information system and a games program source.

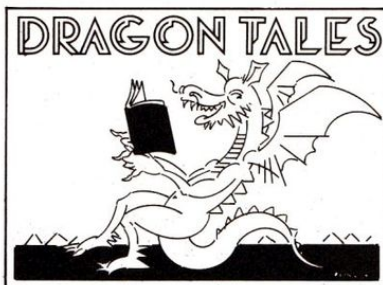
Its main disadvantages are cost and performance. A modem is required to interface a computer with the system and, as operation depends on being connected via the telephone (often for long periods) line charges can come as a surprise when the phone bill arrives. The performance is not good in as much as transmission speeds are slow, so programs of any length (ie multiple pages) can take some time to transmit. It is, however, more flexible than Ceefax as a system, and the Micronet service is available for Spectrum, BBC, Apple and Tandy owners, with other machines to follow.

The Games Network

This is a US service being imported here by WH Smith. Intended for use on cable TV, it is a games players' system that will have 20 different programs available on a continuous basis. These will be changed regularly, with the least popular in any one month being dropped.

This is not likely to be a very cheap way of playing games for a subscription costs £10 per month. After a while you may find yourself paying for the same games month in and month out. As part of the deal you have to use a special computer system called The Window.

This is one of the big companies in the entertainment business which, quite naturally, has designs upon the cable TV business. As it also has growing interests in the home computing software business, it is also natural to expect the company to think in terms of putting the two together. This system will operate in those areas where Thorn wins the cable franchise and users will be able to link their own micro (so long as it is a Spectrum, Atari, Texas Instruments, Vic 20, Commodore 64, BBC or Electron) to the TV adaptor that comes with a cable subscription. This service is planned to have up to 100 games available from both the company's own products list, and from other suppliers. ■



TIGER'S TALE

Setting up your own software house isn't the easiest of projects — Mike Gerrard investigates why

Just before Christmas 1982 Mark Tyson, an electronics engineer in Sunderland, bought himself a Dragon 32. Now, 12 months on, he is running Tiger Software with a friend, teacher Lorraine Brewis, and the run-up to Christmas 1983 has seen them working hard trying to get their fourth piece of software on the market.

Nothing special about that, you might think, but Tiger Software came about in an unusual way and is trying to make a success of a particularly difficult field, educational software, and with a computer which isn't in use in schools.

The home market

"It doesn't bother me that the Dragon isn't being used in schools," Mark told me, "because what we're mainly aiming at is the home market, complementing what goes on in the schools. After all, the home is where the majority of computers are."

Mark comes originally from Nottingham, but moved to Sunderland a few years ago to start his degree course in Physics and Computing.

"I loved the computing side but found the physics and maths a bit high-powered. It was too abstract for me, I'm more of a practical person, and I left to do two years as an electronics engineer. I bought the Dragon a year ago and chose it mainly because my boss had got one and it seemed to me to be a very impressive machine. In fact I still think it is, with some advantages over the BBC machine, which I've just bought."

"I got the Dragon out of interest and curiosity, because I thought I was being left behind with what was happening — which I was! Then I saw a few of the so-called educational programs that were being put out, and I thought I could do much better than that, the general standard was terrible. I felt that some of the programs I'd written at college were already better than some that were on sale, so I decided I ought to try to write something for the Dragon."

Mark's chance to spend time program writing came in a way he hadn't expected — he was made redundant in January, and his time on the dole at least enabled him to become more familiar with the Dragon's workings. It was also during this spell of unemployment that he heard about the Enterprise Allowance, a scheme the government introduced in August. It was aimed at anyone who had been out of work for at least 13 weeks, and who could raise £1,000 capital towards starting their own business. If their venture was approved, the government would pay them £40 a week for one year to help them get the business off the ground.

"I'd always wanted to start my own business," Mark says, "but without getting that allowance there was no way I could have done it. Finding the £1,000 was a bit of a problem. The bank turned me down, saying there was no evidence that the scheme would make money. I understood why they said that, though I didn't really agree. If you're on the dole, how can you show that the idea will work when you haven't tried it before?"

In the end, Mark borrowed the money from his father, a printer, who is now producing the cassette packaging and stationery for Tiger Software. With the capital behind him, and the tiny but regular income from the Enterprise Allowance, Mark set about getting the first software packages out.

"I work with Lorraine Brewis, who's a supply teacher in Newcastle. She teaches a range of subjects, but specialises in the 7 to 11 age range, and that's the group we decided to aim at, from about seven upwards. Lorraine supplies the educational material and the concepts, and we thrash it around for a while and then I do the programming."

General interest

"The first program, *The Tiger Grand Prix*, took four months to write. It's a very thorough program. We wanted to come up with

something that was of general interest to a lot of people, which was fun to play and yet was educational too. This was the best way we could think of doing it, by taking something like a typical board game and almost get children learning without realising it, because it's entertaining at the same time. Education can be fun as well.

"As for *The Tiger I.Q. Test*, there wasn't anything like it available, and I wanted to add another product to the range. I didn't think this would take me too long to program, but that was a mistake, as it did take me quite a while in the end. It's based on fairly standard I.Q. questions, and although its use is far more limited than *The Grand Prix* we thought it was something that would be helpful to people... and a bit of fun, too, something you can get everyone to have a go at."

"We're trying to extend *The Grand Prix* by bringing out some data files for it before Christmas, so that parents or teachers can have a wider choice as to how they use the program. That's what I'm working on at the moment, but we do also have plans to bring out some new material. I don't want to say too much about it, but it will be a range of concept learning packages. It's very important when you're young to get various concepts clear in your mind, whether it's the concept of time, the alphabet, shapes or whatever. Lots of adults still have difficulty using timetables or phone directories, for example, because they never

grasped the concepts behind them when they were children.

"I've just bought this BBC machine, but it will take me a while to get used to it, and while I'd like to be able to put out programs for other machines I'm not converting any at the moment simply because I don't have time."

Seal of approval

A big breakthrough for the company came recently when, after a period of evaluation, Boots agreed to stock *The Tiger Grand Prix* and wanted more than 1000 copies in its shops by the end of November. At the time of writing, it was still considering *The Tiger I.Q. Test*, and was encouraging Mark and Lorraine to continue developing their software.

"The Boots deal was incredibly important to us," Mark admits, "as giving the *Grand Prix* its seal of approval meant that not only will it be featured in its shops but other smaller dealers will be interested in seeing the program and stocking it too. I felt it gave us a lot of credibility."

Readers of *The Sunday Times* will be able to check on the progress of Tiger Software as the company is one of four ventures chosen by its Business Section to be followed through to gauge the success or otherwise of the Enterprise Allowance. Tiger's two programs mentioned above, *The Grand Prix* and *The I.Q. Test*, are both reviewed this month in our Soft Release pages.■

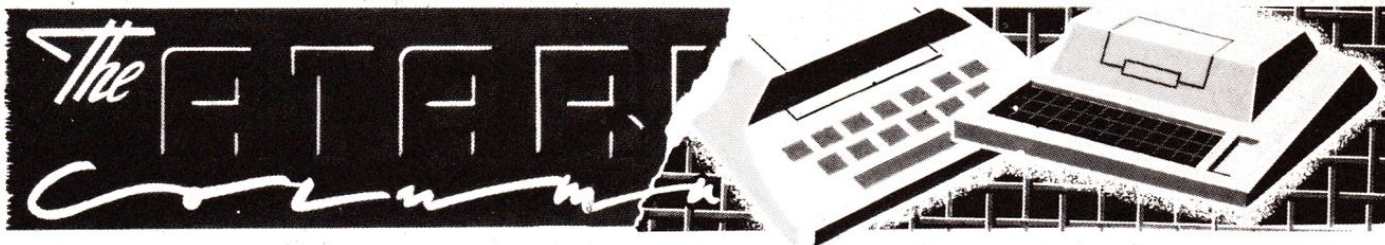


My Dragon has acquired a little red eye since last month. This is not due to excess drinking, but is a handy device put out by Elkan Electronics, of 11 Bury New Road, Prestwich, Manchester M25 8JZ at a cost of £3.95 and called, amazingly enough, Dragon's Eye. This consists of a Din plug that goes in a joystick socket, and a piece of wire, at the other end of which is a piece of white plastic that holds a tiny red light. This can be adhered to your machine, the purpose being not to attract moths, but merely to remind you when your machine is switched on.

With the Dragon's none too

reliable on-off button being hidden away at the back, Dragon's Eye could be rather useful, my only complaint being that the wire is not long enough to enable you to place the red light near the cartridge port, to remind you even more forcibly not to insert anything with the machine switched on, which can be damaging.

At the same time I received a list of the Dragon software that Elkan stocks, and it came to a surprising total of 164 items. So don't let anyone tell you the machine has no software support — and don't say you can't decide what you want after Christmas, either.■



FLIPPING THE PAGES

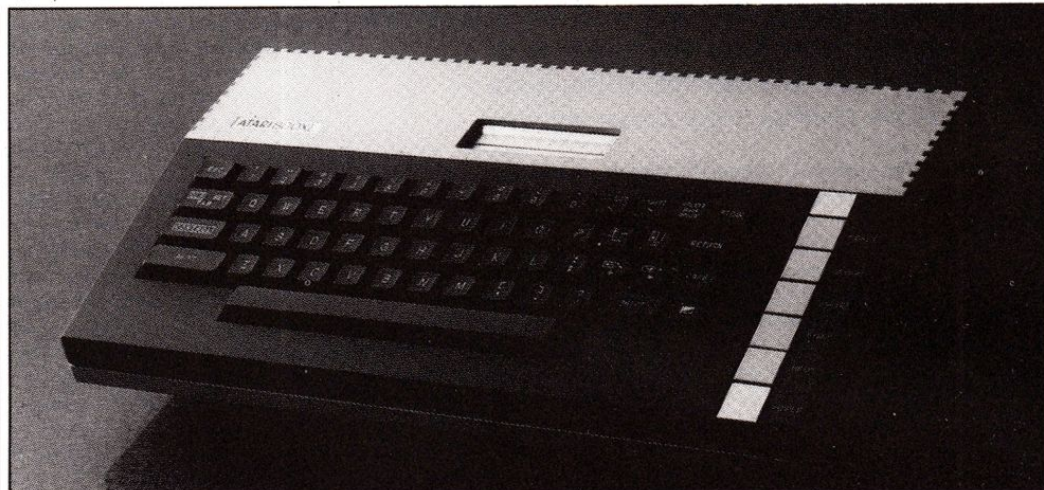
Improve your graphics with Ron Stewart's easy-to-follow guide to page flipping

This month we are going to take a look at page flipping. This is one of the easiest features of the Atari you can use, and can give your programs a surprisingly professional finish. Page flipping allows you to draw or print off the screen and then conjure the pictures or pages out of thin air. You don't have to do anything magical, though, only one or two very small pokes and you can use all the regular graphics or print commands such as PLOT or DRAWTO.

Memory locations 88 and 89 are used exclusively for printing and plotting. These memory locations are not concerned with the display list which is found in memory locations 560 and 561. We can now flip between these two registers; we can draw whatever we want offscreen and, by changing the display list, we can then 'flip' it onto the screen.

Listing

Printed below is a short program to demonstrate page flipping. Let's go through it line by line. Line 5 reserves memory for the second screen and then tells the computer where to find it. Location 106 is used to find the top of the memory, or in other words where our display would normally begin. By using the commands POKE 106,PEEK(106)-# we can fool the computer into thinking that it has less memory than it really has. We have now reserved a block of memory for our second display. We must be careful, at this stage, not to overdo things. If you only have a limited amount of memory in your machine, graphics mode 8 in this routine would seriously limit the amount of free memory available.



The 1450XL, Atari's latest model, is late appearing in the States but the technical specification looks good.

Line 10 puts us into graphics mode 5. Line 15 sets a pointer to the present screen and then tells the computer to draw on display two. Line 20 draws a triangle for display. Line 25 finds the start of the display list. The display list is, in fact, an instruction to tell the ANTIC chip inside the computer where the screen data is and how to display it. Line 30 simply starts a 50 cycle loop within which the program can run. Line 35 produces display two. The B+5 used in the line switches the values stored in the display register. Line 40 tells the computer to wait a bit. Line 45 produces display one. Line 50 tells the computer to wait and line 55 to start over again. Easy isn't it? Try altering the program and experimenting with it. We have found it one of the quickest ways to learn about a feature.

```
5 POKE 106,PEEK(106)-4:DISPLAY2=PEEK(106)
10 GRAPHICS 5
15 DISPLAY1=PEEK(89):POKE 89,DISPLAY2
20 COLOR 1:PLOT 0,0:DRAWTO 75,35:PLOT
  75,0:DRAWTO 0,35
25 B=PEEK(560)+PEEK(561)*256
30 FOR A=1 TO 50
35 POKE B+5,DISPLAY2
40 FOR I=1 TO 200:NEXT I
45 POKE B+5,DISPLAY1
50 FOR I=1 TO 200:NEXT I
55 NEXT A
```

An opportunity recently arose to take a quick look at the new Atari 600XL. The keyboard was pleasant to use, and was beginning to feel better than the familiar 800. The positioning of the RESET key is less pleasing, though, as it is now unguarded and just above the option keys. It does have a stronger spring now but is still very easy to press inadvertently.

There are a number of new graphics modes available straight from Basic which seem to be the ones that were only to be had by fiddling with ANTIC in the old machines. This means that the Atari now has 18 graphics modes.

Software bugs

A word of warning to owners of Atari's new range of computers. Some of the software, admittedly a very small percentage, will not run, or if it does it achieves some weird things.

One of these is *Miner 2049er*. We should be quick to point out that this is not Atari's fault. Software houses were warned about the new computers and the internal changes that were to be made. It would appear that the advice was ignored. If any 600XL or 800XL owners find similar problems with their programs let us know and we will do our best to compile a list and publish it at a later date.

Software houses may well bring out revised versions that will run on the new computers and presumably stickers will be put on

the packages to this effect. Still, be on your guard and check to make sure that the program you are buying will actually run on your own machine.

Rumour Control

The 1450XL is late appearing in the States and will not be available over there until just before Christmas. This presumably means that the computer's arrival on these shores will be even later.

Technical specifications for the CP/M module are filtering through. The module will, of course, feature the Z80 processor which will run at 4 MHz.

The module will have 64K of on-board RAM and use the CP/M 2.2 operating system. A switchable 40/80 column screen output is available to users with either a TV or monitor.

The expansion module would appear to work only with the new XL machines. It has eight expansion slots, two RS232 and one Centronics interface. Anticipated cards, and these will have to come from third party suppliers, are; 80 column video, 128K disk card, hard disk controller, modem, IBM interface, Z80 interface, VCS card, speech recognition and the like. The list is long but we have no prices as yet.

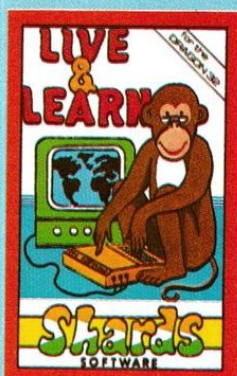
The 800XL should be available as you read this column, but then again maybe it won't. Crystal balls tend to go very cloudy on the mention of computer release dates these days. ■



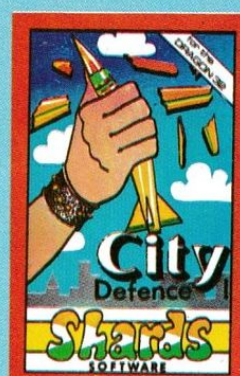
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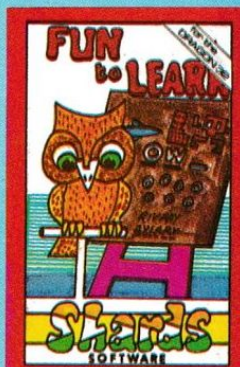
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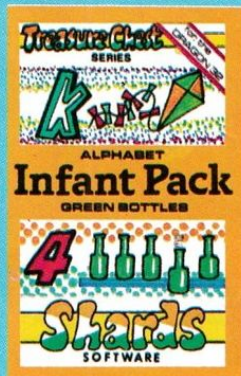
SOFTWARE

FOR THE DRAGON 32

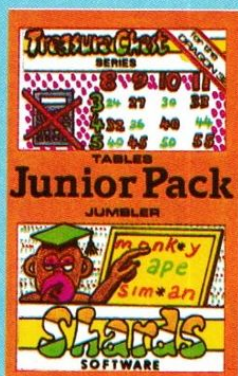
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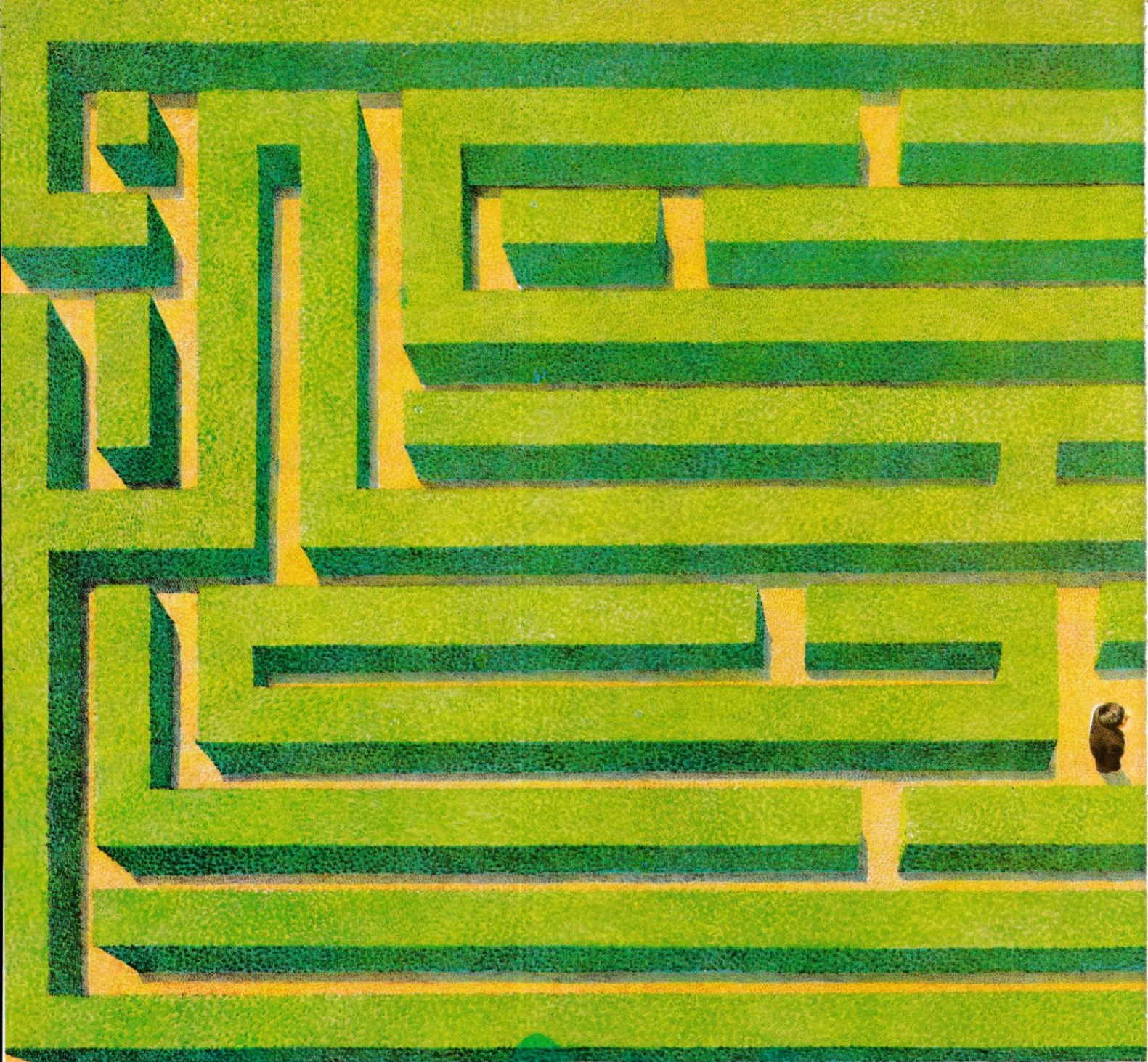
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PETTIGREW'S DIARY





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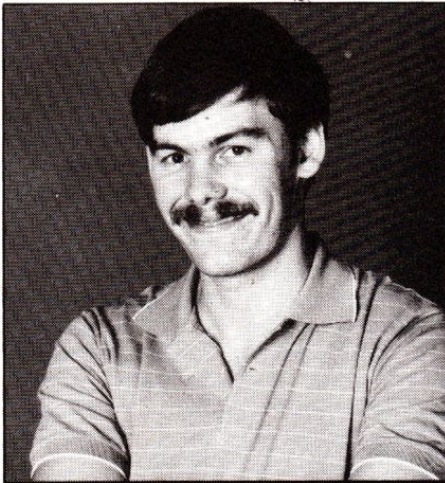
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Chris Lancaster — one of Imagine's small team of freelancers.

continued from page 65
incorrect approach.

We have produced a listing of over 50 companies who actually want programs from the readers of *Which Micro?* They all have one thing in common — they want programs — so your software will be welcome if it's suitable for marketing.

If you send in a program to a company that hasn't advertised for new material and you end up waiting months for a reply it's your own fault, nobody else's. Your cassette is probably gathering dust somewhere inside the organisation.

Games

Most of the companies advertising for material want games. They also want programs in the education field, utilities and business packages, but if you want the largest potential sales choose games. Games program sales can be from 10,000 upwards if it's a successful product — just look at the Top Thirty products to see what's selling today.

Your idea needs to be turned into a full blown program and must be debugged too. Yes — a program must work even when the wrong keys are pressed and the user doesn't follow your instructions. Talking about instructions — they are just as important as the game itself. Lousy instructions can be the mark of a sloppy program.

A faster version of *Pac-Man* is as likely to be a success as your bicycle going faster than Concorde. Copy another game and, apart from anything else, you would have problems from the supplier. Have you copied its program, or are you saying that your version is the same as that well known name — but better? In legal terms this is known as passing off. In other words you must have originality, so forget about improving existing games or making close copies of them for a start.

Any game which has become a big success will have been challenging. There should be a number of levels and the concept must be addictive. But at the same time, it must be easy to start and to reach one of the lowest levels to produce this addictive quality. The worst thing that can happen to the potential user of your game is boredom. There must be a strong

structure, so that nobody ends up thinking the game is tedious.

Although users should be able to get higher scores as they become more experienced, it's essential that they can't predict their final score. This is prevented by putting in random factors and lots of good or bad luck. However, these factors must be balanced so that skill and experience don't end up counting for nothing at all. The difference between winning and losing must be really dramatic and be shown on the screen, otherwise your game will have limited appeal.

Your game must work with the basic configuration of the chosen micro, otherwise buyers will be unhappy when your game doesn't work on their machine. If extra memory is needed this must be clearly stated, as in the case of the Vic-20 which has a very small RAM. Even so, large numbers of games for the Vic are promoted on the basis of working on the "unexpanded Vic".

Your own experience with games is one of your strongest cards. By playing a game with features that really appeal, you also know which ones leave you cold. Bear this in mind when you add features to your own creation.

Which micro?

There are two schools of thought on this question. One states that the greater the number of machines that have been sold, the greater the potential for your program. On that basis it must be the Vic 20, Spectrum or the BBC. The other school of thought takes a completely different approach. When a new brand of micro is launched the press is full of stories about the lack of software. This school argues that these new micro owners will need programs just like the existing ranges, so this shortage of programs is in fact an opportunity for programmers. Equally, this new machine must have high potential sales, or all that work will be wasted.

Both schools of thought are valid and a compromise between them is probably the best bet. There are a lot of micros sold which aren't BBC, Spectrums or Vic 20s, for a start.

Whichever microcomputer you own or intend to buy, make sure the program makes the best use of the computer's features. One micro may have superior features, which can make all the difference in a fast-moving arcade game.

Analysing all the advertisements for games programs where micros were actually named, the ones in most demand appear to be: Apple, Atari, BBC, Dragon, Electron, Commodore Vic 20 and 64, Oric, Lynx, Spectrum and ZX81.

However, if you accept the second school of thought, a micro that isn't listed here could have a lack of software and you could fill that gap.

The other side

Away from the sheer euphoria of the cuckoo land merchants dreaming of their £30,000 a year, reality is quite, quite different. We contacted companies who had advertised for programmers to find out

what they were looking for. One number wasn't obtainable at all. Another answered the phone but had gone bankrupt. Another company which had taken a half page advertisement headed 'Turn your programs into cash' had pulled out. The simple reason was that they received too much low standard material. On average only 2 per cent was acceptable, so either the programmers just weren't taking the subject seriously or they couldn't program at all.

Another company had a very attractive marketing suggestion which unfortunately failed completely because of unsuitable programs. So when you see a company advertising offers and better deals than anyone else, ask yourself, "Will they be around to pay my royalties?"

The payment systems

There's two basic ways to be paid. Sell outright, or have an advance and then take royalties. Most people take an advance and settle for royalties. You can sell outright if you really need the cash, but most of the programmers that have done so regret it — after all, if you are going to be ripped off, it's just as easy to get a bouncing cheque and you still lose out. So outright sale is no guarantee of anything other than having the cash quicker and we don't really advise it. Don't be taken in by sky high royalties either — be realistic. These are the facts:

1. Software is becoming far more competitive — margins are going down with the prices.
2. If you sell to a distributor that company will have to give away at least 60 per cent and probably more.
3. Selling to a dealer will mean at least 40 per cent off.

So what is this royalty coming out of? It isn't the retail price so is it the price to the distributor? Make sure you read the small print very carefully before signing anything. A £10 game could gross only £4 when sold to a distributor, and remember that most games cost well under £10.

The lowest royalties offered may make you far more money than you might expect because the company may well sell more than anyone else. Today the market has moved towards mass retail sale from



Southampton-based Quicksilva handles software from many young programmers.

WILL IT MAKE YOU RICH?

mail order, so the little ads which could have produced a small fortune are on the decline. Instead the companies who supply W H Smiths, Boots, Dixons, Laskys, Rumbelows and record shops will be the ones to survive.

The figures that can be earned are listed below, together with percentage royalties and outright purchase amounts where relevant. Even so, it's unlikely to make you a fortune. Where there have been other examples of success — apart from Eugene Evans — we have listed them together with the name of the program that created the success.

Apart from the money involved you may also want the publicity — in which case choose a company which also promotes the programmers, featuring their portrait and details on the program card.

Languages

If you are producing an arcade game, write it in machine code. Adventures can be in Basic.

The program

Almost all suppliers want the program on cassette, unless the machine is disk based. Always make sure your name and address are on the tape, plus phone number. Record the program more than once and use quality tape, it does make a difference. Then try the new program on at least one other tape recorder, just to make sure all is OK.

Copyright

The law on this subject was never intended to cover computer code. In general, the best advice is to register your program with the Computer Program Copyright Register. It's an organisation which was set up with the Institute of Analysts and Programmers. The register provides written proof of the program's originality even after the programmer's death. If you ever need to go to court to contest the originality of the program, the Register can provide the court with a sworn statement confirming the date you registered the program.

The Computer Program Copyright Register is at Wye House, Tangier Road, Richmond, Surrey, TW10 5DW. Tel: 01-898 0195.

Taking copies

Don't send the only copy of your newly created program to the software house. Some people do this and have lived to regret it. Keep at least two copies of the program and documentation for your files, otherwise you'll have no proof it's your program...

The shotgun approach

There are lots of companies who may want to market your program. Instead of sending one copy to a selected organisation, you may decide to send copies to a wide range of companies and take the best offer. This is, however, the way to get ripped off, to annoy the software companies and to possibly end up the loser. However, you could produce a version of



Virgin is one of the software houses which concentrates on promoting programmers.

your game for another machine to be sold through a different software company.

The rifle approach

Select a company from our listing, ring it or write and wait for its reply. If it is close visit the premises as some prefer to see authors face-to-face before entering into any form of business agreement. As bad pennies are usually quickly noticed, ask your local micro club and dealers about different companies' reputations. It's a good way to separate the dodgy operators. Read *Which Micro?* too.

Agreements

If your program ends up being accepted an agreement will appear through the post. Read it carefully and if in any doubt see a solicitor. Find out what you are signing away. Where will the program be sold — the UK, the USA, Europe, South Africa, Australia, Japan? Are they sole rights or can the program be sold by other companies? Does the company have first option on your next program? Do you want them to? Don't sign anything you don't understand — or you will probably regret it later.

Five golden rules

David Ward, director of Ocean Software based in Manchester recently appeared on the Granada TV program *Chip In* and was asked to give advice to budding software writers hoping to get their games published. This is what he said:

1. Begin by deciding to write an original game, not another me-too version of *Pacman* or *Space Invaders*. Write in machine code and include good, smooth moving graphics and sound effects. Try to use all of the machine's capabilities and bring out the good features of your machine.

2. Contact the software houses which publish games that you like and for your machine, and get an idea of what they are looking for (after all they are in direct contact with the shops that are selling software). Also get the name of the person in charge of software development and when you submit the program address it for their attention.

3. Incorporate the advice from software houses on the type of features your program should have and look in the shops

to see which software houses are actually selling these games in the principal stores. Having spoken to them and seen their other programs, make a short list of say three or four possible publishers for your work and then submit the program for their consideration, either after arranging an appointment or posting the cassette to the software manager.

4. Save your program on cassette (twice), making sure that you keep a reference copy for yourself. Then mark on the body label the name of your program, the machine it runs on, and the memory size — plus loading and control instructions. Repeat this information on the inlay card and also state your name and address, telephone number and a brief scenario of the game plan.

5. If the program is accepted by one or more software companies, take advice as to exactly what is being offered and what your obligations and responsibilities are. All good software houses will be straightforward about how much they can offer either by royalty or copyright purchase. But remember if you are expecting a royalty payment, the total number of cassettes sold is far more important in determining your fame and fortune than a few percentage points from a company less professional in their marketing.

Conclusion

If you really try and persevere, there is money to be made from programs. But it does take time creating, writing and debugging the program. Many well-known and successful programmers have had literally everything done for them for weeks on end, just so that they can concentrate on perfecting their program. It's no picnic but a hard grind. And if you feel that this creativity is lacking — don't worry. Show the companies the quality of your work and some of them will provide the ideas for you to turn into programs. Some companies pay for ideas too. Or send your listing into *Which Micro?* for publication — we pay £25 to £100 depending on the length and quality of the program.

While you may not make your fortune, it's extremely likely you'll earn enough to buy that new computer or the peripheral that will make all the difference.

Now take a look at our monster suppliers' guide and off you go.

SOFTWARE HOUSE RUN DOWN

In cases where we have been able to speak to people at these organisations, their answers to basic questions are listed with their entry. Other organisations have been more difficult to contact, so information as it appeared in their advertising is listed instead. But all the information printed is purely as supplied by the companies themselves, and in no way is a form of recommendation of their suitability by *Which Micro?* & *Software Review*.

Equally you must exercise care and discretion before making your final choice and hopefully our checklist will help sort the wheat from the chaff. Whatever your selection, the best of luck, remember this is a highly competitive business.

Angela Enterprises, 4 Ninnings Lane, Rabley Heath, Welwyn, Herts A16 9TD. Tel 0438 812439
Brands of micro: Newbrain

Anik Microsystems, 30 Kingscroft Court, Bellinge, Northampton

Arrow Software, 7 Woodfall, Astley Park, Chorley, Lancs PR7 1XD
Brands of micro: Dragon

Artic Computing Ltd, 396 James Reckitt Ave, Hull, N. Humberside, HU8 0JA

Atari International Ltd, Atari House, Railway Terrace, Slough, Berks SL2 5BZ
Contact: Mrs. K. Tarvin
Brands of micro: Atari

Bamby Software, Leverburgh, Isle of Harris, PA83 3TX. Tel 085-982 239
Contact: Pat Balse
Brands of micros: Dragon, Lynx, Oric, Spectrum, TI 99/4A
Supply program: On cassette recorded on both sides, plus listing.
Advice: Needs adventure and arcade games. Evaluation takes 4 to 6 weeks. Programs should be written in machine code. Write or ring before sending in a program.
Royalties: Up to 25 per cent
Other information: Make sure you put your name and address and phone number with the cassette and do keep a copy of the program yourself. We still receive a lot of unidentified programs each week. It's still a male-oriented hobby, so far we only have one lady programmer. There must be potential for lots more female programmers — why don't they contact us?

Bubble Workshop, 60 Intern Close, Basingstoke, Hants. Tel 0256 29628
Brands of micros: Vic 20, Spectrum, ZX81
Advice: We need games, business and education programs.

Bug Byte Software, The Albany, Old Hall Street, Liverpool
Brands of micro: Most popular ones including Vic 20, ZX81, Spectrum, BBC

Cascade Software, Cascades House, Llandogo, Monmouth, Gwent, South Wales NP5 4PA
Brands of micro: Oric, ZX81, Dragon, Atari, Vic 20, Apple

Ciro Soft, 184 Hiltingbury Road, Chandlers Ford, Hants SO5 1NS
Brands of micro: Oric

Computerhouse, Freepost, Ilford, Essex IG1 2BR

CP Software, Orchard Lane, Prestwood, Bucks HP16 0NN
Brands of micro: Spectrum

Crystal Computing, 2 Ashton Way, East Herrington, Sunderland, SR3 3RX
Brands of micro: ZX81 and Spectrum

DeptPCN, 8 Harrow Close, Chessington, Surrey
Brands of micro: Dragon, Apple, Vic 20

Dialogrove, 10A James Street, Covent Garden, London WC2
Brands of micro: ZX81, Spectrum

Dorling Kindersley Ltd, 9 Henrietta Street, Covent Garden, London WC2 8PS
Contact: Amy Carroll

Dream Software, P.O. Box 64, Basingstoke, Hants RG21 2LB. Tel 0256 25107
Contact: Mr L Graddon
Brands of micro: Virtually all but the ZX81.
Supply program: On cassette, recorded twice plus detail on how to load.
Advice: We need original ideas, how ever we are on the lookout for copies of existing programs and wouldn't touch them with a barge pole.
As an example one experienced programmer contacted us and wanted £5,000 plus royalties. We are still examining the program. Programs can be written in Basic or machine code — it depends on the program. Ring before sending programs off to us.
Advance: We could pay up to £11,000.
Royalties: Up to 33 per cent.
Buying outright: Up to £1,000.
Other information: Basic can be OK for a graphics package. But most people think that if they can program in Basic, they can write a games package. We do credit authors' names on the program.

The English Software Company, 50 Newton Street, Piccadilly, Manchester, M12EA
Brands of micro: Apple, Atari, IBM PC, Commodore, NEC

Enfield Communications Ltd, 135 High Street, Ponders End, Enfield, Middlesex EN34 6B. Tel 01-805 7434

Express Software Ltd, City Gate, 25 Moat Lane, Birmingham, B5 6BH. Tel 021-623 3103
Contact: Gordon Hedges.
Brands of micro: Oric and 6502-based micros.
Types of program: Games and education. Machine code.

Gem Software Ltd, Unit D, The Maltings, Station Road, Sawbridgeworth, Herts. Tel 0279 723567/723518
Contact: Mr or Mrs Line
Brands of micro: Lynx, Dragon, Spectrum, ZX81, BBC
Type of program: Games and utilities
Supply program: On cassette both sides plus a listing and details of how to run it. We expect details of how to play the game to appear on screen. Documentation essential for utilities.
Advice: We need original machine code arcade games. When prospective programmers contact us we try to find out over the phone what they actually know. If it sounds practical, we tell them to go ahead and send it in.

Royalties: We could advance as much as two months' royalties depending on the game. It depends on how the program is sold and varies accordingly. Selling to the customer direct we pay 20 per cent, when selling to a dealer 15 per cent and when the program is sold to a distributor 10 per cent.
Outright purchase: We could pay up to 60 per cent of 12 months' estimated royalties. Always ring before sending any programs in.
Other information: We usually acknowledge within seven days and as far as suitability is concerned we decide in about one month. In fact we prefer to see people face-to-face where possible, it's better. A good game can have a life of 12 months. Here is an example of a nasty: one programmer sent in two games for the ZX81, we loaded them and both looked familiar. Some checking revealed that they had been typed in from a listing in a weekly computer magazine! Naturally we aren't interested in any programmers taking this so-called short-cut.

Galaxy Software, 62A West Street, Harwich, Essex. Tel Harwich 52446

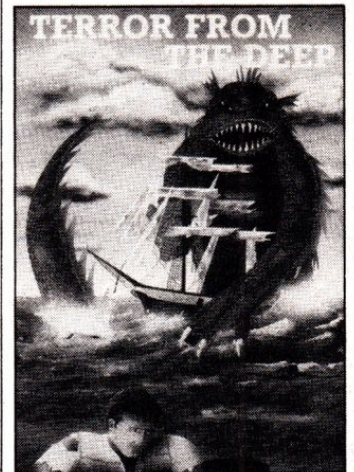
Brands of micro: ZX81 and Spectrum
Type of program: Games, educational and business

Home Computer Software, Acquisition dept, Thorn EMI Video Ltd, Film House, 142 Wardour Street, London W1V 4PT. Tel 01-437 3453

Impact Software, 70 Redford, Edinburgh EH13 0BW. Tel 031-441 4257

IMS, 143-145 Uxbridge Road, London W13 9AV. Tel 01-567 6288
Contact: IMS Software division
Brands of micro: BBC, Oric, Vic 20, Spectrum
Type of program: Games and educational
Supply program: Working example on cassette plus instructions.
Advice: We interview people on the phone and when they have a working example of their program visit them if we feel it necessary. We guide the programmer along the line of what they need to do. Equally it depends on their reaction on the phone, we may ask to see examples of their work or set them a project. Arcade games must be written in machine code. Programs can be sent in on spec.
Method of payment: All available on request.
Other information: We take two to four weeks to answer the programmer. When sending in a program make sure the program has been recorded more than once. Make sure your cassette recorder is in good order and use good quality tapes. Try the sample on a friend's cassette recorder before sending it. Make sure the program is well documented, send a covering letter and if it is an adventure send in the answers — it does save a lot of time.

Jabberwocky Software, 610 Washwood Heath Road, Birmingham, B8 2HG
Brands of micro: Spectrum, BBC B, Dragon 32.



Kayde Electronic Systems Ltd, The Conge, Great Yarmouth, Norfolk, NR30 1PJ. Tel 0493 57867

Knights Software, 14 Knights Court, Knights Park, Kingston-upon-Thames, Surrey KT1 2QL. Tel 01-549 3045
Contact: Mr. G.J. Dutry van Haften
Brands of micro: Apple, BBC
Type of program: Games — arcade and adventure. Utilities, educational. For the Apple business as well.
Supply program: On disk or cassette, depends on the machine.
Advice: Send in some examples of

WILL IT MAKE YOU RICH?

your work. Have been swamped with programs for the BBC and Apple. Can take month to six weeks to reply. Programs can be sent in on spec.

Advance: We sometimes pay expenses as a form of advance.

Royalties: Up to 30 per cent. Company reckons to sell 200 to 400 disk, 400 to 800 cassette. Basic is OK for adventures. Arcade games must be machine code.

Example of success story: Malcolm Whapshott who has written Nano 6502. It's an aid to learning assembly programming. The program interrupts the microprocessor and displays the accumulator, registers, stack etc. It shows the changes while single-stepping through the program.

Other advice: Find out what market the organisation is selling to, because the UK is fairly small and it can be difficult to get into the USA and Canada. However, Japan is very good. Make sure these points are in the contract you sign. Are you going to be dealing with the company on an exclusive or non-exclusive basis, or is the company going to have a first option on your next program? Be very careful. By just changing one or two instructions in the program, there's a completely new one.

Megabyte Marketing, Dept 1, 79 Broderick Road, Eastbourne, Sussex
Brands of micro: Spectrum, Vic 20, Commodore 64, BBC, Dragon, Oric, TI99/4A, Apple II, Atari.

Micronet 800, Bushfield House, Orton Centre, Peterborough, PE2 0UW. Tel 0733 237111
Contact: The software manager.
Brands of micro: BBC, Spectrum, Apple, Commodore, Tandy, Dragon, ZX81

Type of program: Games, utilities, educational, business.

Supply program: Depends on the machine.

Advice: Write in for full details on how to submit programs and the forms which have to be completed. Write your program as though it will be considered. There must be documentation. But don't rely 100 per cent on Micronet publishing your program because there is strong competition.

Advances: These are considered.

Royalties: Up to 20 per cent.

Outright purchase: Sometimes.

Examples of success: Dave Leedham with Guitar program for the BBC. Always write in first — never send in programs on spec.

Micro-Tronics, 27A Market Street, Tamworth, Staffs B79 7LR

Mikro-Gen, 1 Devonshire Cottages, London Road, Bracknell, Berks
Type of program: Games, utilities, education and business programs required.

Mr. Chip Software, 1 Neville Place, Llandudno, Gwynedd, LL30 3BI. Tel 0492 49747

Contact: Mr. Bracey.

Brands of micro: Commodore 64, Vic 20, Spectrum.

Type of program: Games, utilities, education and business.

Supply program: On cassette or disk — must have full instructions.

Advice: When programs are sent in we examine them carefully and then return them with suggested changes. Then they can be considered for marketing. When there is only a small change required, like a title page, then this is done internally. We

usually reply to programs sent in within 14 days. As well as programs we also accept ideas and would pay for them on a royalty basis. Programs should be written in machine code. **Payment:** Full details available on request.

Nebulae Software, Kilroot Park, Carrickfergus, Co. Antrim BT38 7DD
Brands of micro: BBC, Oric, Commodore 64

Oasis Software, Reward, Lower North Street, Cheddar, Somerset. Up to £500 for a program, up to £50 for an idea.

Ocean Software, The Ground Floor, Ralli Buildings, Stanley Street, Manchester, M3 5FD. Tel: 061-832 914357049

Contact: David Ward.

Brands of micro: Spectrum, Commodore 64, Oric, Dragon, BBC and Electron.

Type of program: Realtime arcade games.

Supply program: On cassette, recorded once on each side or twice on a single side using computer tape.

Advice: 1. The choice of program depends on the machine, make sure you choose one which has a future. The type of game depends on the machine's facilities — as an example the Spectrum doesn't have sprites, so a game with things passing over each other and screen scrolling would be better on the Commodore 64.

2. You need a good idea of what the software companies are looking for. Now the market has changed to almost 100 per cent retail from mail order, people look in the shops for something new. A completely new game coming out of the blue is unlikely. We are tending towards software co-operation where the programmer needs the assistance of disk drives and printers. Anyone offering 25 per cent royalties has no margin for profit. It's worth bearing in mind that the software company will have to give at least 40 per cent to the dealer and at least 60 per cent to the distributor, so there isn't much left. Any game will have from 4 to 8 months' life depending on its popularity.

Payment: We consider both advances and outright purchase, but in most cases programmers choose royalties — we pay 12 to 15 per cent. The programs should be written in machine code.

Example of success: Paul Owen, age 19. Spectrum Kong game has so far sold 5,000 and could be as high as 20,000. He has made £1,500.

Programs can be sent in on spec or contact first, programmer's choice.

Other information: Find out the name of the person who is going to see the program. Make sure your name and address and instructions are supplied with the program plus your phone number. Two of the most important things about choosing a software company are credibility and viability.

Oric Software, 118 Worcester Road, Malvern, Worcs WR14 1SS. Tel 06845 62467

Paeen Systems, Quebec Marketing, Little Bealings, Woodbridge, Suffolk, IP13 6LT

Brands of micro: BBC

Palace Software, The Video Palace, 100 Oxford Street, London W1. Tel 01-637 0366

Brands of micro: Atari, BBC.

Spectrum, Vic 20, Commodore 64.
Type of program: Games in machine code.

Phoenix Software, Spangles House, 116 Marsh Road, Pinner, Middlesex. Tel 01-868 3353

Royalties of micro: Vic 20, Spectrum. Programs in machine code.

Q.E.D. Systems, 2 Sefton Gdns, Aughton Green, Ormskirk, Lancs, L39 6RZ.

Brands of micro: Spectrum, Oric, Dragon, Apple II.

Quickmicro Ltd, 2 Woolley Avenue, Poynton, Stockport, Cheshire, SK12 1XU.

Types of program: Games, educational, business programs.

Quicksilver, Palmerston Park House, 13 Palmerston Road, Southampton, Hants. Tel 0703 20169

Contact: Paul Cooper.

Brands of Micro: Vic 20, Commodore 64, Atari 400/800, BBC, Spectrum, Dragon, Lynx, Oric.

Type of program: Arcade game, utility, education.

Supply program: On cassette.

Advice: First like to see sample of work. If it looks OK, then the programmer can go ahead and produce the program. If he doesn't have a firm idea, we can supply him as long as we know he can produce the software. In most cases we reply within 7 to 10 days. Alternatively come along and see us, or meet up on our exhibition stands. Arcade games must be machine code. Programs can be sent in on spec. **Payment:** Royalties can be up to 25 per cent.

Example of success story: Dave Edwards who produced OS Skramble and Invaders for the ZX81.

Rainbow Software, 28 Guildhall Arcade, Preston, Lancs
Brands of micro: BBC

Renaissance Software, Coach House, Otford Hills, Sevenoaks, Kent TN15 6XN

Brands of micro: BBC and Torch. 25-35 per cent royalties.

Runesoft, Charnwood House, 67 Lower Parliament Street, Nottingham, NG1 3BB

Brands of micro: Dragon, Oric, Spectrum

Sagasoftware, 148 Barrack Road, Christchurch. Tel 0202 486207

Contact: Colin Smith

Brands of micro: Below £400

Type of program: Adventure and arcade action

Supply program: On cassette

Advice: If the caller is a child we advise them to ask their parents and to seek legal advice about obligations and responsibilities involved in marketing the program. Any program must be of marketable quality and the programmer mustn't do take-offs of other programs. The programs we receive are mainly low quality, out of 500 about 15 will be worth investigating. For successful programmers we have formed Six of the Best where the programmers can become shareholders.

Royalties: Up to 33 per cent.

Programs can be sent in on spec.

Silverlind, 156 Newton Road, Burton on Trent, Staffs DE15 0TR

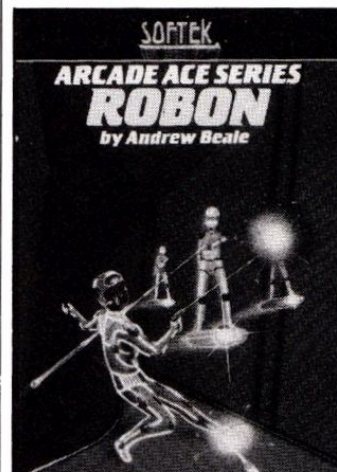
Brands of micro: BBC, ZX81, Spectrum, Dragon, Pet.

Royalties: Up to 30 per cent.

Type of program: Games and educational

Silversoft Ltd, London House, 271/273 King Street, London W6. Tel 01-748 4125

Contact: Mr. D. Bern



Softek. Tel 01-240 1422
Contact: Dr. Langdell

Soft Hits, Scriptor Court, 155 Farringdon Road, London EC1R 3AD
Contact: Mr. A. Rolington
Brands of micro: Most popular machines. Programs in machine code.

Superior Software, 69 Leeds Road, Bramhope, Leeds. Tel 0532 842714
Brands of micro: BBC
Royalties: Up to 25 per cent

Super Tournaments Ltd, Computing Services Division, P.O. Box 47, Wokingham, Berks, RG11 1LN
Freelance programmers contact to set up own software house.

Tansoft Ltd, 3 Club Mews, Ely, Cambs. CB7 4NW
Brand of micro: Oric

Virgin Games, 61-63 Portobello Road, London W11 3DD. Tel 01-221 7535

Contact: Virgin Games
Brands of micro: Vic 20, TI-99/4A, Spectrum, BBC, Dragon, Oric, Atari, Commodore 64.

Type of program: Games.

Supply program: On cassette.

Advice: Program must be original and interesting — really fast moving. If an idea looks good, then the programmer could be encouraged to have a go at writing it. There must be the realistic attitude to adapt to change.

Advances: Made in certain circumstances.

Royalties: 5 to 10 per cent.

Purchase outright: Possible in certain cases.

Approx 10,000 sales of average game. Programs should be written in machine code. Programs can be sent in on spec.

Other advice: Bear in mind that out of the total amount paid for a game in a shop 15 to 20 per cent can go in marketing. Virgin promotes the programmers. Important to have your full name and address with the program. Acknowledgements in seven days.

Wildings, 11 Mesnes Street, Wigan, Lancs. WN1 1QP. Tel 0942 44382

Workforce, 140 Wilsden Avenue, Luton, Beds.
Brands of micro: Spectrum, Dragon, BBC, ZX81

● This is an entirely new computer system. It was designed with both eyes fixed firmly on the future. So that whatever shape the future takes, we'll be able to fit it into the system. Just as simply as the peripherals and software already available fit into the system. That way, the system will grow with you. And you'll never get left behind.

● Based around the Z80A microprocessor, and utilising Microsoft™ BASIC, Aquarius™ has 8K ROM and 4K RAM resident within its console. It is able to provide up to 16 colours and resolution of 320x192, and generates its sound directly through the television's speakers.

● With twin cartridge ports, the mini-expander allows simultaneous use of additional RAM and software cartridges. Twin disc game hand controls are included and the unit provides two additional sound channels. The 16K RAM cartridge plugs into either the console or the mini-expander, increasing Aquarius™'s RAM capacity to 20K.

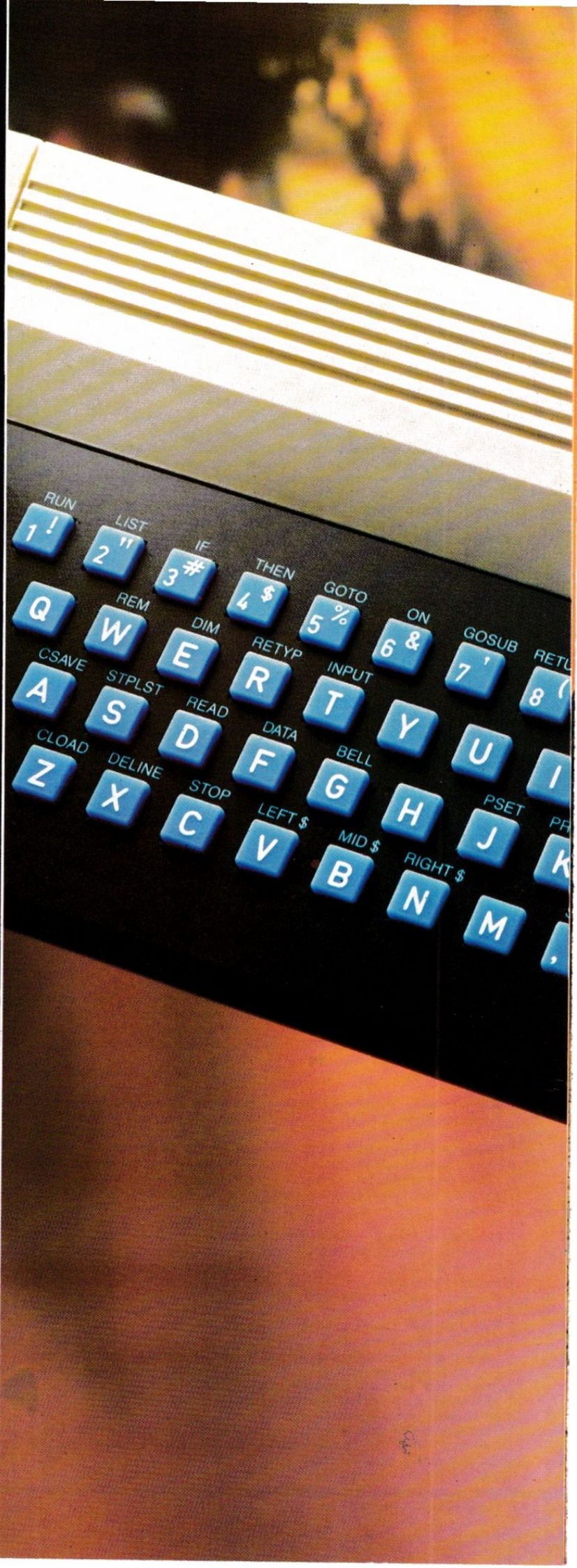
● With the ability to reproduce the entire graphic and character set of Aquarius™ at 80 characters a second, the printer's 40 column output allows transcription of the complete monitor image.



● Using standard audio cassettes, the data recorder provides storage for programs and information, and allows the use of cassette based software. Incorporating a digital tape counter and transmission indicator, it operates sequential searching.

● A large number of games, designed to take advantage of Aquarius™'s sophisticated colour and sound capabilities, are available on cartridges that plug into the console either direct, or through the mini-expander. Cassette based games can be used via the data-recorder.

● A wide range of preprogrammed cartridges is available, including the LOGO teaching program and practical home data systems like FILEFORM™ and the spreadsheet calculator package, FINFORM™.



AQUARIUS™
HOME COMPUTER SYSTEM

WITH AQUARIUS, YOU WON'T GET LEFT BEHIND.

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WHATEVER HAPPENS
IN THE FUTURE, IT'LL
FIT INTO THIS SPACE.

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Everyone wants to get their hands on The Fuller Gift Pack.



The Fuller gift pack has got to be the computer bargain of the decade; no wonder everyone wants to get their hands on one. This super gift pack contains the fantastic Fuller Master Unit, the ultimate unit that provides all the requirements for the serious games enthusiast. The Fuller Master Unit incorporates both the Fuller Box and Orator; its amazing features include a speech synthesiser, an independent sound synthesiser, a joystick interface, an amplifier for standard Spectrum sound, a cassette interface and a hi-fi socket. The pack will also include a Master Unit demo tape and full documentation.

As well as the Master Unit this Gift Pack also contains a de-luxe Joystick, with suction adhesion, a firm smooth action and a moulded hand grip incorporating twin firing buttons.

Once your Spectrum has been added to the Fuller Gift Pack you will have an extended computer system that is second to none.

Now you can pit your mind against the four unique, exciting computer games included in the pack. These games have been especially adapted for this superb system and have added arcade sound effects and speech to bring out the very best in your Spectrum.

The Fuller Gift Pack saves you £20 on the purchase price of buying these items separately.

£79.95

inclusive of post and packaging

Fuller

MICRO
SYSTEMS

Fuller Micro Systems
The ZX Centre, 71 Dale Street,
Liverpool 2. Tel: 051-236 6109.

At Fuller Micro Systems we strive to maintain the highest quality in both research and development, ensuring our products are the very best. We have now built a brand new mail order department to ensure our service is also the very best. Our stock includes a full range of components and kits that will make the most of your Spectrum; all our products enjoy an excellent reputation for reliability and carry a world wide one year guarantee.

Please supply me with..... Fuller Gift Pack(s).

I enclose a cheque/PO payable to

Fuller Micro Systems foror debit my credit card.

Card No. ☐ Barclaycard ☐ Access Card

Signature

Name

Address



Fuller Micro Systems, The ZX Centre,
71 Dale Street, Liverpool 2. Tel: 051-236 6109

Sinclair **Special**

6



Inside...

***Setting new standards in
educational software with
Sinclair-Macmillan***

Plus six other learning programs

TODAY, LEARNING IS A NEW GAME

Subsidised microcomputers are now commonplace as teaching aids for the very youngest children and the ZX Spectrum is prominent amongst those micros at use in schools.

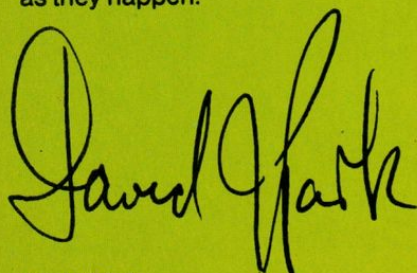
In the relatively short time that the Spectrum has been at work in the classroom, two questions have been answered. Yes: with the right software, the micro can and does teach effectively and thoroughly (and gives teachers more time to devote to individual pupils). Yes: young children think little of working rapidly and successfully, with a screen and keyboard, on even quite complex subjects.

In this Sinclair Special we reveal a range of educational software specifically designed to make full use of these advantages. The programs produced by Sinclair in collaboration with Macmillan Education are fascinating. They deal imaginatively and most effectively with early reading skills and take a truly refreshing approach to basic science.

In the Blackboard range we've programs which bring a light-hearted clarity to the tricky matters of spelling and punctuation.

These programs are designed for use both at home and in the classroom. Each program is accompanied by full documentation which gives parents helpful advice and guidance on the educational objectives.

The programs covered on these pages represent only a fraction of the full and fast-growing list of Spectrum software. Be assured we'll keep you in touch with new developments as they happen.



David Park
Education Marketing Manager

NEW WAYS TO LEARN WITH THE ZX SPECTRUM™

Programs from Blackboard Software

The new range of educational programs from Blackboard Software makes learning an enjoyable process by involving the child in a game which teaches as it entertains.

Each program has a step-by-step example section and gives correct answers after a number of attempts. Vocabulary changes can be made, allowing each program to keep pace with the child's development. This flexibility can also be used in the classroom to cater for children of differing ability.

The instructive and colourful games which follow the successful completion of each group of sentences provide useful practice in letter recognition and increase familiarity with the Spectrum keyboard.

All programs are written for the 48K RAM Spectrum.



Alphabet Games

Three games of letter recognition (using either upper or lower case) to help children learn the alphabet and find their way round the computer keyboard.

Alphagaps — The full alphabet is displayed, along with a second, incomplete version. The child must fill in the missing letters.

Random Rats — Press the letter key that is displayed on the gun to destroy the rats which have invaded the cellar!

Invaders — Stop little green men from landing on Earth by pressing the appropriate letter.

Early Punctuation

While an animated matchstick man marches above displayed sentences the child must decide which punctuation mark is missing and where to insert it. At the touch of a key the matchstick man drops the mark into place. After successful completion of every sentence in the exercise, light relief comes in the form of a bottle-shooting game!

The Apostrophe

As each sentence is displayed, a bird appears with a worm in its beak. The keyboard is used to move the bird and drop the worm into the correct place for the apostrophe. When ten sentences have been corrected, the Grub Game is displayed. Press the correct character to change the grub into a butterfly...before it munches through a flower!

Capital Letters

A program to teach the use of capital letters. Sentences incorporating proper nouns and sentences without opening capitals are displayed. The child inserts the correction by guiding an animated figure to the appropriate letter.

For each correct answer an apple grows on a tree. After ten correct answers the child's skills in recognising letters and using the Spectrum keyboard are needed to save the apples as they fall to the ground.

Speech Marks

A comprehensive program including sentences with one or two sets of speech marks ("inverted commas") and exercises in both direct and reported speech.

Using the Spectrum keyboard, a cursor is used to guide speech marks to the correct position. The program offers three levels of difficulty, with full examples for each section. Guide Max the mouse through a maze, after the correct completion of five sentences from each section, but beware of Persian cats!

Castle Spellerous

A spelling game with ten levels of vocabulary, including words with silent first letters, double letters and other difficult words. The Princess has been captured and carried off to Castle Spellerous. Helped by ten soldiers, the child can attempt a rescue by giving the right answers. Part of a siege tower is built for each correctly spelt word. Mistakes are costly — the wicked wizard appears as a vampire bat, turning the men into frogs, butterflies and bats!

When ten words are spelt correctly the rescue begins and the wizard takes flight.

SINCLAIR + MACMILLAN: A NEW DIMENSION IN EDUCATIONAL PROGRAMS

Sinclair have joined forces with Macmillan Education to produce a completely new and different range of educational software. The results so far can be seen in these exceptional programs.

The Learn to Read series is derived from Macmillan Education's best-selling primary school reading scheme, Gay Way. It offers a unique opportunity for parents and

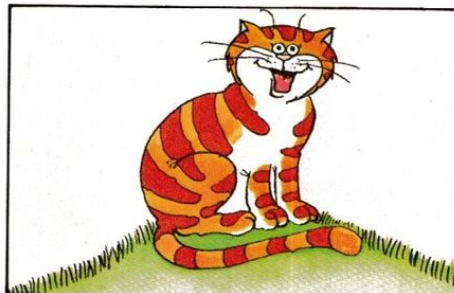
teachers to participate in the child's first experience in reading.

Macmillan Education's Science Horizons is one of Britain's most successful school science schemes. Each program concentrates on key scientific ideas and, through simulation of real life, makes the learning process entertaining and enjoyable.



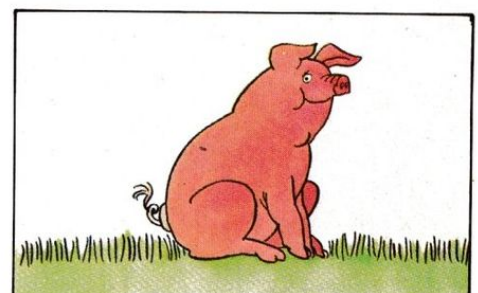
Learn to Read 1

Learn to Read 1 is designed for children who are just beginning to read. It is in four parts, each of which develops skills central to the reading process — letter recognition, sight vocabulary, early spelling and memory. The program is full of colour and fun and children will enjoy learning to read as they meet the animal characters — Ben the dog, Jip the cat and their friends.



Learn to Read 2

Learn to Read 2 extends the fundamental reading skills practised in the first program, as well as encouraging logical thinking. The child's vocabulary is gradually built up as new words such as "red", "green", "car", "ship" and "bus" are introduced. In addition, Learn to Read 2 features an attractive 'reward' system enabling children to see their achievements grow.



Learn to Read 3

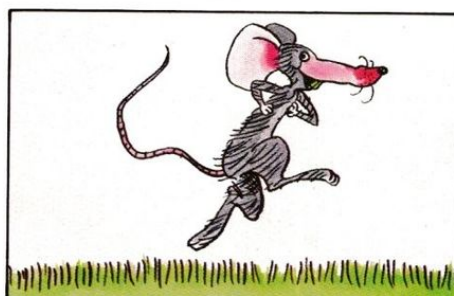
Learn to Read 3 builds on the child's progress so far, so that he or she can gain the confidence to move on through the complex reading process. Learn to Read 3 features four different activities, all of which are colourful and lively. Further vocabulary is introduced until the child is reading more than 30 words.



Learn to Read 4

Learn to Read 4 is the alphabet program in the Learn to Read series.

Using various stimulating activities the program gives the child plenty of practice in working with the alphabet — matching initial letters to words and pictures and spotting missing letters. These exercises build familiarity with simple sequences within the alphabet.



Learn to Read 5

Learn to Read 5 teaches positional language — often difficult to understand and remember — by using words and phrases such as "behind" and "in front of", "inside" and "outside".

The program first demonstrates the meanings of the words using clear pictures. It then tests the child's understanding of the words in two lively games.



Cargo

Set sail around the world. Choose your ports of call — New York, Tokyo, Belem, Helsinki — then the real challenge begins! You must reach your destinations safely, weathering storms on the way. But first, load your cargo — using all your knowledge and skill. Poor loading can mean capsizing and sinking. Your rank, if not your life, is always at stake!



Glider

Be a glider pilot! The glider models real-life gliding conditions so that you can learn through experience. As the pilot you must consider the time of day, the amount of cloud cover and the kind of terrain below you in order to find the up-currents of air that will keep you airborne. Try to fly as far as possible and, when you are high enough, navigate your way back to your home airfield and land safely — if you can.



Survival

Discover what it is like to be an animal in the wild! Be a lion stalking your prey, escaping human hunters. Or be a hawk, mouse or even a butterfly, searching for food and avoiding predators.

Survival models the natural world and brings to life hazards that different creatures must face in their struggle to stay alive.



Magnets

With an army of small magnets you set out to conquer the powerful supermagnets of your opponent. You have one weapon — your forces of magnetic attraction and repulsion.

The strategy is simple: attract smaller magnets to build strength to repel the supermagnet. When cornered, just turn your poles on your enemy and see what happens!

ZX INTERFACE 2

THE NEW ROM CARTRIDGE AND JOYSTICK INTERFACE

Now available in shops



Lloads programs instantly
Takes two joysticks
Just plug-in and play

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum system. It enables you to use new ZX ROM cartridge software: plug-in programs that load instantly. There are ten terrific games already available on cartridge. ZX Interface 2 also allows you to use

one or two standard joysticks without the need for separate special interfaces.

To use new ZX ROM Cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. Switch on and the program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with suitable ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum programs.

ZX MICRODRIVE/ ZX INTERFACE 1

The ZX Microdrive System is unique. This compact, expandable add-on system provides high-speed access to massive data storage. With just one Microdrive and a ZX Interface 1 you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in a matter of seconds, the beginnings of a local area network of up to 64 Spectrums and a built-in RS232 interface. The cost? Less than £80.

How to get ZX Microdrive and ZX Interface 1

Spectrum owners who bought direct from us by mail order have been sent full details. Order forms are being mailed in strict rotation. If you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, send us the form at the bottom of this page and we'll add your name to the mailing list.

How to order

Complete the appropriate sections on the order form below. Note that there is no postage or packing to pay on software purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. Please allow 28 days for delivery.

™ Sinclair, ZX Spectrum, ZX Microdrive, ZX, ZX Interface are trade marks of Sinclair Research Ltd.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

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	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
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E23/S	Castle Spellerous	4322	7.95
E24/S	Alphabet Games	4323	7.95
			TOTAL £

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Please add my name to the Microdrive Mailing List and send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ (tick here).

Free Sinclair ZX™ Software Catalogue

Please reserve my priority copy of the January 1984 Sinclair ZX Spectrum Software Catalogue ☐ (tick here).

Please use the form above to send your name and address.



WATCH YOUR LANGUAGE

Commodore Basic is not the most impressive version around, so Pete Gerrard discusses some alternative languages

Commodore computers, in particular the Vic 20 and the Commodore 64, suffer more than most from the version of the Basic language that they have been allotted. Little has been provided in order to make the programmer's life easier, particularly when using colour and sound. Even if your only use for these machines when programming is to produce a decent, readable, fast program, the inherent Basic is unstructured and not particularly fast.

Luckily, many companies (including Commodore) have recognised the existence of this problem, and by taking a devious step into other operating systems, the Vic and 64 can be programmed in a variety of different computer languages.

One such operating system that instantly springs to mind is CP/M, a Z80 and disk-based system widely used in the industry. To allow your CBM machine to run CP/M and therefore have access to all that

this entails (other languages, databases, games etc) all you need is a disk system and a Z80 card...

Two options are currently available to you if you find yourself in such a position.

The first is to contact Richvale Telecommunications in Canada, which proudly claims that by using its C64-Link (and presumably the Vic 20 version is called the C20-Link) you can access CP/M. Quite how, you'll have to find out by writing to them. Richvale also claims access to 80 column screens and the like, so it's probably worth dropping the company a line. It lives at 10610 Bayview, Richmond Hill, Ontario, Canada L4C 3N8. If your boss happens to be out of the office, the phone number is (416) 884-4165.

The second option is to send a volley of abuse in the direction of Commodore itself for taking such a long time to get its own Z80 card out, which will allow you to run any CP/M based software,

including a wide variety of other languages.

Using CP/M, Commodore promises that you can have Comal, CBasic, Fortran and Cobol up and running on your 64 (sorry Vic owners), although the lack of documentation at present is frightening in the extreme: there simply isn't any!

Comal comments

You can obtain Comal anyway from the Commodore educational workshop to run on an ordinary 64. Comal is a structured language, and usually comes out looking like a cross between Pascal and Basic. The main campaigner for this language, Len Lindsay, has the rare distinction amongst language arguers of actually knowing what he's on about, since he wrote the recommended manual for Comal users.

If you want to drop him a line with any queries, he can be reached at 5501 Groveland Terrace, Madison, WI 53716, or call (608) 222-4432. He'd prefer it if you sent an sae with any letters.

Alternatively, your UK contact is John Collins, who can usually be found at Commodore's headquarters at 675 Ajax Avenue, Slough Trading Estate, Slough, Berkshire, or telephone 0753 74111.

Versions of this language exist for all Commodore machines, and all of them are supposed to be free, if you're interested. You'll probably get charged for a disk, but that's only fair.

There's more!

Other languages promised from Commodore — for the 64 only — are Pilot and Logo, both designed for use in a computer aided learning environment.

For once, the two versions for this machine have been extended to make use of the facilities on the 64, including sprites and sound, and both have their strengths in particular areas.

Pilot, for instance, concentrates on text handling, and scholastic lessons of the 'here's a question, now what's the answer' variety are easily handled in this language.

This is because Pilot can simply be programmed to accept a variety of responses to a question other than the correct one. For example, if the answer to a question is America, most Basic programs would require you to type in just that. However, using Pilot your computer can easily accept variants such as USA, United States of America, and so on.

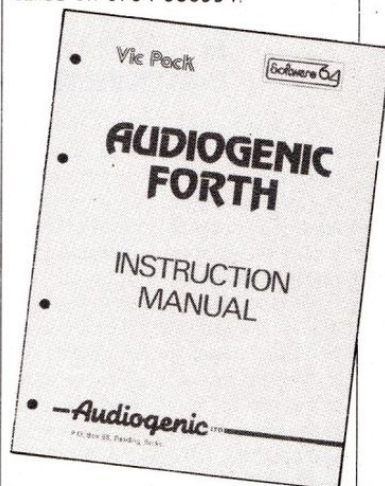
Logo is more of a graphics language, and most people will have heard of the logo turtle, an endearing little chap who wonders about the screen producing pretty pictures. There are drawbacks to it, in that the use of the commands

RIGHT and LEFT for turning corners will mislead many before they properly get to grips with it. Nevertheless, the power of these two languages in the right hands cannot be over emphasised.

Both should be available from the usual Commodore dealers, and no doubt W.H. Jones and Co. will soon be awash with turtles and the like.

From other suppliers

Other languages from independent suppliers include Forth from Audiogenic. This is available for both Vics and 64s, and comes in cartridge form (watch those interfaces!). Audiogenic lives at PO Box 88, Reading, Berkshire, or can be called on 0734 586334.



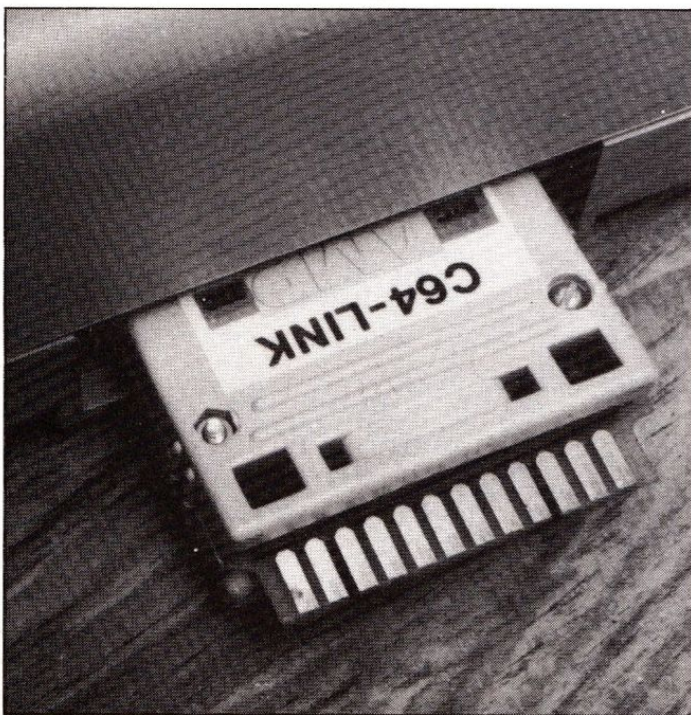
Audiogenic's Forth has been linked into the computer in a professional way, and makes the use of colour and sound much easier than it is on the standard Vic or 64, not to mention a lot faster. At £29.95 for the 64, and £39.95 for the Vic (although they do chuck in an extra 3K of memory in the price), both of these are worth investigating.

A second Forth (any more of them and this could get to be like those ridiculous Scottish score lines in football games. You know, the East Fife 5 Forfar 4 variety) for the 64 is supplied by Kobra Micro Marketing, at PO Box 28, Henley on Thames, Oxfordshire, or telephone 04912 2512. This one costs £39 and is claimed to be a true implementation of the Forth language, although as with all these things one man's standard is another man's version.

Conclusion

But in the long run, whether you like it or not, CP/M seems set to become the industry standard.

As it looks extremely likely that the Commodore 64 will be adopted as Commodore's 'standard' machine for the next few years, a version of CP/M bought for that machine (as soon as a version becomes available) will probably work on all future 64 offspring as well. Until Commodore changes its mind, of course! ■



Access CP/M with the C64-Link from Richvale Telecommunications

READERS PROGRAMS

Welcome to our January collection of Readers' Programs. This month we bring you four programs in this section. There's *Lunar Lander* for Dragon 32 owners, *Hangman* for users of the 16K ZX81, and *Mission Impossible* for the Spectrum. Devotees of Acorn micros are catered for by this month's BBC Micro listing, *Fruit Machine*.

We do check the listings but occasionally a little debugging may be required. But if you decide to send us your program PLEASE try to ensure it's bug-free.

We are looking for more good listings and

programming tips to fill these pages in the months to come, so if you feel your latest game or utility deserves an airing in *Which Micro?*, send it now.

Yes, we do pay for your contributions, the exact amount depending on the length of the listing. As a guideline, it usually averages out at around £30.

Send your printed listings to *Which Micro?*, Scriptor Court, 155 Farringdon Road, London EC1R 3AD together with a copy on cassette if possible.

Please do not send us your only copy as we cannot return it.

MISSION IMPOSSIBLE

Nuclear power stations and men don't mix. There is always the danger of exposure to radiation or the inevitable human error that can lead to catastrophic results. There is also the danger of sabotage and terrorist action.

The solution to this was the Manson Green Automated Nuclear Power Station. It was run by robots for 10 years with no problems at all. A laser defence mechanism kept out unwanted visitors and robots patrolled the nuclear fuel rods.

There has now been a malfunction in the complex and the defence mechanisms are preventing its solution.

The fuel rods are at the top of the screen and can be recognised by the flashing radiation warning indicators attached to them. You must collect these one at a time and transport them to the corridor at the base of the screen and deposit them in the lead containers. But your task is not as easy as it may sound.

The laser defence mechanism has

three modes:

1. Vertical
2. Horizontal
3. Dormant (not activated)

These three stages are passed through and the average time between changing stages decreases as more rods are collected. Early in the game it is fairly easy to make headway whilst the mechanism is not activated. This gradually gets more difficult and a strategy must be worked out in order to complete the task.

NB: The figure is normally black

but changes colour to magenta whilst carrying a fuel rod. Once holding a rod you must make your way to the corridor and deposit the rod before you can collect another.

The game can be played with cursor key control or by using a Kempston joystick. Further instructions are included within the program.

Lines 9200 to 9385 of *Mission Impossible* contain the instructions, while the player's movement is dealt with by lines 2000 to 2825.

```

110 LET L=-1: LET R=0
500 GO SUB 9500
510 GO TO 9820
1000 GO SUB J
1010 IF INT (RND*70)=1 THEN LET
L=L+1: IF L>1 THEN LET L=-1
1020 GO SUB 3100+(100*L)
1030 GO SUB J
1040 GO SUB 3500
1500 GO TO 1000
2000 IF INKEY$="5" THEN GO TO 25
00
2010 IF INKEY$="6" THEN GO TO 26
00
2020 IF INKEY$="7" THEN GO TO 27
00
2030 IF INKEY$="8" THEN GO TO 28
00
2040 RETURN
2050 IF IN 31=2 THEN GO TO 2500
2060 IF IN 31=4 THEN GO TO 2600
110 LET L=-1: LET R=0
500 GO SUB 9500
510 GO TO 9820
1000 GO SUB J
1010 IF INT (RND*70)=1 THEN LET
L=L+1: IF L>1 THEN LET L=-1
1020 GO SUB 3100+(100*L)
1030 GO SUB J
1040 GO SUB 3500
1500 GO TO 1000
2000 IF INKEY$="5" THEN GO TO 25
00
2010 IF INKEY$="6" THEN GO TO 26
00
2020 IF INKEY$="7" THEN GO TO 27
00
2030 IF INKEY$="8" THEN GO TO 28
00
2040 RETURN
2050 IF IN 31=2 THEN GO TO 2500
2060 IF IN 31=4 THEN GO TO 2600
2070 IF IN 31=6 THEN GO TO 2700
2080 IF IN 31=1 THEN GO TO 2800
2090 RETURN

```

```

2500 LET NX=NX-1
2515 IF ATTR (NY,NX)=57 THEN GO
TO 2550
2520 PRINT INK C:AT NY,NX+1;"$":
BEEP .05,-8: PRINT AT NY,NX;"$":
INK 7:AT NY,NX+1;"": BEEP .05,-8:
PRINT INK C:AT NY,NX;"$":
2525 RETURN
2550 LET NX=NX+1: RETURN
2600 LET NY=NY+1
2605 IF ATTR (NY,NX)=63 THEN GO
TO 2620
2605 IF ATTR (NY,NX)=56 THEN GO
TO 5000
2615 IF ATTR (NY,NX)=57 OR 52 TH
EN GO TO 2650
2620 PRINT INK C:AT NY-1,NX;"$":
AT NY,NX;"": BEEP .05,-8: PRINT
INK C:AT NY-1,NX;"": AT NY,NX;"$":
BEEP .1,-8: PRINT INK 7:AT NY-1,NX;"$":
INK C:AT NY,NX;"$":
2625 RETURN
2650 LET NY=NY-1: RETURN
2700 LET NY=NY-1
2710 IF ATTR (NY,NX)=187 THEN GO
SUB 5200
2715 IF ATTR (NY,NX)=57 THEN GO
TO 2750
2720 PRINT INK C:AT NY,NX;"": AT
NY+1,NX;"$": BEEP .05,-8: PRINT
AT NY,NX;"": AT NY+1,NX;"$": BE
EP .1,-8: PRINT INK 7:AT NY+1,NX;"$":
INK C:AT NY,NX;"$":
2725 RETURN
2750 LET NY=NY+1: RETURN
2800 LET NX=NX+1
2815 IF ATTR (NY,NX)=57 THEN GO
TO 2850
2820 PRINT INK C:AT NY,NX-1;"$":
BEEP .05,-8: PRINT INK 7:AT NY,
NX-1;"$": INK C:AT NY,NX;"$": BE
EP .05,-8: PRINT INK C:AT NY,NX;"$":
2825 RETURN
2850 LET NX=NX-1: RETURN

```



```

3000 LET hx=16*(INT (RND*13))+27
3010 INK 2: PLOT hx,32: DRAW 0,1
19: BEEP .07,30: INK 7: PLOT hx,
32: DRAW 0,119
3020 IF dx<>INT (hx/8) THEN RETU
RN
3025 IF ny<3 OR ny>17 THEN RETUR
N
3030 LET m=m+1: IF m<3 THEN GO T
O 4700: GO TO 3225
3100 FOR x=1 TO 10: NEXT x
3110 RETURN
3200 LET ny=2*INT (RND*7)+3
3210 PRINT INK 4:AT ny,2:
BEEP .3
7.20: PRINT INK 7:AT ny,2:
3220 IF hy<>ny THEN RETURN
3221 LET m=m+1: IF m<3 THEN GO T
O 4700
3225 FOR x=1 TO 6: BEEP .05,7*x:
PRINT INK x,AT ny,nx,"~",AT ny,
nx,"~",AT ny,nx,"0",AT ny,nx,"0"
NEXT x
3230 PRINT AT ny,nx," "
3235 GO TO 4000
3500 PRINT INK 7:AT 2,9x," "
3510 READ g: PRINT INK 2:AT 2,9:
"0"
3515 LET gx=g
3520 IF nx=g AND ny=2 THEN GO TO
3560
3530 IF g=2 THEN RESTORE 9990
3540 RETURN
3550 LET m=m+1: IF m<3 THEN GO T
O 4700
3600 FOR x=1 TO 6: INK x: PRINT
AT ny,nx,"~": BEEP .03,8*x: PRIN
T AT ny,nx,"~": BEEP .03,(8*x)-1
0: PRINT AT ny,nx,"0": BEEP .03,
(8*x)-20: PRINT AT ny,nx,"0": BE
EP .03,(8*x)-30: GO TO 3225
4000 PAUSE 100: INK 7: PAPER 0:
BRIGHT 1: CLS
4020 PRINT "OPERATIVE DECEASED:"
: BEEP .1,0: PRINT
4030 PRINT "All life functions z
ero": BEEP .1,0: PRINT : PRINT
4040 PRINT "STATUS REPORT:" : BEE
P .1,0: PRINT
4050 PRINT "Fuel rods recovered:"
: rs
4060 PRINT "Mission success:"
: INT (rs/14+100): BEEP
.1,0: PRINT : PRINT : PRINT : P
RINT
4070 PRINT "Press:" : PRINT : PRI
NT "1: For mission instructions.
": PRINT "2: To start.": BEEP .1
,0
4080 IF INKEY$="1" THEN GO TO 92
00
4090 IF INKEY$="2" THEN GO TO 90
00
4100 GO TO 4080
4700 FOR q=1 TO 10: PRINT AT ny,
nx: INK 6:"q": INK 2:AT ny,nx:"q"
: BEEP .02,q: NEXT q
4705 PRINT INK 7: PAPER 0:AT 0,2
:"OPERATIVE INJURED.PRESS 'X' :A
T 21,0:"FOR MEDICAL ATTENTION &
RE-START": BEEP .1,0
4710 IF INKEY$="X" THEN GO TO 47
40
4720 GO TO 4710
4730 CLS : GO TO 9010
4740 PRINT INK 1:AT 0,0:
4745 PRINT INK 1:AT 21,0:
4750 BORDER 0: PRINT AT ny,nx: I
NK c,"q": GO TO 1000
5000 IF c<>3 THEN GO TO 5100
5010 LET c=0: LET rc=rc-1
5020 FOR x=-40 TO 40 STEP 10
5030 PRINT INK 2:AT ny,nx:"0"
5040 LET ny=ny-1
5050 PRINT INK c:AT ny,nx:"q"
5060 LET rs=rs+1: IF rs=14 THEN
GO TO 6000
5070 RETURN

```

```

5100 LET ny=ny-1: RETURN
5200 IF c=3 THEN GO TO 5300
5210 LET c=3
5220 FOR x=1 TO 7: PRINT INK x:A
T ny,nx:"q": BEEP .5,8*x: NEXT x
: RETURN
5300 LET ny=ny+1: RETURN
6000 PAUSE 100: PAPER 7: INK 1:
BORDER 2: BRIGHT 1: CLS
6020 PRINT "MISSION COMPLETED:"
: BEEP .1,10: PRINT
6030 PRINT "All rods recovered.
Station now safe.
Congratulations.": B
EEP .1,10
6040 PRINT : PRINT : PRINT : PRI
NT : PRINT : PRINT : PRINT : GO
TO 4070
9000 PAPER 7: BRIGHT 0: CLS : LE
T c=0: LET ny=19: LET nx=15: LET
rs=0: LET gx=4: LET m=0: LET rc
=17
9010 PRINT INK 1:" "
9020 PRINT INK 1:" " : FOR x=2 T
O 20 STEP 2: PRINT AT 1,x: INK 3
: FLASH 1:"q": INK 1: FLASH 0:"
": NEXT x: PRINT AT 1,30: INK 1:
" "
9030 PRINT INK 1:" " : INK 7:"
1:" " : INK
9035 FOR y=3 TO 15 STEP 2: PRINT
AT y,0: INK 1:"q": INK 7:"
": INK 1:
"q": PRINT AT 4+1,0: INK 1:"
": FOR x=3 TO 25 STEP 2: PRINT
AT y+1,x: INK 7:" " : INK 1:"q":
NEXT x: PRINT INK 7:" " : INK 1:
" " : NEXT y
9040 PRINT INK 1:" " : INK 7:"
1:" " : INK
9045 PRINT INK 1:" " : INK 7:" "
: INK 1:" " : INK 1:" " : INK 1:
" " : INK 7:" " : INK 1:" "
9050 PRINT INK 1:" " : INK 7:"
1:" " : INK
9055 PRINT INK 1:" " : FOR x=2 T
O 20 STEP 2: PRINT AT 20,x: INK
0:"q": INK 1:" " : NEXT x: PRINT
AT 20,30: INK 1:" "
9060 PRINT INK 1:" "
9070 PRINT INK c:AT ny,nx:"q"
9080 GO TO 1000
9200 CLS : INK 6: PAPER 0: BORDE
R 0: CLS
9210 PRINT "LOCATION:" : BEEP .5,
10: PRINT : PRINT "A FULLY AUTOM
ATED NUCLEAR POWER STATION PATRO
LLED BY GUARDIAN ROBOTS AND PR
OTECTED BY A LASER DEFENCE MECHA
NISM.": BEEP .5,10
9240 PAUSE 600: CLS : PRINT "PRO
BLEM.": BEEP .5,10: PRINT : PRIN
T "FUEL ROD HANDLING MALFUNCTION
. ALL RODS EXPOSED.
TIME TO CRITICAL RADIOACTIVE
RUNAWAY CONDITION: UNKNOWN":
BEEP .5,10
9250 PAUSE 600: CLS : PRINT "MIS
SION.": BEEP .5,10: PRINT : PRIN
T "YOUR MISSION SHOULD YOU DECID
E TO TAKE IT IS TO ENTER THE PO
WERSTATION AND MOVE THE FUEL ROD
S INTO PROTECTIVE LEAD CONTAINE
RS.": BEEP .5,10
9310 PAUSE 600: CLS : INK 5: PRI
NT "TOP SECRET": BEEP .5,10: PRI
NT : PRINT "BRIEF.": PRINT : PRI
NT "1: The fuel rods are located
at the top of the screen and ca
n be recognised easily as they ha
ve flashing radiation warning
indicators attached.": BEEP
.5,10
9320 PRINT : PRINT "2: The lead
containers are situated in
a corridor at the base of the

```


BEYOND

CHALLENGING SOFTWARE

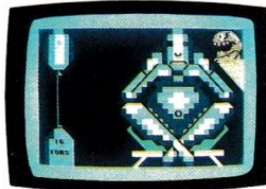


SONAR contact
and the depth charges
tumble



NOBODY'S GETTING THEIR CLAWS
ON MY JEWEL!

RUNS ON COMMODORE
64



Death lurked under
every wave

Red Alert Alien Intruder!



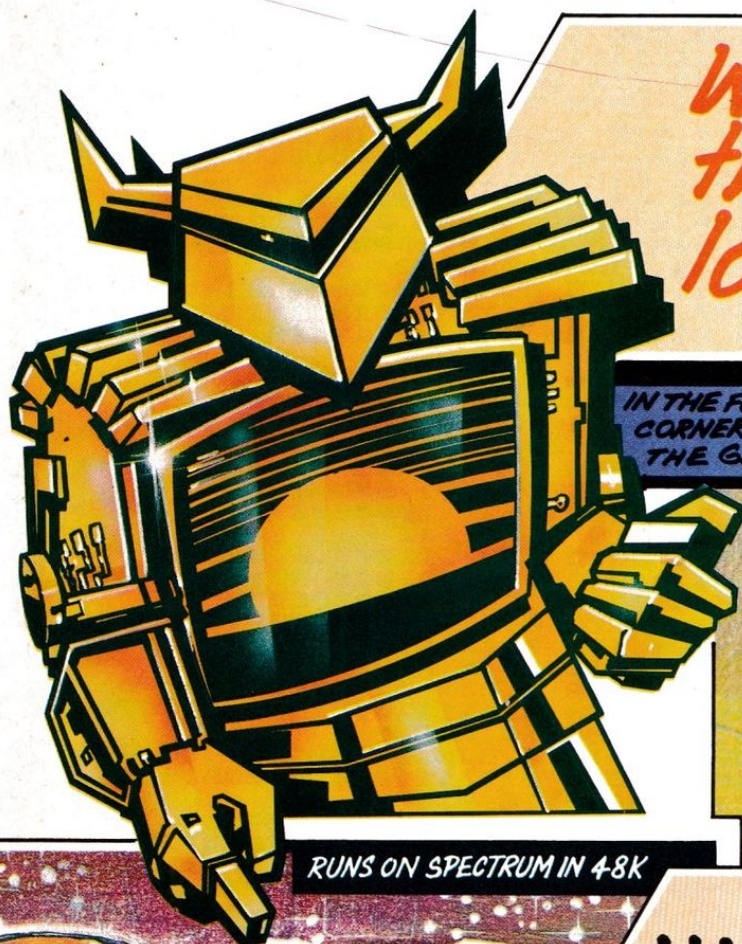
...I must keep it out of the main corridors



ATARI 400/800
WITH 48K

RUNS ON
DRAGON 32





*What's worse
than being
lost in space...*

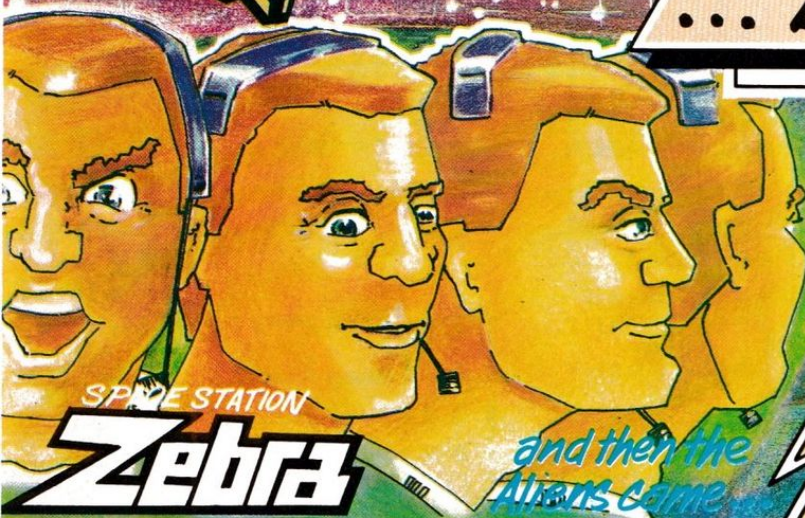
IN THE FURTHEST
CORNER OF
THE GALAXY



SPINNING SILENTLY
IN SPACE

RUNS ON SPECTRUM IN 48K

... BEING FOUND!



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```

screen.": BEEP .5,10
9330 PRINT : PRINT "3: You must
transport the rods to these con-
tainers avoiding the laser fire a-
nd guardian robot.": BEEP .5,10
9340 PRINT : PRINT "Press
s X to select controls."
9350 IF INKEY$="X" THEN GO TO 93
60
9355 GO TO 9350
9375 CLS : INK 7: PRINT "CONTROL
SELECTION.": PRINT : PRINT "CUR
SOR KEYS (Press C)": PRINT : PRI
NT "KEMPSTON J/STICK (Press J)":
BEEP .5,10
9380 IF INKEY$="C" THEN GO TO 94
00
9385 IF INKEY$="J" THEN GO TO 94
20
9390 GO TO 9380
9400 LET J=2000
9410 GO TO 9000
9420 LET J=2050
9430 GO TO 9380
9500 FOR n=0 TO 7: READ a: POKE
USR "a"+n,a: NEXT n
9505 FOR n=0 TO 7: READ a: POKE
USR "b"+n,a: NEXT n
9510 FOR n=0 TO 7: READ a: POKE
USR "c"+n,a: NEXT n
9515 FOR n=0 TO 7: READ a: POKE
USR "d"+n,a: NEXT n
9520 FOR n=0 TO 7: READ a: POKE
USR "e"+n,a: NEXT n
9525 FOR n=0 TO 7: READ a: POKE
USR "f"+n,a: NEXT n
9530 FOR n=0 TO 7: READ a: POKE
USR "g"+n,a: NEXT n
9535 FOR n=0 TO 7: READ a: POKE
USR "h"+n,a: NEXT n
9540 FOR n=0 TO 7: READ a: POKE
USR "i"+n,a: NEXT n
9545 FOR n=0 TO 7: READ a: POKE
USR "j"+n,a: NEXT n
9550 FOR n=0 TO 7: READ a: POKE
USR "k"+n,a: NEXT n
9555 FOR n=0 TO 7: READ a: POKE
USR "l"+n,a: NEXT n
9560 FOR n=0 TO 7: READ a: POKE
USR "m"+n,a: NEXT n
9565 FOR n=0 TO 7: READ a: POKE
USR "n"+n,a: NEXT n
9570 FOR n=0 TO 7: READ a: POKE
USR "o"+n,a: NEXT n
9575 FOR n=0 TO 7: READ a: POKE
USR "p"+n,a: NEXT n
9580 FOR n=0 TO 7: READ a: POKE
USR "q"+n,a: NEXT n
9585 FOR n=0 TO 7: READ a: POKE
USR "r"+n,a: NEXT n
9590 FOR n=0 TO 7: READ a: POKE
USR "s"+n,a: NEXT n
9595 FOR n=0 TO 7: READ a: POKE
USR "t"+n,a: NEXT n
9600 FOR n=0 TO 7: READ a: POKE
USR "u"+n,a: NEXT n
9650 RETURN
9700 DATA 0,BIN 00001000,BIN 000
11100,BIN 00101010,BIN 00001000,
BIN 00010100,BIN 00010100,BIN 00
10100
9705 DATA 0,0,0,0,0,0,0,BIN 0000
1000
9710 DATA BIN 00011100,BIN 00101
100,BIN 00021000,BIN 00010100,BI
N 00010100,BIN 00010000,0,0
9715 DATA 0,0,0,0,0,BIN 00001000,B
IN 00011100,BIN 00011010,BIN 000
01000
9720 DATA BIN 00010100,BIN 00010
100,BIN 00000100,0,0,0,0,0
9725 DATA 0,BIN 00000010,BIN 000
00010,BIN 00000110,BIN 00000011,
BIN 00000010,BIN 00000101,BIN 00
000100
9730 DATA 0,BIN 01000000,BIN 010
00000,BIN 01100000,BIN 11000000,
BIN 01000000,BIN 10100000,BIN 00
100000
9735 DATA 0,0,0,BIN 10101010,BIN
01010101,0,0,0

```

```

9740 DATA BIN 00111100,BIN 00111
100,BIN 11111111,BIN 11111111,SI
N 11111111,BIN 11111111,BIN 0011
1100,BIN 00111100
9745 DATA BIN 01111110,BIN 11000
011,BIN 10100101,BIN 10011001,BI
N 10011001,BIN 10100101,BIN 1100
0011,BIN 01111110
9750 DATA BIN 00000000,BIN 00000
000,BIN 00000000,BIN 00011000,BI
N 00011000,BIN 00000000,BIN 0000
0000,BIN 00000000
9755 DATA BIN 00000000,BIN 00000
000,BIN 00111100,BIN 00100100,BI
N 00100100,BIN 00111100,BIN 0000
0000,BIN 00000000
9760 DATA BIN 00000000,BIN 01111
110,BIN 01000010,BIN 01000010,BI
N 01000010,BIN 01000010,BIN 0111
1110,BIN 00000000
9765 DATA BIN 11111111,BIN 10000
001,BIN 10000001,BIN 10000001,BI
N 10000001,BIN 10000001,BIN 1000
0001,BIN 11111111
9770 DATA BIN 11100000,BIN 11010
000,BIN 01000000,BIN 01000000,BI
N 10100000,BIN 00100000,0,0
9775 DATA 0,BIN 00011000,BIN 001
11100,BIN 01111110,BIN 01111110,
BIN 00111100,BIN 00011000,0
9780 DATA 0,BIN 01100000,BIN 011
01000,BIN 01111110,BIN 01101000,
BIN 01100000,0,0
9785 DATA 0,BIN 00000110,BIN 000
10110,BIN 01111110,BIN 00010110,
BIN 00000110,0,0
9790 DATA 0,BIN 00010000,BIN 000
10000,BIN 00111000,BIN 00010000,
BIN 01111100,BIN 01111100,0
9795 DATA BIN 10100101,BIN 11111
111,BIN 10011001,BIN 01011010,BI
N 01111110,BIN 00100100,BIN 0001
1000,0
9800 DATA BIN 01111110,BIN 11111
111,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11111111,BIN 1111
1111,BIN 01111110
9820 PAPER 0: BORDER 0: CLS : LE
T J=0
9825 FOR y=1 TO 4: INK y
9830 INK y
9850 LET J=J+1: IF J=30 THEN GO
TO 9200: BEEP .5,-25: CLS : PRIN
T
9853 BEEP .5,-25: CLS : PRINT
9860 PRINT "
9865 PRINT "
9870 PRINT "
9880 PRINT "
9890 PRINT : PRINT
9900 PRINT "
9905 PRINT "
9910 PRINT "
9915 PRINT "
9930 PRINT : PRINT : PRINT
9935 PRINT "
9945 PRINT "
9950 PRINT "
9965 PRINT "
9975 NEXT y
9977 GO TO 9825
9980 GO TO 9200
9990 DATA 3,4,3,4,3,4,5,6,7,8,9,
8,7,6,5,6,7,6,5,6,7,8,9,10,11,12,
13,14,15,16,17,18,17,16,15,14,1
4,13,12,13,14,13,12,13,14,15,16,
17,18,17,16,17,18,19,20,21,22,23,
24,24,23,22,23,24,25,26,27,28,2
7,26,25,26,27,28,2

```


HANGMAN

One problem with playing Hangman with a pencil and paper is that you need an opponent. If you can't find one, then DJ Brown's version of the game lets you play against your ZX81.

If you get bored guessing the

words held in line 5030 of the program, you could add more using the same format, or even replace the lot. The program also lets two people play, one player entering a word for the other player to guess.

Each time you try a letter which

doesn't appear in the word, another piece of the hanging man appears on the screen until . . . You're dead.

The part of the program which holds the graphics to do this is between lines 3100 and 4190.

PROGRAMME "HANGMAN"

EDIT LINE 5030 TO CHANGE
COMPUTERS VOCABULARY

```

1 PRINT "      *** HANGMAN ***"
2 PRINT
5 LET G=0
20 RAND
50 PRINT "PLAY COMPUTER OR FRIEND?"
END? " (TYPE "F" FOR FRIEND)"
60 INPUT O$
70 CLS
75 LET S=3
80 IF O$<>"F" THEN GOTO 5000
90 PRINT AT 3,0;"TYPE WORD: -"
100 INPUT W$
110 PRINT AT 3,0;"
112 SLOW
115 LET L=LEN W$
120 DIM R(L)
500 FOR N=1 TO L
510 PRINT AT 0,N;"-"
520 NEXT N
700 PRINT AT 3,0;"TRY A LETTER: -"
710 PRINT AT 5,0;"( "*" TO STOP)"
800 INPUT T$
805 PRINT AT 3,0;"
810 LET I=1
820 IF T$="*" THEN GOTO 3000
1000 FOR N=1 TO L
1010 IF T$=W$(N TO N) THEN GOSUB 2000
2000 NEXT N
1020 LET T=0
1030 FOR N=1 TO L
1031 LET T=T+R(N)
1032 NEXT N
1033 IF T=L THEN GOTO 3000
1040 LET S=S+1
1050 GOSUB 2700+100*S
1060 GOTO 700
2000 PRINT AT 0,N;T$
2010 LET R(N)=1
2020 LET I=0
2030 RETURN
3000 RETURN
3100 PRINT AT 21,0;"
3190 RETURN
3200 PRINT AT 20,2;"
3201 PRINT AT 19,2;"
3202 PRINT AT 18,2;"
3203 PRINT AT 17,2;"
3204 PRINT AT 16,2;"
3205 PRINT AT 15,2;"
3290 RETURN
3300 PRINT AT 14,2;"
3301 PRINT AT 13,2;"
3302 PRINT AT 12,2;"
3303 PRINT AT 11,2;"
3304 PRINT AT 10,2;"
3305 PRINT AT 9,2;"
3390 RETURN
3400 PRINT AT 8,2;"

```

```

3490 RETURN
3500 PRINT AT 9,7;"
3501 PRINT AT 10,7;"
3590 RETURN
3600 PRINT AT 11,7;"
3601 PRINT AT 12,7;"
3602 PRINT AT 13,7;"
3690 RETURN
3700 PRINT AT 12,5;"
3701 PRINT AT 13,5;"
3702 PRINT AT 13,6;"
3703 PRINT AT 14,6;"
3704 PRINT AT 14,7;"
3790 RETURN
3800 PRINT AT 14,8;"
3801 PRINT AT 13,9;"
3802 PRINT AT 12,10;"
3890 RETURN
3900 PRINT AT 14,7;"
3901 PRINT AT 15,7;"
3902 PRINT AT 16,7;"
3990 RETURN
4000 PRINT AT 16,5;"
4001 PRINT AT 16,6;"
4002 PRINT AT 17,6;"
4003 PRINT AT 17,7;"
4090 RETURN
4100 PRINT AT 17,8;"
4101 PRINT AT 18,9;"
4190 PRINT AT 1,14;"YOU'RE DEAD"
4195 PRINT AT 3,10;"THE WORD WAS"
4200 GOTO 9010
4290 RETURN
5000 PRINT AT 3,0;"THINKING..."
5002 PAUSE 50
5004 FAST
5030 LET S$="BADGER/BAT/BEAR/BUFFALO/CAMEL/CAT/CHAMOIS/CHIMPANZE/COW/COYOTE/DEER/DOG/DONKEY/DROMEDARY/ELEPHANT/FOX/GIRAFFE/GNU/GOAT/HIPPOPOTAMUS/HORSE/HYENA/IMPALA/KANGAROO/LEMUR/LION/LLAMA/LYNX/MONGOOSE/MOOSE/OTTER/PANDA/PIG/RHINOCEROS/SHEEP/TIGER/WALLABY/WILDEBEESTE/WOLF/ZEBRA"
5040 LET TW=40
5050 LET NW=INT (RND*TW)+1
5060 LET XW=0
5070 LET W$=""
5080 FOR X=1 TO NW-1
5090 LET XW=XW+1
6000 IF XW>LEN S$ THEN GOTO 70
6010 IF S$(XW)<>"/" THEN GOTO 5090
6020 NEXT X
6030 LET XW=XW+1
6040 IF XW>LEN S$ THEN GOTO 110
6050 IF S$(XW)="/" THEN GOTO 110
6060 LET W$=W$+S$(XW)
6070 GOTO 6030
8900 GOTO 70
9000 PRINT AT 21,10;"SAVED"
9010 PAUSE 150
9020 GOTO 70
9900 LET N$="HANGMAN"
9910 SAVE N$
9920 RUN
9999 STOP

```


FRUIT MACHINE

```

L.
0 REM *****
1 REM ** FRUIT MACHINE **
2 REM **      by      **
3 REM ** Nick Dudley **
4 REM *****

10 ON ERROR BUST%=0:VDU 4:PROC BUST
100 oldA=RND(7):oldB=RND(7):oldC=RND(7)
200 MONEY%=100
300 BUST%=0
400 MODE 2
500 VDU 19,15,7,0,0,0,19,8,0,0,0,0
600 DIM A$(7),B$(7),C$(7)
700 VDU 23:8202;0;0;0;
800 *FX11,0
900 F%=0:F2%=0:F3%=0
1000 H=0:H2=0:H3=0
1100 PROCSETUP
1200 PROCAGAIN
1300 IF BUST%=1 THEN 1600
1400 REPEAT
1500 PROCSPIN:PROCSCORE:PROCAGAIN:UNTIL BUST%=1
1600 END
1700 END
1800 DEFPROCSPIN
1900 IF MONEY%=0 THEN END
2000 MONEY%=MONEY%-10:PROCCASH
2100 IF F%=1 THEN H=1 ELSE H=0
2200 IF F2%=1 THEN H2=1 ELSE H2=0
2300 IF F3%=1 THEN H3=1 ELSE H3=0
2400 TW=200
2500 S=25:NS=0
2600 IF H=1 THEN A=oldA ELSE A=RND(9)
2700 IF H2=1 THEN B=oldB ELSE B=RND(9)
2800 IF H3=1 THEN C=oldC ELSE C=RND(9)
2900 S%=RND(5):S2%=RND(5):S3%=RND(5)
3000 REPEAT
3100 IF H=1 THEN GOTO 3300
3200 A=A+1:IF A>7 THEN A=0
3300 IF H2=1 THEN GOTO 3500
3400 B=B+1:IF B>7 THEN B=0
3500 IF H3=1 THEN GOTO 3700
3600 C=C+1:IF C>7 THEN C=0
3700 COLOUR(A MOD 6)+1:PRINTTAB(7,11);A$(A):COLOUR(B MOD 6)+1:PRINTTAB(9,11);B$(B):COLOUR(C MOD 6)+1:PRINTTAB(11,11);C$(C)
3800
3900 SOUND1,-10,10,2
4000 IF NS>=25+S% THEN H=1
4100 IF NS>=25+S% THEN SOUND 1,-13,50,2
4200 IF NS>=30+S2% THEN H2=1
4300 IF NS>=30+S2% THEN SOUND 1,-13,50,2
4400 IF NS>=36+S3% THEN H3=1
4500 FOR V=1 TO TW:NEXT:NS=NS+1:TW=TW+10
4600 UNTIL NS>=36
4700 SOUND 1,-13,50,1
4800 H=0:H2=0:H3=0
4900 F%=0:F2%=0:F3%=0
5000 oldA=A:oldB=B:oldC=C
5100 PRINTTAB(7,9) " "
5200 ENDPROC
5300 DEFPROCSETUP
5400 A=oldA:B=oldB:C=oldC
5500 VDU 23,224,1,7,26,228,228,238,14,14,23,225,8,106,255,255,255,255,126,36,23,226,0,60,126,255,255,126,60,0,23,227,1,2,52,120,252,252,120,48
5600 VDU 23,228,0,0,255,129,129,255,0,0,23,229,24,60,60,126,126,126,255,24,23,230,102,255,255,126,126,60,60,24,23,231,255,255,24,24,24,216,248,248
5700 FOR X=0 TO 7:A$(X)=CHR$(224+X):B$(X)=CHR$(224+X):C$(X)=CHR$(224+X):NEXT
5800 VDU 23,245,24,60,126,255,255,126,60,24,23,244,255,255,255,255,255,255,255
5900 GCOLOR,3
6000 MOVE 192,0:DRAW 192,768:DRAW 336,768:DRAW 336,928:DRAW 880,928:DRAW 880,768:DRAW 1024,768:DRAW 1024,0:DRAW 192,0
6100 MOVE 1024,96:DRAW 1072,96:DRAW 1072,32:DRAW 1120,32:PLOT 85,1120,768:DRAW 1072,768:PLOT 85,1072,160:DRAW 1024,160:PLOT 85,1024,96:MOVE 1072,96:PLOT 85,1072,160
6200 GCOLOR,7
6300 MOVE 240,720:DRAW 336,720:DRAW 336,800:DRAW 240,800:DRAW 240,720:MOVE 880,720
6400 DRAW 976,720:DRAW 976,800:DRAW 880,800:DRAW 880,720
6500 FOR X=10 TO 28 STEP 2:READ CH$:COLOUR X MOD 5+1:PRINTTAB(4,X)CH$:PRINTTAB(14,X)CH$:NEXT
6600 DATA 5,0,1,0,3,0,1,0,2,0
6700 FOR X=144 TO 656 STEP 64:MOVE 240,X:DRAW 336,X:MOVE 880,X:DRAW 976,X:NEXT
6800 GCOLOR,1:MOVE 432,432:DRAW 784,432:DRAW 784,496:DRAW 432,496:DRAW 432,432
6900 COLOUR1:PRINTTAB(7,17)"F"
7000 GCOLOR,4
7100 MOVE 416,608:DRAW 800,608:DRAW 800,694:DRAW 416,694:DRAW 416,608:MOVE 544,608
7200 DRAW 544,694:MOVE 672,608:DRAW 672,694
7300 COLOUR(A MOD 6)+1:PRINTTAB(7,11);A$(A):COLOUR(B MOD 6)+1:PRINTTAB(9,11);B$(B):COLOUR(C MOD 6)+1:PRINTTAB(11,11);C$(C)
7400 VDU5:GCOLOR,5:MOVE 448,880:PRINT"FRUIT":MOVE 384,829:PRINT"MACHINE":VDU4
7500 GCOLOR,1
7600 MOVE 1100,870:MOVE 1100,962
7700 FOR X=1 TO 361 STEP 10:Z=RAD(X):MOVE 1100,870:PLOT 81,SIN(Z)*104,COS(Z)*104:

```

Have you ever wanted to play the slot machines but not had the money? If you have, then Nick Dudley's program Fruit Machine will let you play as often as you want on your BBC Micro, free!

The scores are:

Two adjacent fruit the same £20
Opposite sides the same £30
All three the same £100
All three 'J's £200

Special Commands

REPEAT — UNTIL loops. These repeat a set of lines until certain conditions are met.

Procedures — PROC. These are subroutines that are called by names, eg PROCSCORE. The PROCs are defined with the DEFPROC and ENDPROC statement.

*FX11,0 stops, ie repeat function on the keyboard.

VDU 23:8202;0;0; — removes the flashing cursor.

VDU 23 — followed by other numbers defines the CHR\$'s which form the fruits.

MOD — gives the remainder of a division sum, eg 6 MOD 4 = 2.

ON ERROR — this makes the computer do something if an error occurs, eg ON ERROR RUN will make the program run if an error occurs instead of stopping and reporting it. (It is advisable to miss this statement out until you have debugged your program).

To Load

*TAPE If you have a DFS
PAGE = &E00 (disk interface)
CHAIN "FRUIT"

Playing instructions

£10 is automatically deducted every time you spin. To start the reels spinning use the space bar. When a hold chance appears, 1, 2, 3 hold their respective columns. (You have three seconds). When a nudge chance appears, 1, 2, 3 nudge their respective columns. (You have three seconds).

When you win something the amount will be displayed in the centre box. You can now gamble your winnings or collect them.

To gamble — space bar

To collect — C

Gambling

To start gambling, press space bar. This will cause a white light to start flashing up the columns on either side of the machine. Your aim is to stop it on the highest number in that column. To stop the light, press the space bar. Your score will then be multiplied by the number the light stops on. If it stops on zero, you win nothing.


```

NEXT
7600 PROCCASH
7700 SOUND 1,-13,33,3:SOUND 1,-13,49,3:SOUND 1,-13,61,3:SOUND 1,-13,33,3:SOUND
1,-13,49,3:SOUND 1,-13,61,3:SOUND 1,-13,33,3:SOUND 1,-13,49,3:SOUND 1,-13,61,3:S
OUND 1,0,61,8
7800 SOUND 1,-13,61,3:SOUND 1,0,61,3:SOUND 1,-13,61,3:SOUND 1,-13,49,3:SOUND 1,
0,49,3:SOUND 1,-13,49,3:SOUND 1,-13,33,3:SOUND 1,0,33,3
7900 ENDPROC
8000 REM
8100 DEFPROCSCORE
8200 IFRND(4)=4 THENPROCNUDGE
8300 IF A=B AND A=C AND A=7 THEN GOTO 9200
8400 IF A=B AND A=C THEN GOTO 8800
8500 IF A=B OR B=C THEN GOTO 9000
8600 IF A=C THEN 9100
8700 ENDPROC
8800
8900 FOR X=255 TO 1 STEP -5:SOUND 1,-13,X,1:SOUND1,-15,255-X,1:NEXT:WIN%=100:CO
LOUR1:PRINTTAB(8,17);WIN%:PROCGAMBLE:ENDPROC
9000 FOR X=1 TO255 STEP 10:SOUND 1,-15,X,1:NEXT:WIN%=20:COLOUR1:PRINTTAB(8,17);
WIN%:PROCGAMBLE:ENDPROC
9100 WIN%=30:FOR X=255 TO 1 STEP -5:SOUND 1,-13,X,1:NEXT:COLOUR1:PRINTTAB(8,17)
;WIN%:PROCGAMBLE:ENDPROC
9200 WIN%=200:FOR X=255 TO 1 STEP -5:SOUND 1,-13,X,1:SOUND 1,-13,255-X,1:NEXT:C
OLOUR1:PRINTTAB(8,17);WIN%:PROCGAMBLE:ENDPROC
9300 DEFPROCAGAIN
9400 :COLOUR7:PRINTTAB(7,25)"START"
9500 IF MONEY%=0 THEN PROCBUST:BUST%=1:ENDPROC
9600 FORX=1TO1000:NEXT
9700 COLOUR 1:PRINTTAB(7,17)" "
9800 BUST%=0
9900 SPIN$=GET$
10000
10100 BUST%=0
10200 IFSPIN$=" " AND RND(4)=4 THEN PRINTTAB(7,25)" " :PROCHOLD
10300 IF SPIN$=" " PRINTTAB(7,25)" " :ENDPROC
10400 GOTO 9900:ENDPROC
10500 DEFPROCHOLD
10600 SOUND 1,-15,100,2:SOUND1,-15,150,5
10700 GCOL0,3:VDU5:MOVE480,760:PRINT"HOLD":VDU4
10800 TIME=0
10900 REPEAT: HOLD$=INKEY$(1):IF HOLD$="1" THEN F%=1:SOUND1,-14,75,1:GOSUB11300:
ELSE IF HOLD$="2" THEN F2%=1:SOUND1,-14,75,1:GOSUB 11400:ELSE IF HOLD$="3" THEN
F3%=1:SOUND1,-14,75,1:GOSUB11500
11000 UNTIL TIME=300
11100 PRINTTAB(7,8)" "
11200 ENDPROC
11300 COLOUR1:PRINTTAB(7,9);CHR$245:RETURN
11400 COLOUR1:PRINTTAB(9,9);CHR$245:RETURN
11500 COLOUR1:PRINTTAB(11,9);CHR$245:RETURN
11600 DEFPROCCASH
11700 COLOUR7
11800 PRINTTAB(5,0)"CASH: ";MONEY%:" "
11900 ENDPROC
12000 DEFPROCBUST
12100 CLS:TIME=0:IF BUST%=1:COLOUR1:PRINTTAB(4,10)"YOU'RE BUST"
12150COLOUR7:PRINTTAB(1,15)"DO YOU WISH TO PLAY"" AGAIN (Y/N)":AGAIN$=GET$:
IF AGAIN$="Y" THEN RUN:ELSE IF AGAIN$="N":CLS:END:ELSE 12150
12200 ENDPROC
12300 DEFPROCNUDGE
12400 COLOUR3:PRINTTAB(7,9)"NUDGE"
12500 SOUND1,-15,150,2:SOUND1,-15,100,4
12600 TIME=0
12700 REPEAT
12800 N$=INKEY$(1)
12900 IF N$="1" THEN A=A+1:SOUND1,-14,75,1:ELSE IF N$="2" THEN B=B+1:SOUND1,-14,
75,1:ELSE IF N$="3" THEN C=C+1:SOUND1,-14,75,1
13000 IF A>7 THEN A=0:ELSE IF B>7 B=0:ELSE IF C>7 C=0
13100 COLOUR(A MOD 6)+1:PRINTTAB(7,11);A$(A):COLOUR(B MOD 6)+1:PRINTTAB(9,11);B$
(B):COLOUR(C MOD 6)+1:PRINTTAB(11,11);C$(C)
13200 UNTIL TIME>300
13300 PRINTTAB(7,9)" "
13400 oldA=A:oldB=B:oldC=C
13500 ENDPROC
13600 DEFPROCGAMBLE
13700 VDU 5:GCOL0,7:MOVE 416,220:PRINT"GAMBLE":VDU4:COLOUR2:PRINTTAB(6,26)"COLLE
CT"
13800 GAM$=GET$:IF GAM$="C" THEN MONEY%=MONEY%+WIN%:PRINTTAB(6,25)" " :FORX
=1TO3000:NEXT:PRINTTAB(6,26)" " :PROCCASH:WIN%=0:ENDPROC
13900 IF GAM$=" " THEN 14000 ELSE 13800
14000 PRINTTAB(6,26)" " :GAM%=RND(10)*64+128:VDU5:GCOL4,0
14100 REPEAT
14200 GAM%=GAM%+(RND(5)*64):IF GAM%>704 THEN GAM%=GAM% MOD 704:IF GAM%<128 THEN
GAM%=GAM%+RND(4)*64
14300 MOVE 262,GAM%:PRINTCHR$244:MOVE 903,GAM%:PRINTCHR$244
14400 MOVE 262,GAM%:PRINTCHR$244:MOVE 903,GAM%:PRINTCHR$244
14500 SOUND 1,-14,100,1
14600 GAM2$=INKEY$(0):UNTIL GAM2$=" "
14700 SOUND1,-15,150,3
14800 MOVE262,GAM%:PRINTCHR$244:MOVE 903,GAM%:PRINTCHR$244
14900 T=TIME+200:REPEAT UNTIL TIME>=T
15000 GCOL4,0:MOVE 262,GAM%:PRINTCHR$244:MOVE 903,GAM%:PRINTCHR$244
15100 RESTORE 15800
15200 REED%=(GAM%/64)-2:FOR X=0TOREED%:READ CH:NEXT:WIN%=WIN%*CH:MONEY%=MONEY%+W
IN%
15300 VDU4:COLOUR1:PRINTTAB(7,17)" " :PRINTTAB(7,17)" " :WIN%
15400 WIN%=0
15500 T=TIME+100:REPEAT UNTIL TIME>=T
15600 PRINTTAB(6,25)" "
15700 PROCCASH:ENDPROC
15800 DATA 0,2,0,1,0,3,0,1,0,5

```

After this you start again. The computer keeps a record of your money and the game ends if you go bust. If you decide to give up then press ESCAPE.

Program structure

Lines 1400-1500 keep the program going.

PROCSPIN — spins on reels and stops them.

PROCSETUP — draws screen up. Defines fruit and other variables and plays the opening tune.

PROCSCORE — works out how much you have won.

PROCAGAIN — starts the reels spinning.

PROCCASH — displays your credit.

PROCBUST — tells you that you've gone bust and starts the program again.

PROCHOLD — carries out all operations connected with the holds.

PROCGAMBLE — carries out all operations connected with the gamble.

PROCNUDGE — carries out all operations connected with the nudges.

Fruit Machine Variables

A\$(7) contains the fruit in column one

B\$(7) contains the fruit in column two

C\$(7) contains the fruit in column three

A chooses the fruit from A\$(7) to put in column one

B chooses the fruit from B\$(7) to put into column two

C chooses the fruit C\$(7) to put into column three

oldA stores one last value of A from the previous spin

oldB stores one last value of B from the previous spin

oldC stores one last value of C from the previous spin

NS holds the minimum number of spins

TW is the spin speed of the reels, with 200 being slow

Money holds your money

Win is the amount won so far

Bust checks for no money left with Bust being 1 when you've run out

CH\$ collects data and prints the numbers used in the gamble up the side of the screen

Spin\$ starts the reels spinning

Hold\$ gets the input to hold a given reel

N\$ gets the input to nudge a given reel

Gam\$ allows you to gamble or collect

Gam holds the vertical position of the flashing cursor used in the gamble

Gam2\$ gets the input to stop the flashing cursor

LUNAR LANDER

Flying a spacecraft isn't one activity which many people get the chance to do. Unless you've got a Dragon 32, that is.

Paul Bocking's Lunar Lander gives you the task of setting down a spacecraft without either crashing or running your fuel tanks dry. The less fuel you burn during the descent, the higher your score. Could this be the first ecologically-minded space game?

A high score table and good use of the Dragon's colour and sound give the program a professional look. The ship is controlled via a

joystick plugged into the right hand port. If you haven't got a joystick, replacing lines 220 to 290 by:

```
220 AS = INKEY$
230 IF AS="A" THEN 270
240 IF AS="Z" THEN 280
250 IF AS="K" THEN 290
260 RL=RL+1:IF RL > 5 THEN
    RL=5
265 GOTO 300
270 IN=IN-1
275 IF IN < -3 THEN IN = -3
276 GOTO 300
280 IN=IN+1
285 IF IN > 3 THEN IN = 3
286 GOTO 300
```

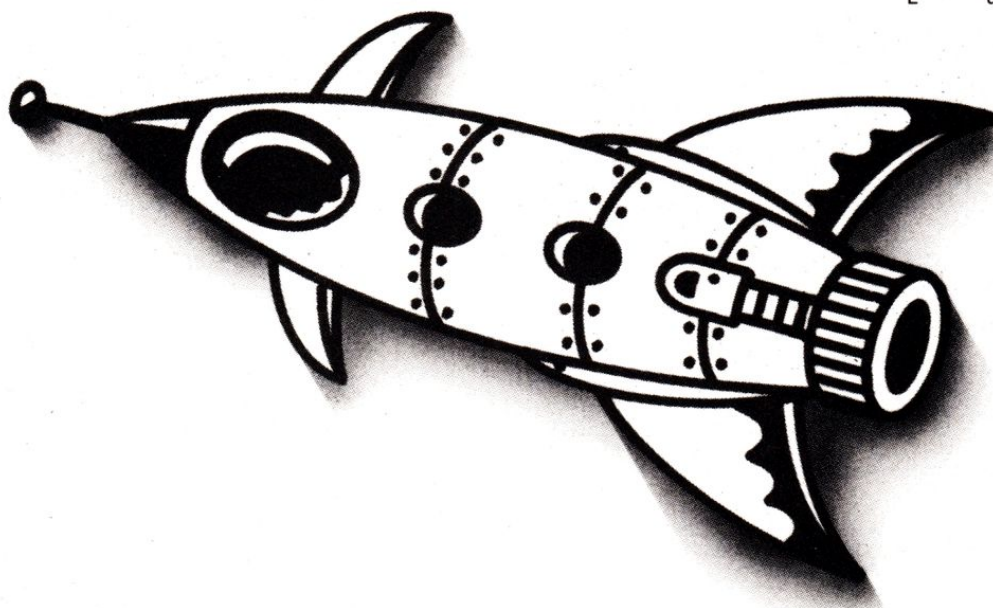
290 RL=RL-1
295 IF RL < -5 THEN RL = -5
will let you use the keyboard. The controls are now

A Move up
Z Move down
K Move left
L Move right

Lunar Lander Variables

HS(N) High score (N)
H\$(N) High scorer's name, maximum length of 9 characters
SC score
LI lives

G gravity — usual value of 1
IN up/down inertia value
RL right/left inertia value
FU fuel left
AB abort count
X x co-ordinate
Y y co-ordinate
P various print @ positions
Q extra life detection
XY ship dimension
SP blank space dimension
CR crashed ship dimension
A 10,000s columns of score
B 1000s column of score
C 100s column of score
D 10s column of score
E units column of score



```
10 POKE411,228:POKE412,203:POKE413,4:POK
E414,237:POKE415,228:POKE410,236:POKE&HF
FD7,0
20 DATA DRAGON 32,10000,9000,8000,7000,6
000,5000,4000,3000,2000,1000
30 FORN=1TO10:RESTORE:READH$(N):NEXTN:FO
RN=1TO10:READHS(N):NEXTN
40 SOUND100,1
50 CLS4:PRINT@233,"LUNAR LANDER";:PRINT@
297,"BY P. BOCKING";:FORN=0TO3000:NEXTN:C
LS4
60 PRINT@232,"INSTRUCTIONS(Y/N)";
70 AS=INKEY$:IFA$="N" THEN 1870
80 IF AS="Y" THEN 1620
90 GOTO60
100 DIMXY(10,10),BL(10,10),R(3),CR(10,10
)
110 SC=0:LI=3:G=1
120 A=140
130 PMODE3,1:PCLS3
140 POKE411,228:POKE412,203:POKE413,4:PO
KE414,237:POKE415,228:POKE410,236
150 GOTO490
160 IN=3
```

```
170 FU=112
180 RL=5:AB=1
190 X=10:Y=10
200 REM*****
210 SCREEN1,0
220 J1=JOYSTK(0):J2=JOYSTK(1)
230 IN=IN-((63-J2)/80)
240 IF IN>3THEN IN=3
250 IF IN<-3THEN IN=-3
260 IN=IN+(G+1)/10
270 RL=RL+(J1-32)/100
280 IF RL>5THENRL=5
290 IF RL<-5THENRL=-5
300 XX=X:YY=Y
310 X=X+RL
320 Y=Y+IN
330 IFX>245 THEN X=1
340 IF X<1 THEN X=245
350 IFY<1 THEN Y=1
360 FU=FU-1
370 PUT(XX,YY)-(XX+10,YY+10),BL,PSET:PUT
(X,Y)-(X+10,Y+10),XY,PSET
380 IFPOINT(X,Y-1)=4 THEN 910
390 IFPOINT(X+10,Y-1)=4 THEN 910
```


READERS PROGRAMS

```

400 IF PPOINT(X+10,Y+11)=4 THEN 910
410 IF PPOINT(X,Y+11)=4 THEN 910
420 IF PPOINT(X,Y+11)=2 AND PPOINT(X+10,Y
+11)=2 AND IN <1.4 THEN 780
430 COLOR4,1:LINE(FU,180)-(FU,188),PSET:
COLOR1,4
440 IF FU<10 THEN 910
450 IF FU<30 THEN SOUND200,1
460 FOR N=1 TO 70: NEXT N
470 P=PEEK(65280):IF P=126 OR P=254 THEN
GOSUB 1170
480 GOTO 210
490 PCLS3
500 LINE(0,140)-(0,140),PSET
510 N=0
520 FORM=1 TO 3
530 R(M)=RND(240)
540 NEXT M
550 FORM=1 TO 3
560 IF N>R(M) THEN R(M)=360:GOTO 590
570 NEXT M
580 GOTO 600
590 COLOR2,4:LINE(N,A-2)-(N+12,A-2),PSE
T:LINE(N,A-1)-(N+12,A-1),PSET:COLOR4,1:
LINE(N-4,A)-(N+16,A),PSET:N=N+12:COLOR4,1
600 A=A+RND(20)-10
610 IF A>170 THEN A=170
620 IF A<90 THEN A=90
630 LINE(N,A),PSET
640 N=N+5:IF N>260 THEN 660
650 GOTO 550
660 PAINT(0,192),4,4
670 DRAW"BM0,10;C1;R1U1L1R1U1R1E1F1R1E3U
1H3L1G3D1F3R1E1F1R1D2R1U1":PAINT(4,4),1,
1
680 GET(0,0)-(10,10),XY,G
690 GET(10,10)-(20,20),BL,G
700 LINE(0,0)-(10,10),PSET:LINE(10,0)-(0
,10),PSET:LINE(3,0)-(7,10),PSET:LINE(10,
8)-(0,1),PSET:GET(0,0)-(10,10),CR,G
710 PUT(0,0)-(10,10),BL,PSET
720 COLOR2,4:LINE(10,180)-(110,188),PSET
,BF:COLOR4,1
730 IF LI=1 THEN 750
740 FOR N=2 TO 1:PUT(N*20+75,179)-(N*20+85
,189),XY,PSET:NEXT N
750 GOTO 1420
760 GOTO 160
770 REM*****
780 FORM=1 TO 2:P=71:SCREEN1,1:PLAY"T255L1
01CDEFGAB02CDEFGAB03CDEFGAB04CDEFGAB05CD
EFGABAGFEDC04BAGFEDC03BAGFEDC02BAGFEDC01
BAGFEDC":NEXT M:SCREEN1,0:CLS6:PRINT@P,"C
ONGRATULATIONS!";:PRINT@162,"YOU HAVE SU
CCESFULLY LANDED!";
790 P=260
800 PRINT@P,"YOU SCORED";FU*10;"POINTS!";
;

810 SC=SC+FU*10:Q=Q+FU*10
820 IF Q>4999 THEN LI=LI+1:G=G+1:SOUND20
0,2:Q=0
830 IF G>5 THEN G=5
840 IF LI>5 THEN LI=5
850 IF SC>99999 THEN SC=0
860 P=352
870 PRINT@P,"YOU HAVE A TOTAL SCORE OF";
SC;
880 P=452
890 PRINT@P,"THE GRAVITY LEVEL IS";G;
900 GOTO 120
910 PUT(X,Y)-(X+10,Y+10),CR,PSET
920 SOUND50,1
930 IF X<10 OR X>245 OR Y<10 THEN 970
940 FOR N=1 TO 20
950 LINE(X+5,Y+5)-(RND(20)-5+X,RND(20)-5
+Y),PSET
960 NEXT N
970 FOR N=0 TO 1000: NEXT N
980 IF FU<10 THEN 1890
990 P=135
1000 CLS3:PRINT@75,"OH DEAR!";:PRINT@P,"
YOU HAVE CRASHED!";
1010 C=ABS(INT(3*IN)+1)
1020 C=C/10
1030 P=193
1040 PRINT@P,"YOU FORMED A CRATER";C;"KM
WIDE";
1050 LI=LI-1
1060 IF LI<1 THEN 1080
1070 GOTO 120
1080 P=324:PRINT@P,"YOU HAVE RUN OUT OF
LIVES";
1090 IF SC<1000 THEN P=386 ELSE P=384
1100 PRINT@P,"YOU HAVE A GRAND TOTAL OF"
;SC;+STRING$(45,175)+"POINTS";
1110 GOTO 1220
1120 FOR N=0 TO 5000: NEXT N
1130 GOTO 1340
1140 PRINT@P,"ANOTHER GO (Y/N)";:A$=INKE
Y$:IF A$<>"Y" AND A$<>"N" THEN 1140
1150 IF A$="Y" THEN CLS4:PRINT@234,"PLEAS
E WAIT-";:GOTO 110
1160 POKE&HFFD6,0:POKE410,57:END
1170 IF AB<1 THEN SOUND100,1:RETURN
1180 IN=-4
1190 SOUND1,1
1200 AB=0
1210 RETURN
1220 FOR N=1 TO 10
1230 IF SC>HS(N) THEN 1260
1240 NEXT N
1250 GOTO 1120
1260 FOR D=0 TO 5000: NEXT D
1270 CLS4:PRINT@162,"YOU HAVE A HIGH SCO
RE";
1280 PRINT@226,"TYPE IN YOUR NAME";:INPU

```



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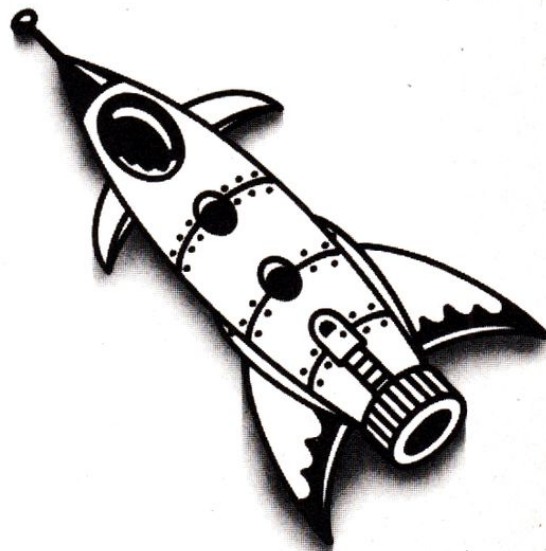
▶ T H$:IF LEN(H$)>9 THEN PRINT@296,"TOO LO
NG-TRY AGAIN";:FORZ=0TO1000:NEXTZ:GOTO12
70
1290 FORM=10TO N+1 STEP-1
1300 HS(M)=HS(M-1)
1310 H$(M)=H$(M-1)
1320 NEXTM
1330 HS(N)=SC:H$(N)=H$
1340 CLS4
1350 PRINT@11,"high scores";
1360 FORN=1TO10
1370 P=32*N+36
1380 P=P+2:PRINT@P,N;:PRINT@P+5,H$(N);:P
RINT@P+16,HS(N);
1390 NEXTN
1400 POKE1024+361,191:POKE1024+15,191
1410 P=456:GOTO1140
1420 N$(1)="BM+8,+0;C2;M-3,+3;M+3,-3;D10
L3R6BM+1,-10"
1430 N$(2)="BM+4,+0;R8D7L8D3R8BM+0,-10"
1440 N$(3)="BM+4,+0;R8D5L6R6D5L8R8BM+0,-
10"
1450 N$(4)="BM+4,+0;D7R8BM-4,-3;D6BM+4,-
10"
1460 N$(5)="BM+4,+0;R8L8D3R8D7L8R8BM+0,-
10"
1470 N$(6)="BM+4,+0;R8L8D5R8D5L8U10R8"
1480 N$(7)="BM+4,+0;R8M-8,+10;BM+8,-10"
1490 N$(8)="BM+4,+0;R8D10L8U10D5R8U5"
1500 N$(9)="BM+4,+0;R8D10U5L8U5R8"
1510 N$(0)="BM+4,+0;R8D10L8U10R8M-8,+10;
M+8,-10"
1520 S=SC
1530 A=INT(S/10000):S=S-A*10000
1540 B=INT(S/1000):S=S-B*1000
1550 C=INT(S/100):S=S-C*100
1560 D=INT(S/10):S=S-D*10
1570 E=INT(S/1):S=S-E*1
1580 DRAW"BM190,178;C2":DRAWN$(A):DRAWN$
(B):DRAWN$(C):DRAWN$(D):DRAWN$(E)
1590 DRAW"BM-50,+0"
1600 LINE(190,174)-(254,192),PSET,B
1610 GOTO760
1620 CLS0
1630 PRINT@9,"INSTRUCTIONS";
1640 PRINT@68,"USE THE RIGHT JOYSTICK "
;
1650 PRINT@100,"TO MOVE THE SHIP.YOU
";
1660 PRINT@132,"HAVE 3 LIVES AND GAIN AN
";
1670 PRINT@164,"EXTRA LIFE AT EACH 5000
";
1680 PRINT@196,"POINTS-UP TO A MAXIMUM
";
1690 PRINT@228,"OF 5.
";
1700 PRINT@260,"IF YOU NEED TO ABORT

```

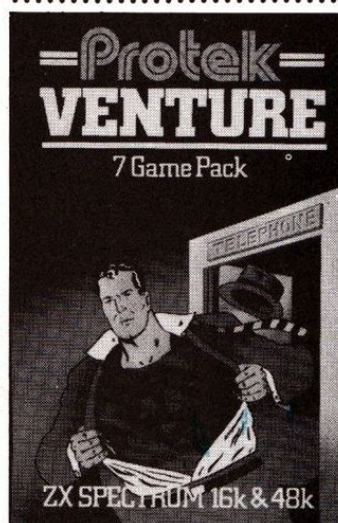
```

";
1710 PRINT@292,"THEN YOU MUST PRESS THE
";
1720 PRINT@324,"JOYSTICK BUTTON-THIS CAN
";
1730 PRINT@356,"ONLY BE DONE ONCE ON
";
1740 PRINT@388,"EACH SHEET.
";
1750 PRINT@455,"PRESS THE SPACE BAR";:A$
=INKEY$:IFA$<>" THEN 1750
1760 SOUND100,1
1770 CLS0
1780 PRINT@9,"INSTRUCTIONS";
1790 PRINT@68,"YOUR SCORE IS PRINTED AT"
;
1800 PRINT@100,"THE RIGHT HAND SIDE OF
";
1810 PRINT@132,"THE SCREEN.
";
1820 PRINT@164,"AT THE END OF THE GAME
";
1830 PRINT@196,"THE HIGH SCORE TABLE IS
";
1840 PRINT@228,"PRINTED.
";
1850 PRINT@455,"PRESS THE SPACE BAR";:A$
=INKEY$:IFA$<>" THEN 1850
1860 SOUND100,1
1870 CLS4:PRINT@234,"PLEASE WAIT-";
1880 GOTO100
1890 CLS3:PRINT@44,"UNLUCKY"+STRING$(49,
175)+"YOU HAVE RUN OUT OF FUEL";
1900 LI=LI-1
1910 IFLI=1 THEN PRINT@165,"YOU HAVE 1 L
IFE LEFT";:GOTO1930
1920 PRINT@165,"YOU HAVE";LI;"LIVES LEFT
.";
1930 PRINT@224,"YOU HAVE A TOTAL SCORE O
F";SC;
1940 GOTO1060

```



SOFT RELEASE



Venture

Computer: Any Spectrum
Price: £4.95
Supplier: Protek, Clydesdale Bank Building, High St, South Queensferry, Edinburgh

This is a seven-game pack with the games all being linked by the fact that you start the first with £1,000 and must see how much, or how little, you have by the end of the seventh.

We will let the first game speak for itself, as described on the cassette sleeve: "Racing: Which duck will win? Choose duck 1, 2 or 3 and watch them race!" Yes, really exciting stuff, watching three ducks move from one side of the screen to the other. The second game is *Fruit Machine*, where you

have ten bets and can win on various combinations of numbers, though the bets curiously enough don't cost you anything so it's impossible to lose.

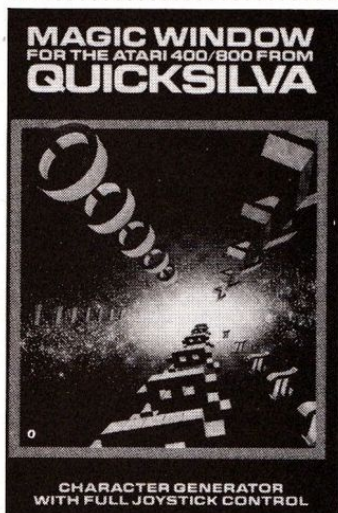
Third comes *Treasure Hunt*, in which one square of an 8 x 8 grid contains some buried treasure and by inputting the grid references the computer gives you a chance of finding it.

Then there's *Mastercode*, and no prizes for guessing that you have to crack the code of four digits that the computer is hiding. And there endeth the first section, which kept us occupied for all of about two minutes.

Crasher has you racing the wrong way down a stock car race-track and attempting to hit as many cars as you can in the time allowed. Every car you hit over 100 scores

you £20 to add to your running total, and while the graphics are nothing special at least it's an improvement on ducks and there is, a passing landscape of sorts. The second game in this section is *Bomber*, the old favourite where you must clear a landing patch as your plane gets lower and lower over a row of skyscrapers, and if you fail the screen prints the message, 'Send for Superman.'

Finally there's *Ad-venture*, where the cursor keys move a man round a tiny maze and you must pick up £2,000 worth of gold to escape and finish the complete *Venture*. The gold is guarded by nasties, and you may find a few useful objects to help you fight them. If you can't fight you must run, which will cost you half your easily-earned cash from earlier games.



Magic Window

Computer: Atari 400/800 16K
Price: £8.95
Supplier: Quicksilva, Palmerston Park House, 13 Palmerston Road, Southampton.

Tucked quietly away in the corner of the Quicksilva adverts is an Atari program. I'm telling you this because many of you will not have noticed it before. This really is a pity because *Magic Window* is a fine utility for creating new character sets or fonts — or indeed the user-defined graphics used by Spectrum programmers.

You may have admired the type style of games like *Preppie* and *Sea Dragon*. Now with a little time and patience you can incorporate these

styles into your own programs using *Magic Window*.

Magic Window uses a joystick to carry out all its functions, the joystick commanding a player/misile cursor to all parts of the screen. The screen is divided into many parts. At the top left hand corner is the window itself. This is where the characters are created. Next to this is the sketchpad which is a four by four grid that displays your characters in close proximity to give you an idea what they will look like in the program you decide to use them in.

To the right of the sketchpad are the command functions. There are 10 of these and all are triggered by the cursor.

Commands include *DATA* which gives a numeric value for each character, *MIRROR* which turns

the character around and *SCREEN* which allows you to use four colour text modes. The bottom half of the screen displays two character sets, the old and the new.

Character sets can be loaded and saved direct from the screen commands for later use. The *Magic Window* tape includes two altered sets to give you further ideas.

So this is an excellent utility at a low price and the use of the joystick for all aspects of the program makes it easy to use. Some superb graphics displays have been created using this program so with a little ingenuity you can totally alter the way your programs look. I look forward to seeing more Atari programs from author Martin Walker.



The Tiger Grand Prix

Computer: Dragon 32
Price: £7.95
Supplier: Tiger Software, 63 Devonshire Street, Monkwearmouth, Sunderland, Tyne & Wear.

Grand Prix might seem an unusual title for an educational program, but the testing that goes on is part of a race game for one or two people, the racetrack snaking up the Dragon's high-resolution screen. The cassette also comes with a small explanatory booklet.

Once the main program has been loaded, you will be asked which of the data files on the tape you

require, and there are 12 of these in all, plus a Fun Quiz at the end, with more data files promised from the company. There are three files of questions for each of the four age ranges covered, these being 7 to 10, 11 to 13, 14 to 16, and 16 plus. Each file contains an average of about 40 questions, these normally being multiple choice covering maths, spelling, general knowledge and the like.

Each turn begins with the Dragon shaking a dice for you, and moving you forward the appropriate number of places, this being followed by a question, the correct answer to which will move you forward a random number of places, an incorrect answer moving you back.

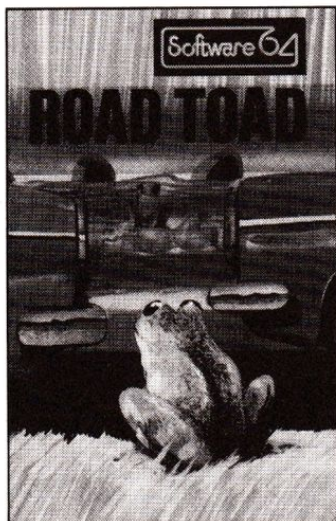
Once you're beyond the first five places, a Gremlin starts to hop

round the track after you, four places at a time, this being an incentive to answer correctly and hope for luck with the dice.

Getting caught by the Gremlins could obviously be a painful experience, and what happens either then or when you win remains the program's graphic secret for the moment, though we're not quite sure how the 16-plus age group will respond to talk of nasty Gremlins.

The Fun Quiz adds an amusing touch to the proceedings, testing your knowledge of the furthest distance anyone has walked with a full milk bottle on their head, or the weight of the world's largest ice-cream sundae. We must add, though, that these are not typical of the questions in the rest of the data files!

SOFT RELEASE



Road Toad

Computer: Commodore 64

Price: £8.95

Supplier: Audiogenic, P.O. Box 88, Reading, Berks

Described in a recent Audiogenic press release as featuring 'squelchability', this is merely another of that well known game for amphibians everywhere, *Frogger*.

The scenario is the traditional one, although couched in slightly untraditional terms. According to the packaging, you're a toad rather than a frog, it's the mating season once again, and the time has come for all young toads of stout heart to get back to the breeding grounds again and — well, we'll leave that up to your imagination. (Needless to say, this theme caused

a certain amount of comment among the female staff here at *Which Micro?*)

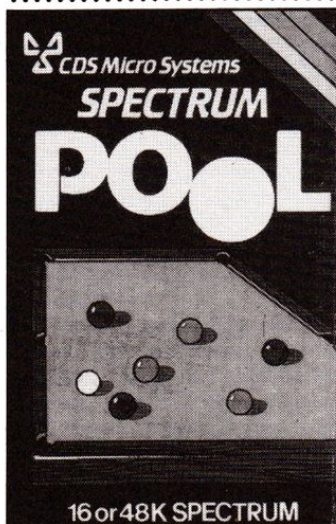
Between you and the breeding grounds there just happens to be a road, full of fast moving cars, and after that, well, coincidence on coincidence, there's a river, full of floating logs and friendly yellow turtles or treacherous green ones.

At the later levels, presumably as an award for reaching the breeding grounds, female toads begin to appear as well, although jumping on them does sometimes have its drawbacks. Although usually to be found relaxing on a log, they do occasionally float along on the water. Female toads obviously know something that male toads don't, since your ability to float is akin to that of a brick. This problem seems to be universal in

Frogger type games, but we have never understood the reasoning behind it. Most amphibians are perfectly happy in water!

Again at later levels other hazards include the nasty snake that walks along the safety zone between the road and the river, and some of the logs are actually crocodiles. Crocodiles and toads don't mix, and another life is lost.

The graphics and sound are as reasonable as one might expect, and if you like a *Frogger* game, this is as good as any others currently out for the Commodore 64. Played with a joytick (why can't people standardise on using one or other of the joystick ports — every game seems to swap from one to the other), it will probably pass some time away happily hopping about the screen.



Pool

Computer: Any Spectrum

Price: £5.95

Supplier: C.D.S. Microsystems, PO Box 93, Doncaster, South Yorks DN4 5LX.

Basically *Pool* provides you with six balls to aim at, three red counting 10 points and three blue counting 20. One of the problems facing programmers with games of this type is how to devise a method of aiming, and C.D.S. has done this satisfactorily by providing a tiny white triangular marker that you move round the cushions using the S and A keys for clockwise and anti-clockwise. The point of this triangle is where the centre of your cue ball is aimed, and the

strength of the shot must be judged on a scale of one to five.

These simple rules are explained on-screen, and after choosing the one- or two-player option there's a quick burst of *The Entertainer* and the balls are set up for you. Don't make the mistake we did of merely cueing off first time, as the nasty program writer has ensured that the marker appears just where it will cause an in-off if you don't move it.

Scoring is simple, each player having three cue balls with three shots per ball, unless one of those shots pots a colour when you start at three shots again. Clear the table and you go on to a second frame. The score for each pot is the number of the frame times the value of the ball potted times the shots remaining on that particular

cue ball, which sounds complicated but if you manage to fluke a blue into a pocket, say, on your very first shot then you score 1 (frame) × 20 (blue) × 3 (shots that were remaining), making 60 in all.

The balls move about with fairly realistic clicks, and we can only assume that the maths in the program ensures they move accurately, though if that really is the case we can't understand why we didn't sink the pots more regularly.

The only minor fault is that the balls tend to lose their colours when colliding or even passing by each other, but that hardly spoils the enjoyment, especially if you try to add to the realism with a few pints of something refreshing and a little bit of hustling on the side.



Puzzler

Computer: Dragon 32

Price: £6.95

Supplier: Shards Software, 189 Eton Road, Ilford, Essex

This is a version of those puzzles which have one piece missing to enable you to shuffle the others around in the tray and rebuild the original picture or sequence of numbers or letters. There are three different programs to choose from, though all give you variations on the same four basic drawings: a flag, a Union Jack, a lion or a fish tank. If you load GAME 1 the drawings will be split into 12 pieces, GAME 2 into 24 pieces, and GAME 3 also into 24 pieces but the colours change from time to time to add to the difficulty.

After loading the game you want, you can then choose from the four skill levels (or five if you count the training level which has no time limit.) The levels range from beginner, where you have 24 moves, to genius with 12 ultra-fast moves being needed. You then select your picture, study it for a few seconds, and wait for it to be broken up and reshuffled.

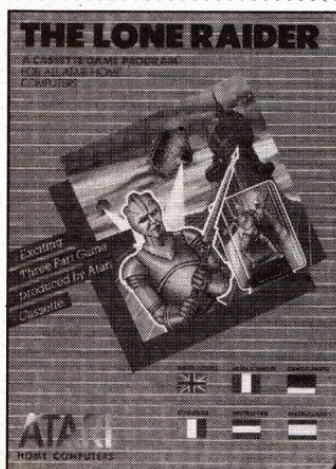
Around the side of the picture frame are letters numbering each of the 12 or 24 squares, and when prompted you must quickly choose which two of the squares to swap, thereby gradually getting back to the original picture.

In GAME 3, the second piece that you enter for each swap will change colour, and here you must not only get back to the original drawing but the colours must be

consistent too. One slight drawback is that even where there are two identical pieces, the computer cannot differentiate between them and you have to be sure you get them in their original places to succeed, and also it is very difficult to play if you only have a black and white TV.

Although the game was extremely hard, especially with a drawing of a fish tank looking like a jumble of abstract shapes, we can't image *Puzzler* having too much long-lasting appeal. Young children will probably find it good fun, and it is certainly better than some other Shards programs which try to be educational but are frequently little more than games. And of course it does have one enormous advantage — there's no danger of losing any of the pieces.

SOFT RELEASE



The Lone Raider

Price: £14.99

Supplier: Atari Inc. Software Products Division, Slough, Berks.

This is Atari UK's first step into the big wide world of software production and if this is the standard of software I look forward to many more. Atari is to be congratulated for this is a fine piece of software sold at a reasonable price.

The Lone Raider is a game in three distinct parts. The object of the game is to infiltrate the nuclear power factory that has been taken over by the ever present 'Unknown Alien'. In the first screen our hero is beamed down

to the planet surface and must destroy all the robot guards. The guards do fire back and the only way to dodge their rays is to pull down on the joystick.

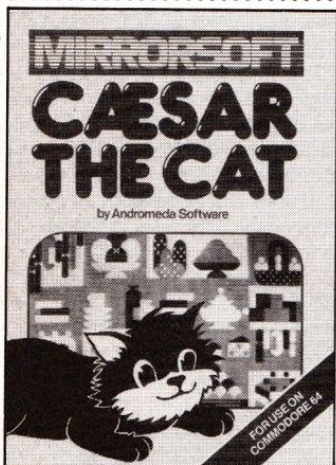
Once the guards have been removed the Lone Raider enters the factory which is made up of lots of corridors where he must collect all the neutrons dotted along them. Mutant guards roam these corridors and the only way to stop them is to capture one of the moving Blue Protons. This activates our hero's defence shield and he can zap the guards while it is flashing.

The corridors have doors in them. If a door opens the Raider will pass up or down into the next corridor which can prove embarrassing. Once through the corridors, having collected all the

neutrons the Raider moves into the storeroom which is a sort of bonus screen. The same corridors, only this time the Raider just has to get to the bottom of the screen where he can stick around and build up points for zapping guards.

Once through the storeroom the Raider must dodge the defences and wait for his ship to beam him up.

There are two nice touches as well as the price; the music while the game is loading and the packaging. The Atari's second track on the tape recorder is generally under utilised and it is nice to see it used here. The packaging is excellent, the tape comes in a book-sized plastic case which has space moulded for a cartridge, another cassette and disks. Great all round value.



Caesar the Cat

Computer: Commodore 64

Price: £8.95

Supplier: Mirrorsoft, Holborn Circus, London EC1P 1DQ

For a group of newspapers that is usually concerned with the size of things other than the number of computer games that it can sell, this appealing little number, dark haired, three year old Caesar the Cat, is a surprisingly child-like game. Child-like, rather than childish. There is a significant difference, and it is a rare occurrence for a program aimed at the very young to achieve this quality.

You take on the role of Caesar the cat, and as the game commences you find yourself in a well-stocked larder, full of food

and potentially broken crockery. To your horror, you see a mouse eating some of the food. Being a good cat it is your sworn duty to your owners to protect the larder and its contents, so off you go in pursuit of the mouse.

And that, in essence, is that! If you manage to catch the mouse, a number of bonus points are scored, and you have to take him out of the larder and through an obligingly open door. However, no sooner has one mouse gone than another one appears, and so you have to re-enter the larder and see him off.

All the time a mouse is running about un-caught, your points tally decreases, and should it reach zero the game is over.

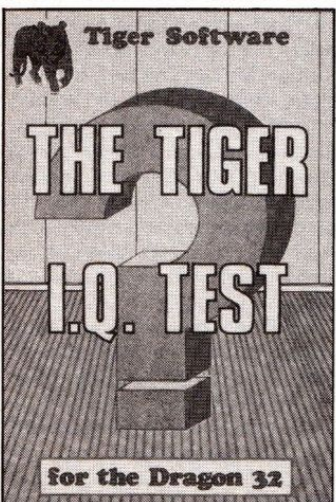
Other hazards include some of the aforementioned crockery.

Knocking that off and breaking it, not surprisingly, reduces your points score by a dramatic amount.

After 10 rather ordinary brown mice, the blue meanies appear. These gobble food faster, move about more quickly, and generally present a greater nuisance to you and the larder.

Getting rid of 10 of those then brings on the white mice, and these are virtually impossible to see off. Broken crockery can be guaranteed by this stage, and if you manage to catch all 10 of these, the game is over and you're entitled to a well-earned rest.

Played with a joystick, this will appeal primarily to the younger ones, or those who are simply young at heart. Lovely graphics, and a fine entry into the market from Mirrorsoft.



The Tiger I.Q. Test

Computer: Dragon 32

Price: £7.95

Supplier: Tiger Software, 63 Devonshire Street, Monkwearmouth, Sunderland, Tyne & Wear.

"The measurement of intelligence is one of the most controversial subjects in psychology in recent years," begins the booklet accompanying this program, and the paragraphs that follow let you know that this is not just a piece of software that has been churned out and labelled 'educational' in the hope of selling a few copies to parents who lack the time to check.

The booklet goes on to explain

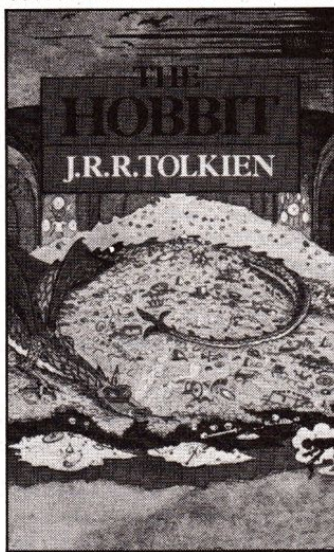
that the tests are far from infallible, with many factors other than intelligence affecting the outcome, but what can be said is that someone who scores highly on I.Q. tests is likely to be highly intelligent, and someone who scores average marks is likely to be of average intelligence.

The cassette actually provides two tests, and suggests you try the first to familiarise yourself with the procedures and types of questions, then use the second as a proper test. You will be given 30 minutes in which to answer 36 questions which examine your arithmetical, visual and verbal skills, typical questions being along the lines of "Which of these objects is the odd one out?" or, "What is the next number in the following sequence?"

The timer doesn't start till the question is on the screen in full, and you can pass on any question and return to it at the end of the test. Your answers are stored till the end, when they will be printed out alongside the correct answers. The result will then be given, along with a fairly detailed comment about your I.Q. level.

Our reviewer took the test and scored 132, putting him in the top 4 per cent of the population, though he won't be getting paid any more because of it. He did point out, however, that 130 to 135 had always been his approximate I.Q. when tested at school, so that is some guide to the accuracy of the program and its questions — of course our reviewer does have a very high opinion of himself — Ed (I.Q. 200).

SOFT RELEASE



The Hobbit

Computer: Commodore 64
Price: £14.95
Supplier: Melbourne House,
 131 Trafalgar Road,
 Greenwich, London SE10

After much publicity and deserved critical acclaim, *The Hobbit* has been transferred to run on the Commodore 64, and what a success it is.

For the benefit of newcomers, *The Hobbit* is a graphical adventure game based on the famous Tolkien book. When it first appeared for the Spectrum the amount of praise that the game received was overwhelming, and I should think the comments about the various versions for other machines will be equally praiseworthy, if this 64

version is anything to go by.

The action starts off in Bilbo Baggins' hobbit-home, with Gandalf the wizard and Thorin Oakenshield, the pompous leader of the dwarves, in attendance.

The game itself is played in real time, and all the major characters in it can act independently of you, so that, for instance, whilst you fiddle about with the chest in the room, Thorin gets impatient and tells you to hurry up. Gandalf will probably have already headed east towards the Trolls' lair.

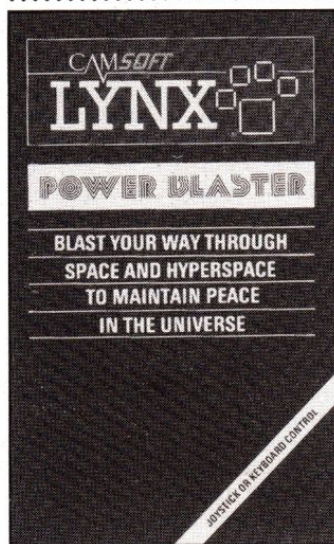
The program is capable of accepting commands in a dialect far beyond the traditional TAKE AXE variety, and indeed commands are typed in as plain English sentences. You can also talk to the other inhabitants of this mythical world so that you can, for instance, have

a command something like SAY TO ELROND "READ THE MAP", and Elrond may or may not respond by giving you some hints.

The graphical displays are superb, if a little irritating when you start the adventure for the 97th time after being killed by a goblin.

One or two criticisms however should be mentioned. Whilst marooned in a dungeon with a window, we managed to get Thorin to carry Bilbo. Thorin obviously sulked at this, and wouldn't move at all. Typing in the command LOOK produced the curious response that, 'You are in the Thorin!'. The mind boggles. Also, the SAVEing game data to tape feature seems a little unpredictable at times.

Those aside, this is worth a place in anyone's game collection.



Power Blaster

Computer: 48K & 96K Lynx
Price: £9.90
Supplier: Camsoft, 33A
 Bridge Street, Cambridge,
 CB2 1UW.

Although this review version is released on the Camsoft label, the game *Power Blaster* is produced under licence from Romik Software which sells its own Lynx edition and also versions for other micros. As with all Camsoft releases so far, each cassette is supplied with the program recorded at 'tape 0' (600 baud) and 'tape 3' (1500 baud).

We are told that the year is 2201, and space no longer holds any frontiers (No this is not a game of *Star Trek*!) The universe has for

many years been ravaged by ferocious wars. However, tentative peace talks have at last been arranged (sounds familiar?). The Martian Overlord has already arrived on Venus to discuss peace talks.

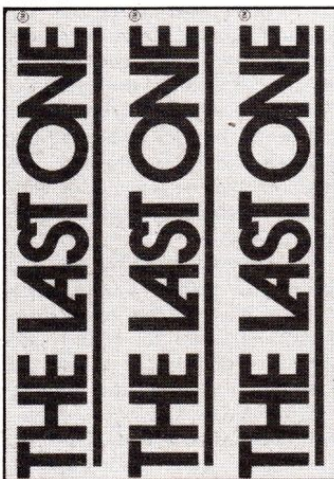
No, you are not playing the role of the secretary general of the U.U. (United Universe), but the commander of a Venusian defence force patrol ship. Your mission is to blast and destroy the remote-controlled bombs which are being planted by the Martian Overlord's attack force should the negotiations break down.

To shoot down the Martian ships is dangerous and could cause the talks to break down, however if you get too close to them, they shoot you down. Your only means of escape, thereby averting a

diplomatic incident, is to hyperspace.

The screen display comprises a large maze-like area complete with mines (the explosive kind!). You start in the centre of the maze and before you are able to move in any direction, you need to clear a path before you. Your spaceship can be controlled via the keyboard or with joysticks (providing you have the Computers joystick interface and Atari compatible joysticks).

The action is fast, the graphics and sound are good, but after such elaborate scene-setting, as explained in the instructions, the game comes as something of an anticlimax, if not a disappointment, being somewhat of a hybrid — a coming together of many past arcade-style games in a slightly different guise.



The Last One

Computer: Commodore 64
Price: £97.75
Supplier: D.J. 'AI' Systems,
 Station Road, Ilminster,
 Somerset.

The Last One burst onto the microcomputer scene amidst a wealth of controversy and conflicting reports. Describing itself as the "last program you'll ever need to buy", the massive advertising campaign assured for itself a place in programming history.

We were beginning to think that we'd go down in history, as half-an-hour passed whilst making up a back-up copy of the master disk. This back-up disk was re-headered immediately after looking at the product, which sums up our

opinion.

The manual has yet to be re-written for the 64, and in its place we had an old Commodore Pet manual with a few pages of corrections for the 64 version. A potentially serious one that DJ Systems missed was immediately spotted, when its suggestion for selecting the first menu option would have re-set the computer!

After overcoming the inherent difficulties of using an incorrect manual, *The Last One* was found to be a well-written, robust program that is obviously the work of some very talented programmer(s).

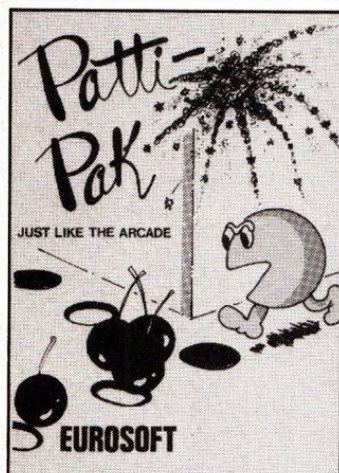
However, to suggest that it's the last program you'll ever need to buy is ludicrous. In our opinion, a program generator should be able to produce a) an integrated accounts package and b) a mega-

zap *Space Invaders* game in order to qualify for the above accolade.

Using *The Last One* and following all the steps outlined in the manual, it took a very tedious couple of hours to produce a simple mailing program. Examining the finished code, in Basic, revealed that the same program could probably have been written in less time just by sitting down at the keyboard and writing the thing.

So, if you're a systems analyst who can't produce a keyword of Basic, then this is the program for you. If, on the other hand, you are more than half-way familiar with Basic as presented on the Commodore 64 (and don't expect *The Last One* to nod its head in the direction of colour and sound), this is probably the last program you'll ever even want to buy.

SOFT RELEASE



Patti-Pak

Computer: Dragon 32 with joystick

Price: £7.95

Supplier: Eurosoft, 1 Punch Lane, Limeslade, Swansea, West Glamorgan.

It seems that every new software house must have at least one arcade clone in its opening stock, and Eurosoft has decided that what the Dragon world has been waiting for is yet another version of Pac-Man. It's difficult to be critical of a game which arrives with its own personalised reviewer's title screen, but we're afraid there's much to be critical about, which is a pity as some of Eurosoft's other products look promising and the company was set up by Gerry

Quick, one of the men responsible for the Dragon's very existence by persuading Mettoy to go into the personal computer market in the first place.

The cassette comes in a plastic wallet which doesn't mention the make of computer the software is for, nor that a joystick is essential, nor that you need to press the fire button to clear the title page off the screen. The cover doesn't forget to say that the game is, "Just like the arcade," which is a slight exaggeration, though admittedly the sound, speed and graphics don't fall too far short.

The instructions that appear after the title say that at the end of each game you can press 'W' to return to the start if you wish to select a different one of the eight skill levels available, a facility which

didn't work for us (and we tried every key on the keyboard). The only way to change skill levels was to reload or progress upwards through the screens when the level changes automatically.

Just to complete the criticisms, the figure seemed slow to respond to the joystick, and the game proved difficult to play on a black and white TV.

As to the good points, the game is in machine code, there are those eight skill levels, three lives, four ghosts, fruit to eat, an extra life every 10,000 points, and an invisible maze every fourth screen, if you count that as a good point. There's also a high score record and the noise is a satisfactory munching sound, but overall there is much better software around if you've £8 to spare.



Renaissance

Computer: Commodore 64

Price: £8.95

Supplier: Audiogenic, P.O. Box 88, Reading, Berkshire

Othello, which most people seem to think is merely a play by Bill Shakespeare, is also the name of an ancient game. Change the name to *Renaissance*, and you have this offering from Audiogenic for the Commodore 64.

The rules are relatively straightforward. The game is played on an eight by eight board, with two different coloured sets of counters: black and white is used in this version of the game. Players move alternately, if a legitimate move exists, and a piece must be placed so that it forms a line

(diagonal, horizontal or vertical) with another piece of the same colour, with at least one intervening piece of a different colour along the same line.

That different coloured piece is thus trapped by the line, and is flipped over to be the same colour as the pieces doing the trapping.

Thus the game progresses, and the winner is the person who, when the board is filled or no one can make a legitimate move, has the most number of pieces on the board.

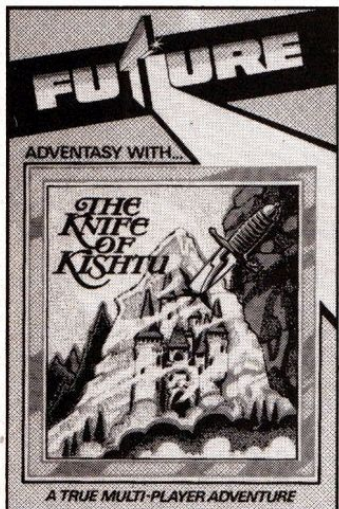
Strategy revolves around keeping track of the diagonals, making for the side of the board, and above all getting a piece in at least one of the four corners.

Renaissance takes into account all these various strategies, and even on the lowest of its eight levels

plays a very good, and very fast, game. It can be played using either a joystick or the keyboard, and there are a number of extra features not found on the traditional board game.

You can ask your computerised opponent for help in a tricky situation, on levels greater than the lowest one you can swap the board around if you find yourself in a doomed position, and you can load and save game positions for later use.

The other options include taking back moves, or setting up special positions for re-playing other games. As an opponent, the Commodore 64 offers a good game, and if you like *Othello*, you'll love *Renaissance*. It is one of the few traditional games which transfer well to the micro.



The Knife of Kishtu

Computer: Dragon 32

Price: £7.95

Supplier: Future, 6 Arundel Close, Chatham, Kent ME5 8UZ.

The Knife of Kishtu is described as a new type of game, an adventasy, but if that's the case then this new type has been around for a while, a straightforward adventure set in a fantasy land, this particular one being the small kingdom of Tyan in the northern hemisphere of Old Earth. The story goes that the wicked trickster Loki captured Lovilia, the daughter of the King of Tyan, and took her back to his 'Citadel-in-the-Ice.' The King sent his own most powerful wizard,

Kishtu, after them, and this is where the thing starts to get complicated. But to cut a long story short, where Kishtu failed, you have been sent to succeed, and to do so you must find the Knife of Kishtu and the four magic rings he was also known to be wearing when he entered the Citadel.

Before you can boldly go anywhere, though, you must first sort out your identity problems and decide who you are, allocating 200 points between strength, wisdom, dexterity and charm.

Up to five characters can play, but if you're on your own then it would still be wise to set up five characters at the start as a sudden death means having to reload the program unless an understudy is waiting in the wings. Or maybe you could plan a mass assault on the

Citadel SAS-style with several tough characters and a clever-clogs.

There are no graphics, and the game is in Basic so is a touch on the slow side. Each location has a brief description, a note of the visible exits, anything else you can see in the room (though searching is still advised), and you're likely to encounter snow rats and goblins and other nasties determined to make your life miserable.

This is the type of adventure that could be a lot better, or a lot worse; the only thing out of the ordinary to recommend it is that five people can play at the same time. If that fact would transform your life then by all means give it a try, but the Lone Adventurer would be better off saving up for something more challenging.

SOFT RELEASE



Cruncher

Computer: BBC Model B
Price: £6.95
Supplier: Virgin Games Ltd.,
61/63 Portobello Road,
London W11.

The first impression from the program is that Virgin has improved its presentation considerably. The title screen reveals a nicely-drawn Virgin logo appearing on the screen in full colour. It's obvious from the time and trouble that must have been taken to produce this that Virgin's attention to detail has been tightened up quite significantly.

Cruncher is of considerably superior quality to some of Virgin's earlier releases — it is well written, with the speed enhanced by the use

of machine code, and also contains some fairly amusing little twists.

The object is to trample various flashing time bombs which appear randomly on a matrix of squares. Also populating the arena are numerous mines, flags, and large stomping boover-boots. It is important to keep a close eye on proceedings throughout the game, as these latter pieces of footwear tend to jump on the player-figure without warning.

All this may sound a little too easy for the seasoned arcade game player, but there is one devious little feature which quickly changes that. You are only allowed to walk on the squares you have not yet visited. The used ones disappear as you leave them, and this makes it impossible to succeed without thinking well in advance of the

game. A couple of seconds' dithering can leave you completely isolated, cut off from the bombs you are trying to reach. Unless you get to them in time, they explode, thus cutting short your competitive career.

To make the game reasonably playable, the programmer has included full wrap-around. In other words, if you disappear off any edge of the screen, you reappear on the opposite edge.

Tactics can yield useful gains here, and it is definitely worth trying to isolate the stamping boots in a pen of their own. That way they can't get at you.

When you have beaten the ticking fuses a certain number of times, you are booted up to the next level, where everything becomes more fast and furious.

Spelling Tutor

Computer: Dragon 32
Price: £4.95
Supplier: Micro-de-Bug
Consultancy, 60 Sir Johns
Road, Selly Park,
Birmingham B29 7ER

This is one of several cheap educational cassettes put out by MDB, but unlike the others which are mostly aimed at specific age ranges (7-11, 'O' level revision etc) this one is designed to give anyone practice with the most commonly misspelt words.

When the program has started you have a series of questions, after each of which you will be asked to type 'E' for End, 'S'

for Score, or any other key for the next question. In other words there is no set test, you just keep going till you're ready to quit.

As to the questions themselves, there are three basic types. One asks you to choose the right one from two alternative spellings, e.g. "I like the (peace) (piece) and quiet of the country." Another type gives you five words, one of which is wrongly spelt, and you must find it and give the right spelling, while the last type asks you to spot which word in a sentence is wrong and correct it.

The words chosen can seem quite simple, such as choosing 'buy' or 'by' in a sentence, but include more complicated ones like rhythm or unnecessary.

The database is rather limited, as I found that some questions

started to repeat themselves after only 18 attempts, and there are no instructions with the program explaining how users might amend that database to suit their own requirements.

When you end the session you are told the number of correct and incorrect answers you gave, and the only assessment is a remark like 'Excellent,' 'Very Good' or 'Try again.' While this program does have the virtue of being cheap, I'm sure that anyone with a little programming knowledge (and you don't need much) would be capable of writing something much more comprehensive and adaptable to the needs of different ages. Learning to spell needn't be as dull as this... in fact it ought not to be, or nobody will be encouraged to use the program.

Practicalc 64

Computer: Commodore 64
Price: £39.95 (tape); £44.50 (disk)
Supplier: Marketing Micro
Software Ltd, Goddard Road,
Whitehouse Industrial Estate,
Ipswich IP1 5NP

The latest spreadsheet offering for the Commodore 64 is a package called *Practicalc 64*, and first impressions reveal that this is indeed a son-of-VisiCalc.

Supplied on either tape or disk, the first thing to establish is the size of the spreadsheet in term of rows and columns. The maximum number of 'cells' which can be thus defined is approximately 2000, and you're told how much room is left for your data as you go along.

This is followed by the

increasingly familiar spreadsheet, with axes labelled both horizontally and vertically. The large cursor which lives on the spreadsheet nips about at a fairly quick pace, although we've seen faster. The other cursor, living above the sheet on the top couple of lines on the screen, is used for inputting information, formulae, and so on, on to the sheet.

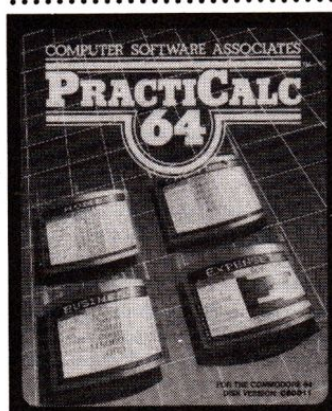
If you've seen one spreadsheet program you've seen them all, and *Practicalc* is no exception.

Once the information is in there, you can sort columns, take average values, find maximum and minimum, shift data about, and do everything else that this program's famous predecessor could.

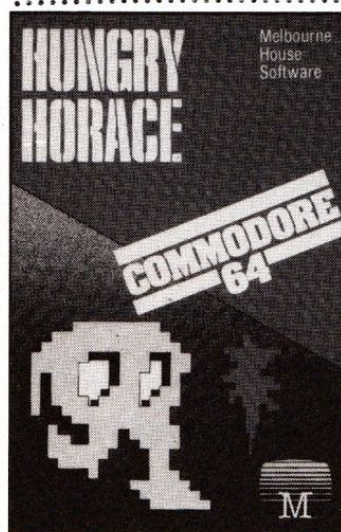
But, and it's a big but, it is so s-l-o-w! When merely adding up three numbers and putting them in

another column, you would expect instant action, but there is a perceptible delay of about one second before anything happens. When taking percentages of several different numbers, the delay increases to an intolerable level, leaving you waiting to type in the next piece of information whilst the computer is still performing mathematical calculations.

Practicalc 64 is just another spreadsheet. It is slower than *VisiCalc*, but is also significantly cheaper, and, of course, does work on the Commodore 64 whereas *VisiCalc* doesn't. There are others around (*Busicalc*, *Calc-Result* for instance) so it's worth checking the field before parting with any money. Buy the wrong one, and you'll need a spreadsheet program to balance the finances!



SOFT RELEASE



Hungry Horace

Computer: Commodore 64
Price: £5.95

Supplier: Melbourne House,
131 Trafalgar Road,
Greenwich, London SE10

Another program from Melbourne House that is currently undergoing translation from machine to machine, *Hungry Horace* is the first of its successful Horace series to appear on the Commodore 64.

Horace is a lovable (?) little imp, or sprite in this case, who manages to get himself into a number of different scrapes. It is your job to guide our friend out of his troubles, and in this case we're presented with a version on a Pacman theme. Or should that be Horaceman?

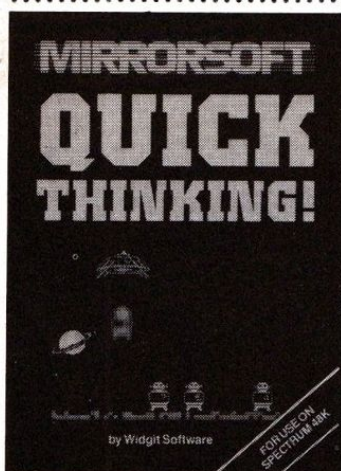
Being Horace, you find yourself in a park maze, being chased by park-keepers who want you out of there. In the frantic hustle of the chase they occasionally drop some of their lunch onto the floor. Horace welcomes this as a points bonus, and it's usually worth the trouble of running around to eat it up. Also in the park, shown on the screen as a maze covered with little dots, à la Pacman, is a little bell. Ringing this makes the park-keepers panic, and your job much easier.

If you succeed in getting out of the maze, you simply find yourself in another, more difficult one, where the object is the same (i.e. to get out), but achieving that object is a little more challenging. And so it goes on, with four different mazes in all.

If that were all there was to the game, it would be fun enough, but not anything special. However, *Hungry Horace* has one additional feature which should make it stand out from the crowd.

You can design your own mazes. These can be as easy or as challenging as you like, but however difficult you make them, they can all be saved onto tape for later use in the game. They can replace one or all of the standard mazes, and greatly add to the sustenance of interest in playing the game.

The graphics and sound are both quite good in this keyboard or joystick controlled game, and we can only look forward to seeing the rest of the Horace series of games translated over to the 64 as well.



Quick Thinking!

Computer: Spectrum 48K
Price: £6.95

Supplier: Mirrorsoft, Holborn
Circus, London EC1P 1DQ

This is an education and fun package incorporating two learning games: *Sum Vaders* and *Robot Tables*.

The cassette is handsomely packaged in a sturdy thick card container. Though both the games are in Basic, the graphics are excellent with a slight Ultimate look about them as the characters seem to slip across the screen. *Sum Vaders* is apparently aimed at anyone from eight years to adult, with *Robot Tables* from six or seven

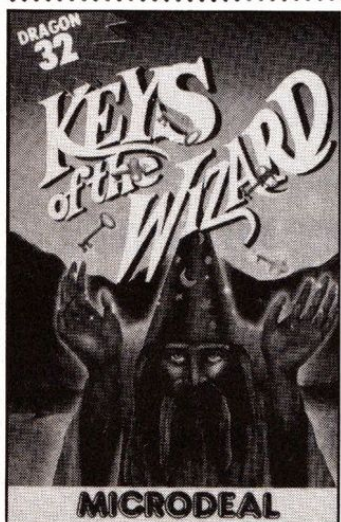
to 12 years old and beyond.

In the first game you choose whether to take addition or subtraction, for one player or two, with instructions optional. There are five difficulty levels, the easiest using only numbers up to nine, the hardest anything up to 99. What happens in play is that a space ship floats across the top of the screen, stops, and allows a robot to start its descent to the ground. Both have numbers on them, and you must add the robot's number to the ship's number (or subtract it as the case may be) and type in your answer before the robot hits the ground.

Robot Tables naturally enough tests your tables, the game being more complicated. A piece of raw material moves along a conveyor belt, and before it reaches a sort of

meat mincer you must say whether the number on it is the next one or not in the sequence of tables being tested. These range from two times tables only at the easiest level, to 6, 7, 8, 9 and 12 times tables at the hardest.

The mincing machine turns the raw material into a box, which goes along another belt into the robot maker. What comes out at the other end depends on your answer. If you were right, a perfect robot slides out and takes its place on the row of ten stands at the bottom of the screen. Get it wrong and the material may disappear in a puff of smoke (if you're lucky, as the game does tolerate the occasional wrong answer) or may produce a distinctly wonky robot that looks as if it's bumped into a steamroller.



Keys of the Wizard

Computer: Dragon 32
Price: £8

Supplier: Microdeal, 41 Truro
Road, St Austell, Cornwall

This is the first adventure Microdeal has put out for the Dragon in several months, and quite a sizeable one it is, too. The three skill levels govern how many treasures there are to find, and how nasty the nasties are.

We know that the adventure is sizeable because after several plays we have uncovered over 50 different locations, excluding mazes, and are still nowhere near finding all 32 treasures giving the maximum 662 points if you can

drop them all in the Sanctuary... if you can find the Sanctuary, that is.

Commands are the conventional VERB-NOUN instructions, with the program recognising 30 verbs (listed in the notes), though multiple command entries are not allowed. There are eight weapons around the landscape, and eight creatures too, ranging from the deadly Cyclops to the friendly Unicorn.

The command REST will allow you to build up your strength by staying in the one place for a time, but this also has the unfortunate effect of making the various creatures move around at 60 times their normal speed, and they will inflict twice as much damage if they get you while you're resting.

The adventure is text only, and is

in machine code making for quick reaction to inputs, with the location descriptions occupying a few lines and making some attempt at more than a bald statement of where you are... not quite to the extent of the famed original *Adventure*, but better than most. We also liked the response to some of our more ludicrous suggestions: "Don't be ridiculous!" Alright, we only thought you might be able to eat the bottle.

Keys of the Wizard has the essential QUIT and SAVE facilities, and betrays its American origins (Spectral Associates) by asking you to type UNCLE if you're ready to give up altogether. It doesn't explore any spectacular new ground in adventure-land, but is well worth adding to the Dragon adventure library.

February Contents

Contents subject to late revision

FREE COVER GIFT

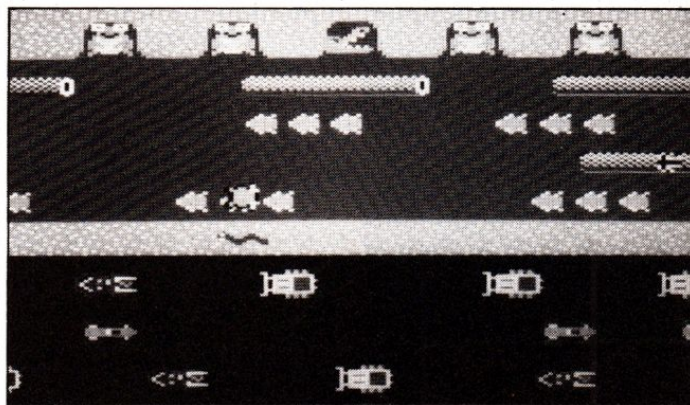
Have you always wanted to write arcade quality games or envied the home-made utilities of others? Then despair no more as every copy of February's Which Micro? will contain a special booklet — An Introduction to Machine Code Programming

The Oricle — our new column just for Oric owners makes its debut in the next issue.

We examine a new £120 computer which can be built by taking a £70 Atari Video Computer System and adding a £50 Spectravideo Compumate.



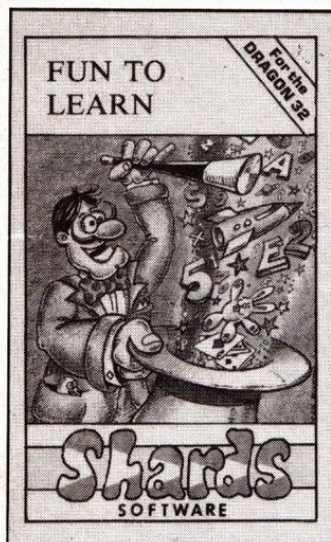
Disk Drive Review — we look at some of the most popular brands and find out when it's worth adding this expensive peripheral



Converting Programs — starting our guide on how to change that listing for your micro plus of course all our usual programs

Computer Clubs — what do they offer the beginner or expert?

SOFT RELEASE



Fun to Learn

Computer: Dragon 32
Price: £6.95
Supplier: Shards Software,
 189 Eton Road, Ilford, Essex

Fun to Learn is, "A comprehensive teaching program for 6-12 year olds, written by a teacher and tested in schools. You are offered the menu of five word and number games.

Counting displays several letters on the upper part of the screen and asks you to count them, giving you five points if you are correct along with a comment on how quick you were. The number of letters can range from just four or five through to 30 or 40.

Word Mixer requires you to solve anagrams of words up to about six

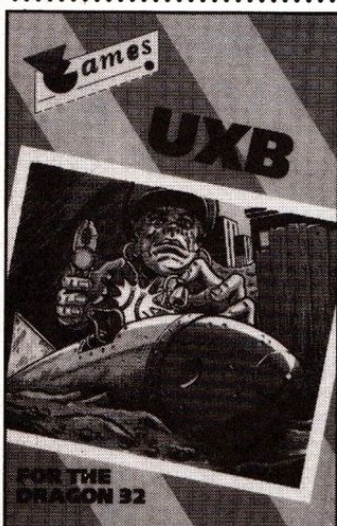
letters long, though the majority are about four letters long.

The next option is *Calculator*, which displays a sequence of numbers and asks you to add them together, the sequence increasing by one each time — a kind of mathematical Simon. This is followed by *Starship*, the only really good program on the tape, which could be retitled Hangman in Space. We can imagine this having great appeal to children, with a spaceship on one side of a building and an alien on the other. Each wrong guess has the alien shooting a bolt at the ship, slowly destroying the building between them.

The final game is *Codebreaker* which lists the alphabet across the top of the screen with its coded equivalent underneath. You are given a coded word and must

decode it, which is not too intellectually taxing as you only need to look at the screen to tap in a letter at a time. Perhaps the programmer himself thought this was too easy and decided to complicate things: the answer to one of our attempts was SCHOOL, which we dutifully typed in only to be told we were wrong and the correct answer was SCHOOL.

At the end of all the games, or each individual one, you get a list of your correct and incorrect answers and a percentage score for each game or overall. This at least is thoroughly done, but despite the assurance that *Fun to Learn* has been tested in schools we can't help thinking that it is rather overpriced for one good game and several make-weights.



UXB

Computer: Dragon 32
Price: £7.95
Supplier: Virgin Games, 61/63
 Portobello Road, London W11

This new game from Virgin starts off with promise, putting you in the crack UXB team and asking you to defuse an old war-time bomb, a rare model for which there is no documentation. You have a toolkit of 12 items, but for space reasons you can only take six with you from the list comprising stethoscope, pliers, spanners etc. The instructions strangely say that one of these items is essential, and they're not telling you which it is, though as there are several stages in the game where you need certain items with you if you're to

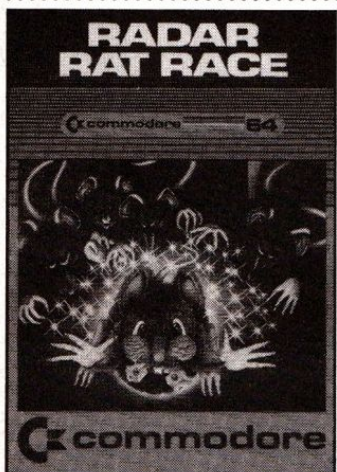
progress, obviously more than just one tool is essential.

Your initial menu has five options: view bomb side, nose or hatch, view list of tools or view tools being carried, the graphics for the bomb being very simple and unmemorable. Choosing your tools presents the first drawback to the game, as a piece of careless programming means that after each choice you're asked if you want to go on to the bomb or return to the menu, so five times you must return via the menu to the list of tools to compile your six items.

On one occasion, after choosing only three tools, we got a rather mystifying "OM ERROR IN 3560," but after starting again we made it safely to the next section where you're invited to choose

your next action from five on offer. "Listen" seemed the safest bet, but pressing that number only returned us to the list of 12 tools. We therefore assumed you were meant to type in the tool you would use, so we entered '6' for stethoscope, which we were carrying, only to be told we could only carry six items and we were promptly blown up. But we were only carrying six items!

UXB is an interesting idea for a game with a difference, but the program does seem to have several bugs in it, and it also suffers from the problem that once you've succeeded the game becomes redundant, as it's the same sequence of events every time. It's rather a high price to pay for just a few hours of not-too-thrilling entertainment.



Radar Rat Race

Computer: Commodore 64
Price: £9.99 (cartridge)
Supplier: Commodore
 Business Machines, 675 Ajax
 Avenue, Slough Trading
 Estate, Berkshire

In the never-ending search for variations on a theme, instead of saving the universe or some other such mundane task, in this program you are a mouse.

Being a mouse, you're partial to a bit of cheese, and dotted about the maze you've inexplicably tumbled into are several choice cheese cuts. However, the red rats are anxious to preserve their supply of cheese for themselves. Which means that on level one you

find yourself being chased by three of the things.

To the annoying strains of *Three Blind Mice*, the main part of the screen is taken up with a large scale display of just part of the maze, and some nice programming has this scrolling about all over the place as you try to dodge the rats. Over to the right of the screen your mouse radar shows the whereabouts of the pieces of cheese, yourself, and the chasing rats.

One of the pieces of cheese, the big cheese, is a special one. For every bit of cheese you eat you get 100 points extra, i.e. the first piece gives you 100, the second 200, and so on. However, the 'big cheese' doubles everything, so is worth finding and eating early on.

There is also a time limit, which runs out rather rapidly. You'll have

to avoid the cats as well, but these aren't too bad as they merely stay put: you just have to make sure you don't run into them.

Finally, to help you out, you can leave a smoke trail behind you which temporarily confuses the rats. But as this eats up valuable time, you have to be sparing with it.

As you race about the place, you'll discover that the rats are extremely intelligent, and can seek you out everywhere. Your radar will be put to plenty of use!

With many different levels that get increasingly harder, this is a challenging and addictive game. With the added bonus of being joystick compatible, and available on cartridge, this is definitely one of Commodore's better offerings. The price is good, too!

BUYER'S GUIDE

The microcomputer market has a reputation for volatility at the best of times, but the last month or so has been particularly turbulent. The future of the Jupiter Ace now looks bleak, with its manufacturer Jupiter Cantab in receivership. This Forth-only micro experienced an initial surge of sales when it was launched, but ironically its demise became almost inevitable when the attendant publicity spawned Forth interpreters for computers like the Spectrum, which had the vital ingredients of colour, sound, and extensive software support.

Texas Instruments' decision to withdraw the

TI99/4a will probably lead to shortages of new software in the future, but in the short term, the 99 may become cheaper as stocks run down.

Another casualty is the Comx 35. We liked this from the technical point of view, but production examples were less satisfactory, and a high fault rate was the result.

Every effort is made to keep the Buyer's Guide completely up to date, but if you have any comments or suggestions, please send them to Buyer's Guide Editor, *Which Micro?*, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.

Acorn Electron	£199
Apple IIe	£845
Aquarius	£49
Atari 400	£99
Atari 800	£299
BBC B	£399
Colour Genie	£168
Commodore 64	£199
Commodore Vic 20	£140
Dragon 32	£175
Epson HX20	£411
Laser	£70
Lynx	£225
NEC PC-8001	£397
Nascom 3	£376-£506
Oric 16K	£100
Oric 48K	£140
Sharp MZ700	£240
Sharp MZ80A	£477
Sharp MZ80B	£899
Sord M5	£150
Spectrum 16K	£100
Spectrum 48K	£130
Tandy Model 100	£500
TRS-80 Colour	£299
Texas TI99/4a	£90
Texas CC40	£170
ZX81	£45

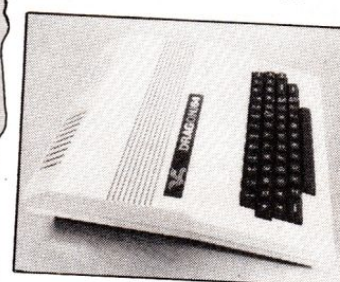
Memotech MTX500

Price: £275
Use: Home
RAM: 32K
Colour: Yes
Interface: Parallel
Supplier: Memotech 0993 2977

For: The MTX has an excellent hardware specification enabling graphics and sound to match the best BBC and Commodore 64 levels. The Noddy language supplied is excellent for beginners, the Basic copes well with sound and graphics, and a built-in assembler aids machine-code programmers.

Against: Non on-board RS232 interfaces on the basic model. The error messages in Basic are very unhelpful.

Conclusion: The MTX has features which will appeal to all kinds of home computer buyers, but check on availability.



Dragon 64

Price: £225
Use: Home
RAM: 64K
Colour: Yes
Language: Basic
Interface: Parallel/RS232
Supplier: Dragon Data 0656 744700

For: This upgrade of the familiar Dragon 32 brings a few welcome changes — the keyboard feel and response has been improved, and auto-repeat has been introduced when extra memory is being accessed. Existing software runs in the Dragon 32 emulation mode.

Against: Still looking long in the tooth, despite modifications. Pricing could be keener.

Conclusion: Something of a wasted opportunity, but it is encouraging that some work is being done.

Price — The costs quoted for each micro are based on the lowest common retail price prevailing at the time of going to press.

But when budgeting for a system remember that the machines will usually require extras to perform their required function. This ranges from access to a television set and cassette recorder, to spending several hundred additional pounds on a printer if the computer is going to be used for serious business purposes.

Use — This gives an idea of what most machines are best suited for — though price tends to be the overriding factor as few non-millionaires would spend £3000 on a computer to play games with. But additionally some micros have large amounts of software and special features that are tailored for a particular market.

RAM — The size of the RAM memory in a computer defines how large and how sophisticated a program can be run. It's generally true that the larger the memory

the better the computer — and the more expensive.

Colour — Micros that show colour when plugged into a colour television are becoming increasingly popular in the home market as price fall. For many business applications, however, colour is not considered that important.

Languages — Nearly all micros offer the Basic computer language which, at the moment, is the easiest and simplest language for

those wanting to learn how to program. Other languages tend to offer more powerful facilities or are specially suited for particular applications.

Interfaces — These are the sockets on a micro which allow such peripherals as printers and modems to be connected and controlled by the computer. The most common is the RS232C interface and a wide range of equipment can be connected to it. Less well-known interfaces may give a more limited choice. ■

UNDER £250



Sinclair ZX81

Price: £45 — special offer "starter pack" which includes 16K RAM.

Use: Home

RAM: 1K

Colour: No

Language: Basic

Interface: Own

Supplier: Sinclair Research 0276 685311

For: Sinclair's celebrated ZX81, the computer which broke open the home market, is still available, though for how long this will continue is anyone's guess.

But in recognition of the declining appeal of a black and white computer that costs over £70 — by the time the virtually obligatory 16K of extra memory is purchased — Sinclair has now introduced a £45 starter pack. For this reasonable sum purchasers can acquire a ZX81, a 16K RAM pack and a software cassette.

Against: That membrane keyboard! It's like typing with a sheet of cardboard over the keys.

Although the software is plentiful and cheap, there is virtually no new material coming out, since programmers prefer the Spectrum. It's also worth remembering the speed at which it loads — everything happens v-e-r-y s-l-o-w-l-y.

Conclusion: At its new "all inclusive" price of £45 the ZX81 may well have been given a new lease of life. It still won't do half the things you can do on an Oric or Spectrum but it is half the price. As an entrance to Basic it is unique and those on a tight budget can do no better.

May/June 1982 — Inside the ZX81
April 1983 — IBM PC v ZX81
May 1983 — Add-ons for ZX81
October 1983 — New lease of life



Aquarius

Price: £49

Use: Home

RAM: 4K

Colour: Yes

CP/M: Not yet
Language: Basic
Interface: Own

For: Excellent documentation and a wide range of games cartridges will attract beginners. The potential for expansion is good, with cheap peripherals such as the printer (£135) available, but don't hold your breath for CP/M.

Against: The main failings are the keyboard (diabolical), the Basic (antiquated), and the prices (high for expanded versions).

Conclusion: For users (especially games) rather than programmers.



Laser 200

Price: £70

Use: Home

RAM: 4K

Colour: Yes

Language: Basic

Interface: Own

Supplier: Computers for All 0268 418414

For: The lowest price of any home computer in the UK; reasonable keyboard and Basic interpreter including handy choice of conventional or one-key program entry.

Against: Sound is only up to (weak) Spectrum standard, graphics are distinctly low-resolution at 128x64. 16K memory expansion raises price to Spectrum level.

Conclusion: Performance is distinctly better than that of some recent big-name attempts at a £100 home computer (notably Tandy and Mattel). However, the Spectrum still shows the way.

October 1983 — The Laser — A shot in the dark?



Oric 1

Price: 16K £80 48K £140

Use: Home

RAM: 16K-48K

Colour: Yes

Language: Basic

Interface: Parallel

Supplier: Oric International 0990 27641

For: On paper, the Oric is a strong competitor to the Spectrum. Its specifications include useful pre-programmed sounds and high resolution graphics, and the buyer may well prefer the Oric's keyboard and conventional entry of program statements.

The Basic included is a near-standard Microsoft with many powerful extensions, so when software houses have had time to catch up on the recent surge of new machines, programs for the Oric should appear quickly.

Against: The 16K version is still hard to get hold of, lengthy production delays having held up its appearance.

A worrying, but persistent rumour about the Oric is that of problems in the cassette handling area — certainly, ours have never worked properly, and we have received numerous phone calls mentioning the same difficulty.

Conclusion: The Oric is a difficult computer to sum up, outshining the Spectrum in some areas, but (as yet) behind in the vital areas of software support and complete documentation. If you want a tried and trusted computer, check the competition first.

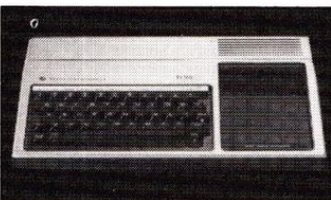
February 1983 — Oric I Review

February 1983 — Comparison:

Oric I v Spectrum

May 1983 — Oric I v Vic 20

October 1983 — Oric — will it zoom ahead?



Texas TI99/4a

Price: £90

Use: Home, education

RAM: 16K

Colour: Yes

Language: Basic

Interface: Own

Supplier: Texas Instruments 0234 67466

For: Now sadly out of production, the Texas remains a powerful and easy to use micro which has many technical advantages over other £100 rivals. With the possibility of price cuts as stocks run out, it would be good value for the dedicated hobbyist who doesn't require add-on hardware or software (both of which will become scarce).

Against: Most users will feel left out in the cold once software supplies die out.

Conclusion: The 99's major fault is that it costs too much to manufacture, making it unprofitable for Texas.

The company has never been happy in the home computer

field, despite the point that the TI was debatably the first recognisable entrant to this market and could therefore be described as having invented it. The company should have been quicker to react when Commodore brought out the 64 (which is remarkable for its low production costs), and started the price war which has led to so many casualties. A cheaper TI99/4a-compatible computer would have gone down well over the last year or so. It is also a shame that Texas will not be bringing out a new home computer as far ahead of the opposition as its original TI99.



Atari

Price: 400 £99 800 £250

Use: Home

RAM: 400 16K 800 48K

Colour: Yes

Language: Basic

Interface: RS-232C

Supplier: Atari (01-900 0511)

For: Atari produced an excellent games machine in its 400 and 800 home computers, which is no surprise given its background in arcade machines and home games consoles.

What did surprise many industry observers was the readiness of software houses to supply serious software for educational and business purposes, especially on the 800 version with its typewriter keyboard and disk interface.

The software is one of the main reasons for buying an Atari, its quality being consistently high.

Against: There are several drawbacks to becoming an Atari user, including the irritating need for a special cassette recorder at the inflated price of about £45. The touch-sensitive keyboard of the 400 is also rather off-putting, and limits the practical uses.

Software prices for the Atari seem to be rather high compared to those for rival machines.

Conclusion: The Atari is one of the older machines to enjoy a place in the Top Ten, but still holds up well in any comparison with its rivals.

Recent price cuts and specification improvements have made it more competitive.

Tandy MC10

Price: £99.95

Use: Home

RAM: 4K, expansion to 20K

Colour: Yes



Language: **Basic**
Interface: **RS232C**
Supplier: **Tandy 0922 648181**

For: Not many strong points, but standard RS232 interface is handy, calculator-style keyboard beats rubber rivals, and the quality of construction seems high.

Against: Price/specification balance seems poor compared to 16K Spectrum, the Basic is very old-fashioned (with no editing facilities!) and the graphics are rather weak.

Conclusion: Not unlike a colour ZX81 without the support of software/add-on hardware suppliers.

October 1983 — Tandy MC10 — no sparkle?



Sinclair Spectrum

Price: **16K £100 48K £130**

Use: **Home**
RAM: **16K-48K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Sinclair Research 0276 685311**

For: As one of the most popular computers, the Spectrum has a very large amount of software support. This means you can get a top-quality version of almost any game or utility, and pay less for it than you would if you had any other computer.

A similar situation exists on the hardware front. The Sinclair printer is now down to only £39.95, and with the recent launch of the Microdrive (£70) high speed tape access should soon be available.

However, this has not stopped a rush of cheap peripherals from independent manufacturers — digital tracers and interfaces to connect the Spectrum to office-quality printers, among others. These make it possible to build up a very complete system at a very low price.

The launch of the ZX Interface 2 (£20) allows fast loading cartridge software (£14.95) to be

used as well as standard joysticks. **Against:** We just wish the man would fit decent keyboards to his computers. At least it keeps the manufacturers of add-on keyboards in business.

The single-key Basic entry is often rather frustrating.

Conclusion: At the new price of £100 it is hard to beat the Spectrum if you are a newcomer to home computing.

July/August 1982 — Sinclair's Spectrum v The BBC Micro
February 1983 — Comparison: Oric 1 v Spectrum
October 1983 — Sound on the Spectrum



Commodore Vic 20

Price: **£140 (with starter pack)**

Use: **Home**
RAM: **5K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Commodore 0753-79292**

For: Since the Vic is very widely used, it is well supported by software houses and specialist magazines. Apart from that, it has few advantages over its arch-rival, the Spectrum, except for the keyboard.

It is nice to see a decent keyboard on a cheap computer, indeed, the Vic shares this item with its big brother, the 64. And it is easily available with a huge choice of software.

Against: The standard user memory of 3.5K is far too small for any self-respecting computer these days, and it shows just how much the Vic has dated since its introduction.

Other signs of encroaching obsolescence are the bizarre display with its jumbo character set, the untidy jumble of external apparatus required to run the thing, and the old-fashioned Basic which has been little improved since the early Pet days.

The potential for good sound and graphics is certainly there, but there is no support for the advanced features in Basic, and one is obliged to interfere with memory by means of clumsy POKE statements in order to get anywhere.

The manual is a bit of a joke, but then it does mean healthy sales for the (almost essential) Programmer's Reference Guide.

Conclusion: A good cartridge games machine, but memory

expansion is essential for any serious purpose. And the cost of additional memory makes the Commodore 64 a far better buy for those wanting a Commodore machine.

Sept/Oct 1982 — Dragon 32 v Vic 20
May 1983 — Oric 1 v Vic 20



CGL M5

Price: **£150**

Use: **Home**
RAM: **20K**
Colour: **Yes**
CP/M: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Computer Games Ltd 01-508 5600**

For: Even before most of us have actually seen it on the shelves, Sord has cut the price of the M5 by £40. (Could it be they read our review in the July issue?)

This makes it more of a potential winner; it's well made, well documented and takes three different Basics in its cartridge slot.

Against: Limited memory is the major drawback. Of the 20K RAM, 16K is used for video, which doesn't leave much space and really makes extra memory in the shape of an expansion box essential for any serious programming. Trouble is, it's not available yet.

Conclusion: The M5 has the potential to become a popular home micro, especially since the price cuts. But the competition is tough: you can now get a 48K Spectrum complete with printer for £170 — and excellent support.

July 1983 — M5 — A double-edge Sord



Atari 600XL

Price: **£159**

Use: **Home**
RAM: **16K**
Colour: **Yes**
Interface: **Own**
Supplier: **Atari UK 01-900 0511**

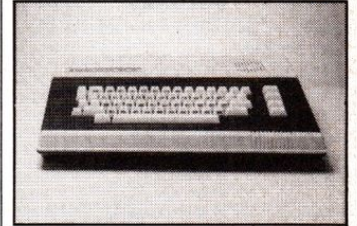
For: Atari's latest runs all the old favourites from the huge reserve of Atari 400/800 software, plus

you get a superb new keyboard and much-improved quality of construction.

Against: The standard memory (as with most US home micros) is rather on the mean side, and the necessity of compatibility with the old 400 means the Basic is now rather old-fashioned.

Conclusion: A fine games machine as ever, but now with potential for serious use offered by the proper keyboard. Word processing is especially easy with Atariwriter.

December 1983 — Atari v Spectravideo



Colour Genie

Price: **£168**

Use: **Home**
RAM: **32K**
Colour: **Yes**
Language: **Basic**
Interface: **RS232C**
Supplier: **Lowe Electronic 0629 4995**

For: Full size keyboard with proper keys, good graphics and sound facilities.

Against: Not as compatible with the TRS-80 as earlier Genies, and there isn't much software.

Conclusion: A lot of micro for the money, but check what programs you will be able to buy.
December 1982 — The Lynx and The Colour Genie



Texas CC40

Price: **£170**

Use: **Business**
RAM: **5.5K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Texas Instruments 0234 67466**

For: Offering real computer power in a box small enough for one-handed use, the CC40 has a low starter price with a range of accessories and ROM based software on the way.

It is easier to use than the Epson if your task is simple, and the keyboard (although small) is acceptable for typing short documents.

Against: Expansion of the

system will be necessary for some applications — in particular, the "wafertape" floppy tape will be almost essential for permanent data storage. The price is around £150.

Conclusion: It may be all the computer power you actually need for some business applications.

June 1983 — Computing in the lap with the Texas CC40



Dragon 32

Price: £175

Use: Home

RAM: 32K

Colour: Yes

Language: Basic

Interface: Parallel

Supplier: Dragon Data 0656 744700

For: After a fairly slow start, the Dragon really took off over last Christmas, selling out completely in most shops. This surge of interest seems to have spurred the independent software producers into supporting the machine, since there is now a fair amount of good games material available for the Dragon.

The Dragon's users are typically very enthusiastic about their machine, mentioning the useful extended Basic and typewriter keyboard as strong points. No special tape recorder is necessary, and the machine offers a reasonable display on a domestic TV.

Against: It is disappointing that the Dragon has not inspired a family of cheap peripherals in the same way that the Spectrum has. The addition of a cheap printer in particular would be a real boost.

There is a rather old-fashioned feel to the Dragon which can be pinned down to its lack of a lower case display and crude Microsoft line editor. The latter must be responsible for a lot of wasted time in program development.

Conclusion: The Dragon has many features in its favour, including its British manufacture and fine value for money. A small amount of development on the system software would make it a world beater. But take a look at the comparably priced Electron as well.

Sept/Oct 1982 — New Dragon 32 v the Vic 20

April 1983 — Dragon 32 v Lynx



Spectravideo SV318

Price: £198.50 (cassette recorder £39)

Use: Home

RAM: 16K

Colour: Yes

Interface: Own

Supplier: C K Computers 0934 515085

For: Excellent Basic offers great ease of use. Sound, graphics and colour are all strong points, and there is a fair amount of software around, which is surprising for such a new machine.

Against: Rubber keys are a bit flabby, and standard RAM is niggardly at 16K. You can't expand without buying the expansion box.

Conclusion: The first MSX specification machine has a solid, mature feel. It makes a worthy rival to any computer in the under-£200 class, and quite a few over that price.

The adoption of MSX by the Japanese consumer electronics concerns makes the Spectravideo's future bright. Long-term support should be no problem.



Commodore 64

Price: £199

Use: Home, Business

RAM: 64K

Colour: Yes

Language: Basic

Interface: RS-232C

Supplier: Commodore 0753 79292

For: The Vic-20's most obvious failing is its puny memory size, and the lookalike 64 certainly makes up for this with a useful 38K of Basic program space.

The ability to switch out the Basic ROM and overlay it with RAM has been exploited by a number of software houses who have brought out word processors, financial planning packages and other business programs.

Against: Unfortunately, Commodore has not learned from all its mistakes with the Vic.

The documentation supplied is down to their usual standard, and anyone wanting to write his own programs is pretty much on his own. The sound facilities are

impressive in hardware terms, but there is no Basic or system support, and all sound modulation is via a clumsy series of POKes.

Although the infamous 22 column Vic display is replaced by a more readable 40 column display, there is no 80 column option, unusual in what Commodore obviously intends to be an entry-level business system.

The Basic interpreter has improved little since the early Pet days, and now looks dated beside that of the BBC Micro.

Conclusion: The 64 is a great improvement over earlier offerings, but in some ways it represents a missed opportunity for Commodore. And the Electron is worth considering first.

March 1983 — Commodore 64 Review



Acorn Electron

Price: £199

Use: Home/education

RAM: 32K

Colour: Yes

Language: Basic

Interface: Own

Supplier: Acorn Computers 0223 210111

For: Most of the attributes of the BBC Micro, including class-leading graphics and easy-to-use sound. The structured BBC Basic makes programming easy to understand, and compatibility with most BBC software makes the Electron a machine you can use right now. The typewriter keyboard makes serious use possible with Electron versions of Acorn's ROM-based word processor and spreadsheet under development.

Against: Some cost-cutting evident, especially the power supply. **Conclusion:** Will cause headaches for all competitors.

September 1983 — Here at Last
October 1983 — Splitting the Electron



Lynx

Price: 48K £225 96K £299

Use: Home

RAM: 48K-96K

Colour: Yes

Language: Basic

Interface: Serial

Supplier: Computers 0223 315063

For: Whatever else you can say about the Lynx, it must be said that it is an interesting machine. £225 buys a compact box with a typewriter keyboard, an unusual structured Basic and 48K of RAM (though only about 13K is available for program storage).

The real interest, however, must be in the potential for turning the Lynx into a business machine.

Computers say that massive amounts of memory expansion will shortly be available, along with a disk operating system (probably CP/M).

If their plans are fulfilled, this will make the Lynx a rival to the Apple II as a realistic small business computer, yet with all the features the home user wants.

Against: As the machine stands, however, it suffers from a lack of software and a somewhat quirky display with no scrolling and slow screen handling.

The first games software for the Lynx is now becoming available, but it is too soon to say whether or not these programs will overcome the display limitations.

Conclusion: The Lynx could well be a rising star, but at the moment there are surer bets for the home user.

December 1982 — The Lynx and The Colour Genie

April 1983 — Dragon 32 v Lynx



Sharp MZ-700

Price: £240-£420

Use: Home/business

RAM: 64K

Colour: Yes

Language: Basic

Interface: Own

Supplier: Sharp 061 205 2333

For: Launched this month, the MZ-700 is well-made, well-documented and good value for money at £240. £420 buys you the model with a built-in cassette recorder and printer/plotter.

Against: Limited graphics capability and you need to load Basic from cassette.

Conclusion: This is Sharp's latest assault on the home micro market, and looks its best bet yet. But the imminent appearance of the £200 Electron looks like being the nut it will have to crack.

September 1983 — Sharp Move

OVER £250



TRS-80 Colour

Price: £299
Use: Home
RAM: 16K
Colour: Yes
Language: Basic
Interface: RS232C
Supplier: Tandy 0922 648181

For: Very popular in America, so there is plenty of software if you know where to look (e.g. Molimerx).

Against: Overpriced, especially when compared to the Dragon, which is effectively the expanded TRS-80 Colour at half the price.

Conclusion: Look at the Dragon first.

November 1982 — Tandy in Transition



BBC Micro

Price: Mod. B £399
Use: Home/education
RAM: Mod. A 16K Mod. B 32K
Colour: Yes
Language: Basic
Interface: RS-423
Supplier: BBC Micro Systems, PO Box 7, London W 6XJ

For: Acorn's BBC Micro is one of the most advanced and user-friendly computers on sale.

Its long-term expansion potential is unmatched by any other.

The Basic makes the BBC an excellent device on which to learn programming, and the best of the software exploits the machine fully, to make it outshine its rivals.

As one of the most sophisticated micros, the BBC lends itself to use with new computing ideas.

Against: Though technically excellent recent price cuts on other machines now make it look very over-priced at £400.

However, Acorn's new Electron, selling at £199, may offer the ideal solution to most home buyers, retaining the essential sophistication of the BBC Micro, but making many of the interfaces optional extras. Its launch also means the instant demise of the BBC Model A.
Conclusion: An extremely

versatile and impressive computer but expensive.

May/June 1982 — Auntie's Attractive Features

March 1983 — Comparison: BBC Micro and Commodore 64

May 1983 — BBC: Can it work in business



Epson HX20

Price: £411
Use: Business
RAM: 16-32K
Colour: No
Language: Basic
Interface: RS232C
Supplier: Epson UK 01-900 0466

For: Remarkably efficient design gives you a 4 x 20 character LCD screen, a mini printer and an optional micro-cassette drive in a package the size of a large paper-back. The keyboard is a joy to use, and a versatile range of software is available from Epson and others.

Against: The lack of inbuilt arithmetic logic is annoying, all simple calculations having to be done through Basic. The Basic itself is nothing special.
Conclusion: The first truly useful micro to be portable rather than merely transportable. A crop of imitators is on its way with Tandy Model 100 worth a look.

March 1983 — Epson HX20 Review



Link 480Z

Price: £450
Use: Education
RAM: 32K
Colour: Yes
Language: Basic
Interface: IEEE 488
Supplier: Research Machines 0865 49866

For: The 480Z is a low-cost version of the 380Z designed to be used in a network, and provides a cheap way to expand a school's system.

Against: Acorn's Econet with BBC Micros is set to make the RM systems look very old-fashioned and expensive.

Conclusion: OK for those who already use the 380.



Tandy 100

Price: £500
Use: Business/home
RAM: 8K-32K
Colour: No
CP/M: No
Language: Basic
Interface: RS232C
Supplier: Tandy 0922 648181

For: Superbly compact design brings together true portability and desktop micro power, with excellent built-in software, documentation and LCD display making this the easiest machine to use in its class.

Against: More memory would be useful for storing documents and data files.

Conclusion: One of the very few micros which is genuinely easy for even a raw beginner to use profitably for business.

August 1983 — Tandy Model 100 Review

Hewlett-Packard HP75C

Price: £695
Use: Business
RAM: 16-20K
Colour: No
CP/M: No
Language: Basic
Interface: RS-232C, HP-IL
Supplier: Hewlett-Packard 03446-3100

For: Almost pocket size makes this the machine with the best power/portability combination. Hewlett snob appeal is strong.

Against: Since it is made by HP the price is pretty hefty, especially compared to machines like the new Tandy 100 and Texas CC40. It is unlikely to achieve similar sales success.

Conclusion: The sort of thing you buy to prove that you can afford one.



Apple IIe

Price: £845
Use: Business, Home, Education
RAM: 64-128K
Colour: Yes

CP/M: Extra
Language: Most
Interface: RS-232 choice
Supplier: Apple UK 0442 60244

For: This new version of the old faithful Apple II is well made and well supported with all kinds of extras available from Apple and independent manufacturers. It is compatible with software written for the Apple II+, but most reputable suppliers are producing new versions to exploit the more advanced design of the new model.

Against: The cost of the IIe is rather high, especially when the US pricing structure is taken into consideration.

Conclusion: A fine machine, worth consideration against many newer designs.

March 1983 — Apple IIe Review

Sharp MZ80B

Price: £899
Use: Home, education, business
RAM: 64K
Colour: No
CP/M: Extra
Language: Basic, Assembler, Pascal
Interface: RS-232C
Supplier: Sharp 061-205 2333

For: Very high build quality typical of Sharp makes the MZ80B a pleasure to use.

Against: The cassette drive fitted needs to be supplemented by disk drives.

The range of software available is disappointingly small, so check the availability of what you want with great care.

Conclusion: Never a great seller; unremarkable in most respects.



NEC PC8001

Price: £997
Use: Business
RAM: 64K
Colour: Yes
CP/M: Yes
Language: Basic
Interface: RS-232
Supplier: NEC 01-388 6100

For: Although it looks like just another CP/M system, the NEC has some nice extra features including an excellent colour monitor and a three processor heart which improves graphics and input/output.

Against: Not much.

Conclusion: A refined option for the small business buyer.

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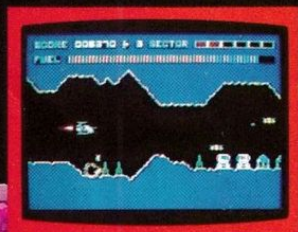
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