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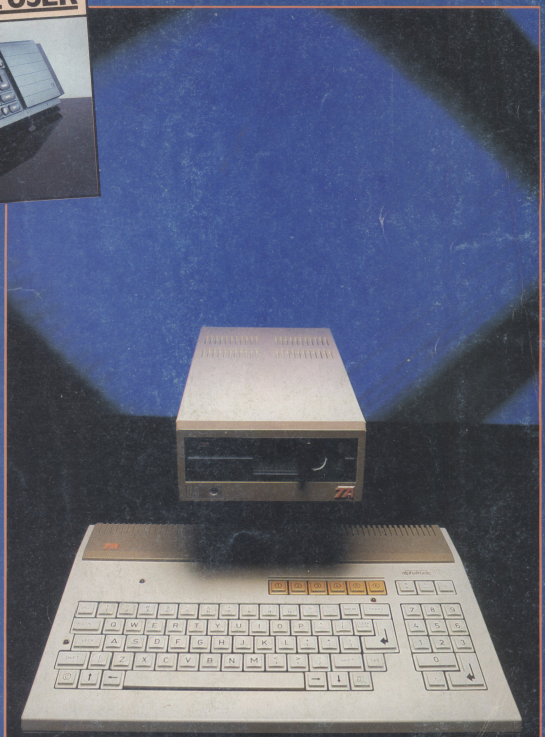

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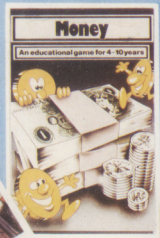

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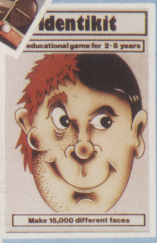





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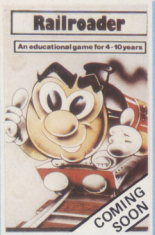

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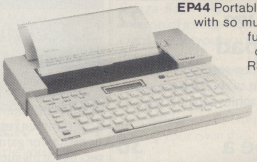

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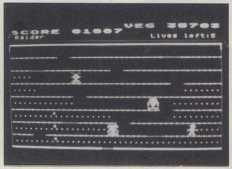

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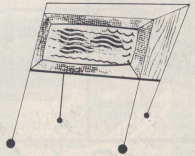

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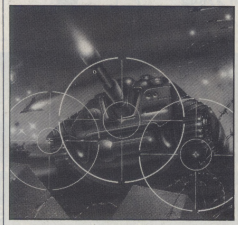

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Cover photos by Rick Cordell

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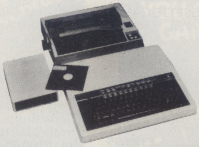

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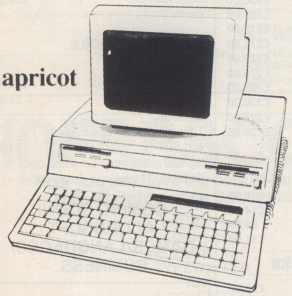

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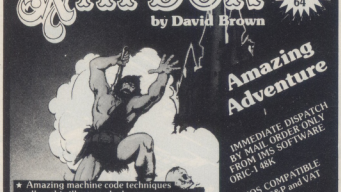

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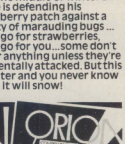

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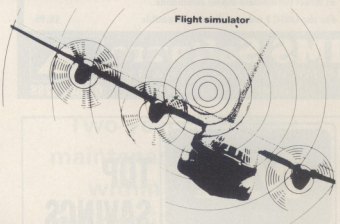



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Access

•NEWS•

Amstrad wades in

Amstrad has launched a new 64K computer aimed at a part of the home consumer market that has so far been neglected by the major manufacturers. The computer, provisionally named the Mallard, comes in two packages. The cheaper variation has a black and white monitor while the second has a full colour screen.

Based around the ever-popular Z80 microprocessor, the machine's software belies its origins. The Basic supplied is an extremely advanced dialect that includes comprehensive graphics, sound, error and interrupt handling keywords, with easy access to the operating system for the more advanced programmer.

This Basic is also extremely fast, coming very close to BBC Basic in the PCW benchmarks, and beating the Spectrum and Oric Atmos hands down.

The screen can be set to any of three modes, which allow 20, 40 or 80 columns of text. The graphics resolution is an amazing 672 by 200 pixels with a possible 16 colours, although it is not clear how many of these colours can be displayed at any one time.

The machine features a large typewriter style keyboard with a separate numeric keypad and a further cursor control pad above that. A Centronics interface is provided as standard, along with a socket euphemistically labelled 'Floppy disk'. This is likely to be an extension of the Z80's control, address and data buses.

The unit is approximately two feet long, six inches deep and two inches high, rising to three inches at the back. A cassette unit is integral and has two speeds — 1000 and 2000 baud.

Finished in what can only be described as classic Amstrad style, it is rumoured that the machine will cost £199 for the black and white model and £299 for colour.

With specifications like these, it's going to be an interesting spring.

See June issue for full review.



The lastest company to get into the starter pack business is CGL, which has put together a pack based around the Sord M5. It is now down to CGL managing director David Morein, to try and sell it to you.

What you get with the new pack is the chance to part with £149.95 of your very own money. In exchange, Mr Morein will supply just about everything needed to get computing with the M5. This will include the M5 itself, a cassette recorder, an application ROM cartridge containing Basic 1, an introduction to programming, a manual and users' guide, two cassette games, and all necessary cables to connect it to a television.

If you buy the starter pack, you will gain instant membership of the free M5 Users' Club, which includes access to a telephone hotline service to answer technical queries.

Computer artistry

Damn it, let's be nice to Commodore for a change. The company has announced sponsorship for a brand new competition to find the best computer artist in the world. The company is putting up a total of £150,000 in prizes, including four £5,000 endowments to the winners to allow them to study computer art anywhere in the world.

The object of this laudible exercise is for entrants to produce still or moving pictures that have a maximum cycle time of 60 seconds on either a Vic 20 or Commodore 64. There are to be four host countries running the competition — UK, West Germany, USA and Canada — and entrants will be divided into three age groups. These will be under 12 years old, 12 to 17, and 18 plus.

The results are to be judged by a panel of experts who will be examining entries for both technical skill and artistic qualities. This panel will include Professor Brian Allison, World President of the International Society for Education through Art; Commodore marketing manager, John Baxter; Paul Brown, editor of the Computer Arts Society's journal, *Page*, and the artist, Tony Hart.

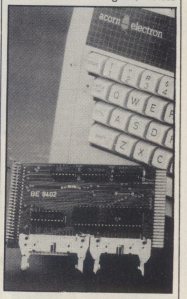
In addition to the prizes (which include up to £1500-worth of Commodore kits) the winners will have their work exhibited around the world at a series of special exhibitions.

If you feel like having a go, entry forms will be found at most major retail computer stores.

Electron add-ons, real or false?

Broadway Electronics has narrowly escaped responsibility for what could have been one of the better marketing nonsenses of the year (better, even, than the non-add ons for the non-QL). Broadway Electronics is the Bedford-based company that has produced, or is working on, a range of add-on cards for the Acorn Electron.

It has been saved from the dubious honour of having real add-ons for a non-machine by the recent appearance of the Electron on high street shelves. "At long last," voices



are heard to cry out in the wilderness.

In practice, there is only one 'real' add-on at the moment, the other 'real' add-ons still being under development. The real 'real' one is a printer interface and user port which comes complete with drive software and screen dump routine and costs £39.95.

The 'real' add-ons under development include a disk interface, a joystick controller, and a motherboard that will allow multiple installations of add-ons.

More details on 0234 58303.

Well, imagine that!

Self-professed success story in the games software business, Imagine, has bombed the price of its games packages to £3.95 after "extensive market research."

The games price has been bombed, according to the company, to make games more accessible to home computer users. It should also boost the sales volume for Imagine on games such as *Pedro* and *Alchemist*.

These titles were among 33,421 games cassettes with a retail value of £200,000 which were stolen from the company's Liverpool warehouse earlier this year. If Imagine has such large quantities of stock in store, could it be that the company's sales figures aren't *quite* as high as they might be?

Imagine has also been involved in what is termed the 'amicable termination' of its arrangement with Marshall Cavendish to prepare programs for a part-work publication.

The deal had the publisher fronting the development of some new programs to go with a computer partwork it is planning. The deal has since fallen through and arrangements are in hand for Imagine to pay the front-money back.

The company has also published its own newsletter, the back page of which is largely taken up with accounts of how it has sacked former sales manager Colin Stokes for disclosing information and/or setting up a rival business.

Imagine has taken an injunction out against Mr Stokes. Apparently the company believes that he was about to leave and set up a rival business in response to their attempts to persuade him to sign a contract preventing him from working for other software companies should he leave Imagine.

Now you might be bored with what appears to be industry gossip, but Imagine obviously feels that the case has a much wider significance. In its newsletter, the company says it feels it has a duty to warn the micro software industry against 'insidious practices'.

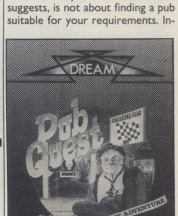
Software companies should remember that there is a saying from some book or other (could it be the Bible?) which goes: 'let him that is without sin cast the first stone'.

As we go to press, Imagine has reinstated its original software prices. The game goes on . . .

Too much to drink

If you think you know how much you can drink and what makes 'a man' (or 'a woman') of you, read on.

Dream Software has launched a game program called *Pub Quest* that, contrary to what the name suggests, is not about finding a pub suitable for your requirements. Instead, it is about having three hours to pay your bar bill at the local after having consumed a skinfull.

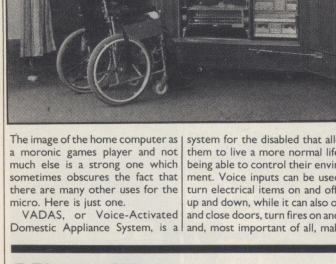


The promotional literature with the program has the knack of glorifying drunkenness, which is sometimes an OK condition in the right circumstances, but hardly something to make a big promotional number out of. The main object of the game seems to be to find your money after you have lost it down a drain. There are those that would say it serves you right if you fail to recover your cash.

If getting drunk, or more precisely pretending to get drunk, is your forté this is the program for you.

Details from Dream Software, PO Box 64, Basingstoke RG21 2LB.

Concerned technology



The image of the home computer as a moronic games player and not much else is a strong one which sometimes obscures the fact that there are many other uses for the micro. Here is just one.

VADAS, or Voice-Activated Domestic Appliance System, is a system for the disabled that allows them to live a more normal life by being able to control their environment. Voice inputs can be used to turn electrical items on and off, or up and down, while it can also open and close doors, turn fires on and off and, most important of all, make a cup of tea.

VADAS is part of an exhibition that will be touring the country this year. Called The Concerned Technology, it is being mounted by the Department of Trade and Industry to demonstrate how information technology systems can be used to produce aids for those with special needs.

Although many of the systems on show are still relatively expensive, it is encouraging that they are dropping rapidly in price. This is partly because many of them are now based on home computer hardware, such as the BBC 'B'. They could probably be made even cheaper if more effort was put into developing new systems and programs for the disabled. It's a lot more worthwhile than creating yet another space invaders game. The trouble is, at the moment there's still much more money to be made in inane arcade games.

High flier

I suppose it had to happen one day, and now it has. One of the more interesting things that you can do with a home computer — simulate the experience of trying to fly an aeroplane — has been brought down to the level of everything else in the games world with the addition of lots of shooting-down-the-bad-guys nonsense.

This time all the machismo is based around the second world war and the Spitfire, and the company responsible is Acornsoft. Having learned to 'fly' your Spitfire and scored points for flying under a bridge and between two skyscrapers, you then have to defend a place called Acornsville from the enemy.

Still, this is merely the opinion of a jaundiced reviewer, so let us instead step aside and introduce a more positive approach. Come in ex-flight lieutenant Barrington Waldergrove-Smythe.

"Hello chaps, good to see you all again, especially Air Vice Marshall Sandy Johnstone; dashing good of him to come and launch this program thingie from Acornsoft. What do they call it? *Aviator* or something.

"Just had to have a little go you know and by golly it took me back to the good old days; Jerry coming at ten o'clock high, swarms of them you know. We used to climb above them, get the sun on our backs and dive amongst them. Used to give them a terrible thrashing you know; pasted them all over the sky.

"I even managed to get this plane under the bridge eventually. Took me a couple of goes, of course, which is what it used to take in the old days. Got a terrible drubbing from Wingco of course, bending all his precious aeroplanes like that; still, daddy sorted him out.

"Yes, this *Aviator* thing is really top-hole; get them in your sights, wait till you see the whites of their eyes and blast them out of the skies, wonderful, wonderful.

"Pardon? The cost? Oh yes, the cost. Now these Acornsoft wallas tell me it costs £14.95 as a cassette and £17.65 as a floppy disk, whatever that is.

"One thing, the Jerries on this Aviator thing look a bit odd, all those tentacles and wotsits. I'm not sure a real Spit would have managed to shoot them down. Now, a Spit with heat-seeking, radar-guided, laser communicated thermo-nuclear rockets, that would be fun."

Thank you Barrington, thank you.

Interest in QL buyer's fund (or 'Queue Hell')

Not for us the banner headlines screaming that Sinclair has flunked it once again with the non-delivery of the QL. As we reported last month, experienced observers of the home computer business predicted at the time of its launch that earliest deliveries to punters would be about May.

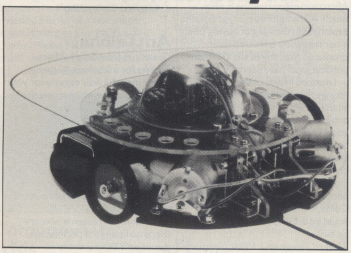
Nothing has happened to change that opinion, so there is little to report for the moment, save that May deliveries might even prove to be a trifle optimistic. We have had letters from readers telling us that Sinclair is now mentioning not only June, but July as delivery dates. It would appear that the majority of people who have placed mail orders will probably get a QL by the time it goes on sale on the high street, which should be in time for Christmas.

The best advice now might well be, if you want to get a QL and haven't ordered one yet, wait until it appears in the shops.

One final point on this non-story of the year concerns all those people who have already paid by cheque for their yet-to-be QL, and have had their cheques cashed by Sinclair. As most people will know, the company has set up a trust fund and, rather than have the hassle of calculating the interest due to each customer, is threatening to give them all an, as yet unspecified, 'gift' instead.

Now, nobody here is terribly good at sums, but the general view is that most of the long-suffering QL purchasers should be looking for a 'gift' of around £12, maybe more, if they are to recover their full share of the interest.

Robots for all the family



So, you fancy the idea of getting your hands on a robot, but are none too sure about the price. Alternatively, maybe you're good with one of those soldering irons. Whatever the case, you may well be interested in making one yourself rather than buying it assembled.

Prism Consumer Products is launching a range of kit form robots that are collectively referred to as the Movits.

There are five of them altogether, ranging in price from £9.99 to £34.99. Each comes with all the components needed together with a construction plan which, the company confidently states, will allow the whole family to enjoy building the robots.

More details from Prism on 01-253 2277.

Oric upgrade

Rumours of a recall of Oric's new Atmos micros have been "totally denied" by Oric Products International. The company claims that the misunderstanding arose due to the replacement of the 1:0 ROM in the Oric 1 with the 1:1 ROM in the Atmos.

Readers of last month's Atmos review will remember we mentioned Oric's plans to institute a conversion scheme for Oric 1 owners wanting to upgrade their micros to full Atmos specifications.

Well, Oric has brought forward the starting date of this scheme from "late summer" to this month, and has fixed a price of £60 including the new manual, a new 12 month warranty, VAT and post and packaging.

The upgrade itself includes the new ROM, full pitch keyboard and the black and red case. The cost applies to a 16K Oric 1 upgraded to a 16K Atmos and to a 48K Oric 1 upgraded to a 48K Atmos.

If you're an Oric 1 owner and want to take advantage of this service, send your machine (without the power supply or leads) together with £60 to Oric Assembly Unit 1, Hampton Road West, Hanworth, Middx.

Getting ridiculous

This month's winner of the I'm-not-sure-I-could-have-thought-of-this-one-even-after-drinking-six-cocktails-name-for-a-game competition is software house, Salamander.

It has actually released a game going by the improbable title of *Metagalactic Llamas Battle at the Edge of Time*.

This is probably one of the best examples of silliness to turn up this year, though it is certain there will be more . . . there's always more.

Commodore in Corby-it's official

Now it can be officially revealed. Commodore Business Machines recently told us what everybody thought was already public knowledge.

The company has moved to the town of Corby in the north-east of England where it will be manufacturing personal computers. This was announced to the press by Minister of Technology Kenneth Baker. The company will be producing Vic 20 and Commodore 64 machines in the new factory for both the UK and European markets. These used to be made at the company's plant in West Germany, even though Commodore spokespeople suggested last year that it was already making 5,000 of the beasts at Corby. Ho hum.

The West German plant is now going to be devoted to the manufacture of the company's range of business machines. This will probably be considered a good thing by many of Commodore's business systems dealers, many of whom have been wondering of late where these machines are hiding.

Not content with official announcements, Commodore has also managed to acquire one of the great accolades of life and it is now deciding what to do with it.

It has received a Royal Warrant, which means that the company is now, 'by appointment to Her Majesty the Queen, manufacturers of computer business systems'. Impressed, eh?

There is currently no official word on how many of the zillions of computers Commodore is producing in Corby the Royal Family is to buy, or whether they (sorry, They) have decided to set up in Windsor as a distributor or dealer — perhaps as specialists in estate management software.

The burning question is, however, how does a Royal Warrant compare with a knighthood on the grand scale of things?

Roman Empire

To clear up any confusion, last month's Commodore 64 listing, Roman Empire, bears no relation to Lothlorien's product of the same name. Lothlorien's *Roman Empire* is available for several home micros — except the Commodore 64.

Letters TO THE EDITOR

THE EDITOR, WHICH MICRO & SOFTWARE REVIEW

SCRIPTOR COURT, 155 FARRINGDON ROAD, LONDON EC1R 3AD



Paintbrush puzzle

I am a regular and avid reader of your magazine and enjoy its informed content. However, I must admit to a certain amount of confusion and head scratching where the front cover of the March 1984 issue is concerned. Perhaps it relates to an article I overlooked, but I fail to see what the illustration of a paintbrush refers to!

Despite this small problem, which I trust you can clarify, I shall continue to subscribe to your excellent publication.

D. Brian, Stockport

Definitely a gold star for observation, D. Brian of Stockport!

The paintbrush illustration referred to the game on the free March flexi-disc for the Spectrum and BBC. It was called *Airbrush*. Geddit? You did *notice* the flexi-disc, didn't you?

Which is best?

My eldest son is taking an increasing interest in computers and I am considering buying a micro for general family use. I intend to use the computer for storing information as well as for computer games.

I bought your magazine to assist me in choosing the right machine, but having little knowledge of computers or programming I am having some difficulty. My eldest son's school uses a BBC model B, but I am reluctant to spend £400 on a 32K computer. If I were to spend this sort of money I would have thought that the Sinclair QL was much better value, but will games software be produced for it and how much will additional micro-drives cost?

I would prefer a 'standard' type keyboard which rules out the Spectrum. However, there are still numerous other machines to choose from. The Commodore 64 seems to suit my needs best as I would be looking for a memory in excess of 32K. But bearing in mind my lack of knowledge, the comments about the supplier's manual in your Buyer's Guide make me very wary of buying this machine. In addition I have little knowledge of the new Oric Atmos which may be an improvement on the Oric 1.

Could you please advise me on which machine(s) you consider would be most suitable?

D. King, Luton

The Commodore 64 sounds suitable for your needs, especially now that it can be obtained for about £400 complete with disk drive. There is certainly a large amount of software available for all purposes, serious and frivolous. The manual is indeed a weak area, but a book such as Peter Gerrard's 'Using the 64', published by Duckworth Home Computing, should fill in the gaps nicely.

Computer Choice

I do not own a personal computer but want to buy one. I am not in the market for a games computer; I need the machine which is best suited to mathematical research, in both the numerical and graphics modes (to be used for topology etc.) I will be quite capable of writing my own programs. Can you advise me?

A.P. Rhodes, Manchester

It's hard to judge the best computer without knowing a little more about your individual requirements, but the BBC Micro should be a good bet with its wide choice of programming languages and good graphics. Since it is widely used in scientific and higher educational roles, there might be suitable software already available.

Book hunting

I am writing to ask for help in locating a book which you featured in *Manual Override* in your December issue.

I cannot find the book, *Easy Add-on Projects for Spectrum, Z81 and Ace*, even in the best computer bookshops. I would be grateful for the address of the publisher.

J.M. Bolton, Northumberland

The publisher is Bernard Babani which can be reached on 01-603 2581.

German greetings

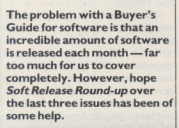
I am a regular reader of *Which Micro* and enjoy reading it very much. Although I do not yet possess a micro I am thinking of buying one. Your magazine is much better produced than any of the German publications I have seen.

I noticed in one of the program listings that you gave a reference to all the variables used within the program. I think that this was a very good idea as those who are not so hot on the subject are given the chance to understand what is going on.

Another thing that I think a lot of people appreciate is the Buyer's Guide. If the same sort of thing could be done for software it would be nice.

Richard Townsend, West Germany

The problem with a Buyer's Guide for software is that an incredible amount of software is released each month — far too much for us to cover completely. However, hope *Soft Release Round-up* over the last three issues has been of some help.



Calling Memotech

I read with interest the review of the MTX in your January issue. You didn't mention the fact that you can only get 39 characters on the text screen. I phoned Memotech to ask them about this and they assured me that this only happens on the first line. So off to my computer I go and (surprise, surprise) they're wrong.

The next problem arose when printing text on the graphics screen and I found that I lost all the left hand characters. Another phone call to Memotech. I was told that if I adjusted the horizontal hold the disappearing characters would come into view.

Off to my computer I go once more and I find that (surprise, surprise) they're wrong again.

There are other oddities: why are circles egg shaped, why is there no left hand border on games software and why is it difficult to get a good picture and good sound at the same time?

I know that these unwelcome features are not peculiar to my machine. A local dealer has sent his Memotech computers back for the same reasons.

The real headache is how to get the problems solved when Memotech repeatedly fobs me off with 'solutions' that don't work. I think that the machine is faulty, but how do I get Memotech to agree?

E. Hughes, Colwyn Bay

Am I alone?

Greetings from South Africa. Thanks for a fabulous magazine. Every month I wait eagerly for your super magazine which is invariably one month late. The magazine here costs R2.70, but it's worth it.

Before I bought my computer, the Spectrevideo 318, I went through your comments in the December issue which I found very helpful. Your review made up my mind. The next day I went out and bought myself the SV 318.

Now, my problem is why are there no listings of peripherals, games etc? Why is there no company making games for the Spectravideo?

I would like to correspond with anybody in the world who has a Spectravideo SV 318. All letters will be answered. My address is: 5 Orly Park, Bonaero Park, Kempton Park, 1622 Rep. of South Africa.

Paul Ferreira, South Africa

Commodore saga

I never really believed the many articles I've read about poor service given by Commodore . . . until I ordered an RS232 serial interface from them. That was last July and I am still waiting.

The following is a summary of Commodore's replies to my numerous telephone calls during the last eight months:

July: The interface will be available end of August.

August: We are waiting for supplies to be shipped from Germany.

September: We are still waiting for supplies from Germany.

October: Our shipment has arrived (hurray!) but is being held up in Customs (boo!)

November: Your interface will be available after Christmas.

Early Jan: We have received

delivery. Your interface will be despatched in the next day or two, just as soon as we have translated the instructions from Japanese into English (could be helpful).
Mid Jan: Sorry, we are still waiting for them to arrive in the country (here we go again).
Following day: We apologise for messing you about. Your interface will be posted to you today.
Late Jan: Although we said we would send you the interface when you last phoned, an order actually takes 28 days to process. You'll have to be a bit more patient.
Mid Feb: Sorry, we can't find your order. However as you've been waiting so long, we'll rush your interface to you first thing Monday (20th).
23rd Feb: Ah yes, Mr. Langham. It was a C2N Cassette Unit you wanted wasn't it . . . ?

By the way, an article in the *Windsor Express* of 24th February says that the Commodore has been awarded the Royal Warrant of Appointment to Her Majesty the Queen. Please Maam, when you order an interface, I wonder . . .
A.J. Langham, Essex



Computerless crisis

Please could you give me some advice on buying a computer in the below £200 range. The story so far:

In July 1983, I bought an Oric 1 48K and although pleased with its performance it suffered from the much publicised loading trouble. After six months of putting up with this I finally gave up and got my money back. Now I am looking for another machine in the home/educational line.

The new Oric Atmos looks tempting, but I am not sure if I want to risk the same company again. I am now interested in the 64 or Electron as I understand both have great potential in the educational area.

Your advice would be much appreciated as I am finding computerlessness is far worse than Guinnlessness!
M.J. Thorne, Dorset

We would recommend the Spectrum 48K for your purposes, largely on the strength of the large amount of good educational software available. In this field it rivals the BBC Model B. At this stage, not many programs are available in an Electron version and it is not always possible to run BBC Micro versions successfully on the BBC.

Computer club

I read your magazine with great interest and find it good value for money. I am, however, writing in response to a letter printed in December's issue of *Which Micro*. The article was written by F.G. Longmore and it was about the Aquarius home computer system. I am glad to say that due to demand amongst school friends I have formed a 'user friendly group' for the purpose of exchanging programes, tapes etc.

The club will be free of charge and open to anyone. If you are interested then you should write to me at: 54 Dunbar Crescent, Hillside, Southport, England, PR8 3AB
Gerard McGuchin, Southport

Aquarius update

In the review of the Spectravideo Compumate in your March issue you said that the Aquarius was no longer produced by Mattel, but by Add-On Electronics.

In fact the machine is now produced and distributed by Radofin. The company address is Hyde House, London NW9 6LG.
A. Rosbotham, Devon



Unfair to Aquarius

I was interested to read the Buyer's Guide in your March issue as I am a recent purchaser of the Aquarius. In defence of the Aquarius keyboard, which you claim is "diabolical" I must tell you that my three children (aged 6, 10 and 11) totally disagree. They find the keyboard extremely easy to use, it has a positive response — without the constant repeat as in the school's BBC micro. As an adult user (who is accustomed to a portable typewriter) I was very apprehensive at first, but can now claim to be as skilful as my children. The greatest appeal of the keyboard has to be that it's *Noiseless*!!! — unlike the Vic 20 which sounds like a loose pair of false teath clattering away.

Another point in favour of the Aquarius is the fact that any computer compatible cassette recorder can be used and, unlike the Dragon 32, programs can be verified.

The screen display from the Aquarius is excellent. I feel that you should mention this as it excels over its nearest rivals in this price range, and many higher priced computers too.

As beginners to programming, we have not yet experienced any great difficulties with the "antiquated Basic". We have written some simple educational programs for the children's home use and have just finished our first (text only) adventure game, thanks to having purchased the 16K memory. We understand that an 'extended Basic' cartridge should be available next month.

I believe that, like our family, you will be surprised to find that for a home computer it has a great deal more to offer than you at first suspect. When you consider the price — £49.95 for a 16-colour computer and £29.95 for the 16K memory, and with an outstandingly good instruction book thrown in — it is remarkably good value. My children and their friends are thrilled with the Aquarius, and my husband and I are getting quite good at programming and debugging as well!

Please explain why the Basic is antiquated. I can't wait until you write the article. Many thanks for a great magazine; some programs for the Aquarius would be nice.
Margaret Harris, Swindon

64 fan down under

Living way out in the backwoods of Australia it gave me new hope when I read the most interesting article by Pete Gerrard in your December issue. I live in a town with a population of only 44,000, yet it has seven stores selling Commodores. But only one of them deals exclusively with that product. My dealer, although not the cheapest, stayed with me during the teething problems of my first and subsequent purchases, thereby sparing me a lot of wasted time and effort. And his help was free of charge.

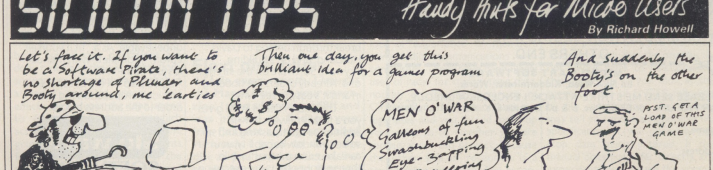
Like most others, I bought my first 64 for my children to learn computer literacy, and of course to play games on. As I run a small supermarket, my dealer introduced me to the *Total Business 3.6* program. Thanks to him, I had it up and in full operation after only two evenings work. I would recommend this program to anyone in small business. It has allowed us to expand into another shop due to the availability of vital information that we did not have access to prior to computerisation on our little toy.

The moral of the story is: do not always go to the cheapest dealer (he won't necessarily give the best value for money) and always seek out an exclusive dealer. In being exclusive he shows that he believes in the product he is selling.
Bob Eustace, Australia

SILICON TIPS

Handy hints for Micro Users

By Richard Howell



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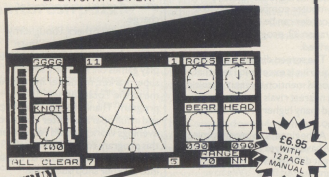
FL. LT. J.T.F. DYER



SPECTRUM 48K

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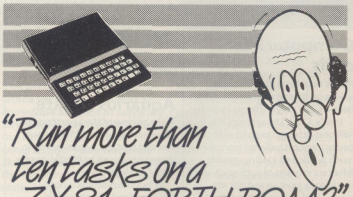


"Run more than ten tasks on a ZX81-FORTH ROM?"

Sure! More than 10 tasks simultaneously and, in some cases, up to 300 times faster! That's what replacing the basic ROM with the new FORTH does for the ZX81 – and more!

The brains behind the breakthrough belong to David Husband, and he's building Skywave Software on the strength of it. Already orders are flooding in and it's easy to see why.

The ZX81-FORTH ROM gives you a totally new system. In addition to multi-tasking and split screen window capability, you can also edit a program while three or four others are executing, schedule tasks to run from 50 times a second to once a year, and with a further modification switch between FORTH and BASIC whenever you like.

The ZX81-FORTH ROM gives you a normal keyboard with a 64 character buffer and repeat, it supports the 16k, 32k, 64k RAM packs, it is fig-FORTH compatible and it supports the ZX printer.

The price, too, is almost unbelievable. As a "fit it yourself Eprom", complete with manual, it's just £25 + VAT.

Add £2 p&p UK (£5 Europe, £10 outside Europe) and send your order to the address below.

Skywave SOFTWARE
David Husband
73 Curzon Road, Bournemouth, BH1 4PW, ENGLAND.
Tel: (0202) 302385.
International +44 202 302385.

PROBLEMS

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



Tape problems

After following all the advice about using tape with my Sinclair I am still getting loading problems. Since my programs tend to be fairly long this is a terrible nuisance. Have you any fail-safe ideas?
T. Gorringe, London N2

The expensive way around this problem is to place the programs in some form of solid state store that cannot easily be destroyed. Many Sinclair specialist dealers know about such units because if they create software then they often keep their precious software protected by battery back-up. And in any case it gives them quick loading for smooth demonstrations. Micro-Z of Exeter advertises a battery supported store for this purpose, but I would advise talking to a specialist dealer. It may not be necessary to go for this solution which is rather expensive if you wish to handle a lot of programs.

Stack of Liverpool sells a cartridge containing a monitor and toolkit which you will find useful for about £30. The main aim of the Stack software is to enable your own programming creations to be faster in tape speed working by bamboozling the cassette system. Many Sinclair users would rather have slower tape operations with Commodore levels of reliability.

64 Back-up

I am writing to you on a matter that I have been very anxious over for the past few months. The problem is that I can't seem to find any company that sells back-up tape copiers for the Commodore 64. The only ones that I have seen are for the ZX Spectrum. I was wondering if you know of such a company and if you do would you please give me their address and if possible the price of the tape copier.
Donald Kelly,
Whitehaven, Cumbria

The query you have raised may be hanging upside down so to speak. The Commodore cassette systems are exceptionally reliable and slow. The reason for this is that load and save operations are done at 1200 baud, but all tape operations are done twice and the two operations are compared against each other in a 'verify' matching process. This effectively reduces the tape speed to 600 bits per second which accounts for many moans and groans. However, it also accounts for the extreme reliability of the tape systems with both the Vic and the 64 machines from Commodore, which in turn makes it rather unprofitable to advertise 'back-up' systems.

File first aid

I have got two files mixed up together on my disk. I have not been able to work out how this happened. What should I be looking for and is there any way I can be certain to stop this happening again?
G. Strauss, Bedford

What's happened is that the list of where files are put has become confused. The disk map for files might have been knocked out by a power failure or something else like that. It is also possible that you might have changed diskettes without telling the routine which finds space that it needs to handle a fresh file.

What you need to do is to keep an eye on the map of files on disk and write a routine which works out whether any space is being donated to more than one file. It is good practice to take a look at the disk map when important files are being put away, because although backing up from some previous file is often possible, the whole procedure is tedious. The whole point of learning where vital lists of facts about your system are kept by the control routines is to help you in managing your work without fuss or bother. Sometimes you can spot danger points in your working sequence which might garble these tables. Once spotted, these points of vulnerability are generally quite easy to get around.

Flexi disk blues

As I do every month, I bought the March issue of your magazine. I own a Spectrum 48K and was pleased to find on your free flexidisc a program called *Airbrush*. I tried to copy the disc as you had instructed, but to my horror I found that the needle of my record player simply slid across the Spectrum program. I went back to Menzies where I had purchased the magazine, and they kindly exchanged the disc for another one. I went home and tried again but was dismayed to find that yet again it would not work. Please could you tell if you have had any other complaints on this matter.
Andrew Johnson,
Tweedmouth, Northumberland

The grooves in the plastic records are not very deep. When using a record player (even for playing ordinary records and looking after them properly) it is important that the stylus balance is arranged so that the effective mass is low but stable.

The guess is that the stylus is arranged on your player to produce an excessive mass. If it is an elderly arm plus cartridge then there is not too much we can do about it, but if it is alleged in the instructions that the balance can be adjusted then you may be able to do that. If in doubt check with a friendly hi-fi buff since these types keep the needle weight low. Lateral tracking bias may be the problem.

Radio communications

I am anxious to learn more about a subject I saw on the TV recently. It involved someone picking up short wave radio signals and loading them into his computer, which in turn printed out the message received. Could you tell me what equipment I would need and which computer is best suited to this job. Also, is it just simply a matter of LOAD 'CHARACTERS' when entering it into the computer, as if entering something off a tape?
Alan North, Basingstoke

You should contact the Radio Society of Great Britain (RSGB) as it has lots of experience of members using radio communications with computers. There have been illegal uses of radio for transmitting data, notably on the illegal version of Citizens Band. However, there are legal uses and you should make up your mind as to whether you are serious about this project, because the other side of reception is a transmission capability. The reception only equipment is simple, which is why the BBC is transmitting programs as part of its programmes.

Logo info

I am thinking of buying Logo for my Commodore 64 and have been trying to work out how to approach the language. I have been urged to buy *Discovering Apple Logo* by David Thornburg. I am a bit bothered by the fact that this is directed at Apple users. Is there a good book for the Commodore Logo user?
Graham House, Basingstoke

Do not be afraid to buy the book by Thornburg since it forms a useful introduction to the language. I do not know of a comparable title for Commodore owners, but books on Logo are trickling off the presses all the time. The original standard in the field has been Peter Ross's *Logo Programming* and this is good.

Password programming

I am trying to illustrate some simple security procedures to some youngsters. How can I enter data on the keyboard without having it displayed on the screen? I want to do this to match the process of using passwords practised in commercial applications. Is there an easy way to do this?
F. Pitcher, Reigate

The objective here is to enter data while being ignored by the editor. This is possible on some machines. The problem is that the manuals do not always refer to functions like this. However, if you look at the suggested use of ENTER followed by file specifications the manuals may tell you about an ignorable file specification. It will generally not stop data being entered. If the manual does not refer directly, try experimenting through the normal range of symbols. The other ways of tackling invisible data entry involve stopping the characters getting to the screen related memory.

SPECTRUM SKETCHPAD

PART 2

Last month's opening instalment of *Spectrum Sketchpad* introduced the reader to the general concepts behind the program. The modules already presented enable the user to move the cursor in various ways and to draw or erase lines and circles. This month we continue with more modules to enhance the program and help you to achieve high quality graphics.

Module 1.8 — Subroutine — Fill

This fill routine is a fairly simple one. The starting point must be placed inside a completely enclosed area. The edge of the screen is not adequate so this must have a line drawn against it if an inked-in area is to abut it. The program searches upwards, line by line, inking as it goes until it hits a 'ceiling' upon which it then searches downwards from the starting position until it hits the 'floor'.

Complex shapes are not filled in one go and the user will have to move the starting cursor (which corresponds to the standard pixel cursor) to a new position. As long as boundaries are completely defined the routine will not escape onto the rest of the screen. If it does then the boundary is deficient. If this happens BREAK before too much damage has been done, enter RETURN in direct mode and access unplot mode to undo the damage.

Line 2410 — Set the intitial co-ordinates for going up (xu,yu) and for going down (xd,yd) to the same value as x and y.

Line 2420 — Set a marker at start of line.

Line 2430 — Test each pixel to right. If uninked ink it and move one pixel right.

Line 2440 — When edge reached (IF statement in 2430 unsatisfied) go up one line.

Line 2450 — Search to right to find rightmost boundary of new line if starting pixel was found to be uninked.

Line 2460 — Search to left to find first empty pixel if starting pixel was found to be inked.



```
2400>REM ************************
2401 REM    MODULE 1.8 - FILL
2402 REM ************************
2405 BEEP .05,24: PRINT #1;AT 0,0;"FILL ROUTINE - CONFIRM Y/N   ";o$
2406 PAUSE 0: LET i$=INKEY$
2407 IF i$="n" THEN  GO SUB 4000: RETURN
2408 IF i$<>"y" THEN  GO TO 2406
2409 BEEP .05,24: PRINT #1; FLASH 1;AT 0,0;"                WAIT    "
2410 LET xu=x: LET yu=y: LET xd=x: LET yd=y
2420 LET xus=xu: PLOT xu,yu
2430 IF POINT (xu+1,yu)=0 THEN  LET xu=xu+1: PLOT xu,yu: GO TO 2430
2440 LET yu=yu+1
2450 IF POINT (xu,yu)=0 THEN  LET xu=xu+1: GO TO 2450
2460 IF POINT (xu,yu)=1 AND xu>xus THEN  LET xu=xu-1: GO TO 2460
2470 IF POINT (xu,yu)=1 AND xu=xus THEN  GO TO 2550
2480 LET xus=xu: PLOT xu,yu
2490 IF POINT (xu-1,yu)=0 THEN  LET xu=xu-1: PLOT xu,yu: GO TO 2490
2500 LET yu=yu+1
2510 IF POINT (xu,yu)=0 THEN  LET xu=xu-1: GO TO 2510
2520 IF POINT (xu,yu)=1 AND xu<xus THEN  LET xu=xu+1: GO TO 2520
2530 IF POINT (xu,yu)=1 AND xu=xus THEN  GO TO 2550
2540 GO TO 2420
2550 LET xds=xd: PLOT xd,yd
2560 IF POINT (xd-1,yd)=0 THEN  LET xd=xd-1: PLOT xd,yd: GO TO 2560
2570 LET yd=yd-1
2580 IF POINT (xd,yd)=0 THEN  LET xd=xd-1: GO TO 2580
2590 IF POINT (xd,yd)=1 AND xd<xds THEN  LET xd=xd+1: GO TO 2590
2600 IF POINT (xd,yd)=1 AND xd=xds THEN  GO SUB 4000: RETURN
2610 LET xds=xd: PLOT xd,yd
2620 IF POINT (xd+1,yd)=0 THEN  LET xd=xd+1: PLOT xd,yd: GO TO 2620
2630 LET yd=yd-1
2640 IF POINT (xd,yd)=0 THEN  LET xd=xd+1: GO TO 2640
2650 IF POINT (xd,yd)=1 AND xd>xds THEN  LET xd=xd-1: GO TO 2650
2660 IF POINT (xd,yd)=1 AND xd=xds THEN  GO SUB 4000: RETURN
2670 GO TO 2550
2680
2681
2682
2683
```

Line 2470 — If all the pixels are found to be inked and starting marker is found (from previous round of the loop) assume ceiling has been found and pass to downward inking.

Line 2480 — You have found the rightmost edge of the new line. Set starting marker and ink first pixel.

Lines 2490-2530 — Same routine but going in opposite direction.

Line 2540 — Ceiling not reached — start whole loop again.

Lines 2550-2670 — Analogous routine going down. Escape to main control loop at line 2660 if 'floor' found.

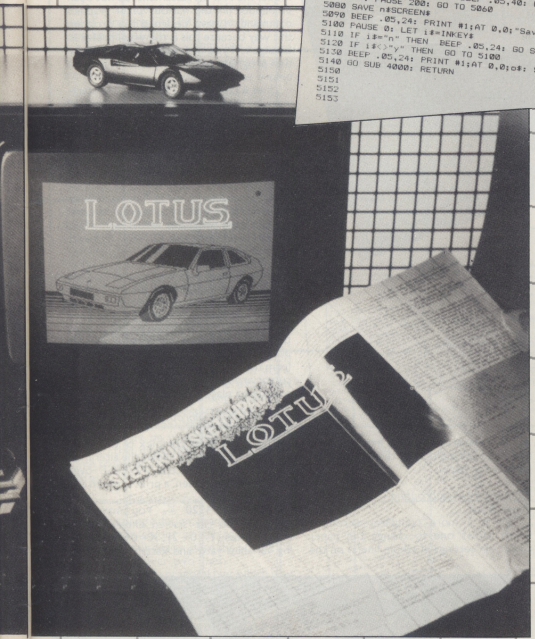
If you wish to follow the routine, imagine you are at a leftmost position starting at line 2420 and inking to the right. Entering the subroutine the first time

usually places the starting position midway along a line making the role of xus (or xds) difficult to understand.

Testing Module 1.8

Run the program and draw a few circles around the screen. Fill them with the starting point in different positions. Try

```
5000 REM **********************
5001 REM      MODULE 1.9 - SAVE
5002 REM **********************
5010 BEEP .05,24: PRINT #1;AT 0,0;"SAVE TO TAPE CONFIRM - Y/N          ";o#
5030 IF i#="n" THEN  GO SUB 4000: RETURN
5040 IF i#<>"y" THEN  GO TO 5020
5050 BEEP .05,24
5060 INPUT "Filename? ";n#: IF n#="" THEN  GO TO 5060
     "; PAUSE 200: GO TO 5060
5080 SAVE n#SCREEN$
5090 BEEP .05,24: PRINT #1;AT 0,0;"Save one more copy? (Y/N)          "
5100 PAUSE 0: LET i#=INKEY$
5110 IF i#="n" THEN  BEEP .05,24: GO SUB 4000: RETURN
5120 IF i#<>"y" THEN  GO TO 5100
5130 BEEP .05,24: PRINT #1;AT 0,0;o#: SAVE n#SCREEN$
5140 GO SUB 4000: RETURN
5150
5151
5152
5153
```



with SCREEN$. You are well advised to make two recordings of any designs you create. In the LOAD module you are asked for the filename but pressing ENTER suffices if the tape is correctly positioned.

Testing Modules 1.9 and 1.10

Make a design and save it to tape. BREAK the program and CLEAR. Now rerun and load your design.

Module 1.11 — Subroutine — COPY to printer

Again this is a pretty straightforward module which needs no explanation. Owners of professional quality printers and a suitable interface which can support a screen dump given a suitable program will wish to substitute such a routine here. There is plenty of room as this is the last-numbered routine in pixel mode, the coding for PRINT mode starting at line 7000. Test the module by copying a design.

Module 1.12 — Subroutine — Erase picture and Restart

This subroutine never returns. We jump out of a GOSUB call by RUNning the program. This is objectionable only to aesthetes since RUN clears the GOSUB stack. Test the module by making a simple design and then entering this routine. Watch your design disappear for ever!

Attributes

So far we have been plotting and painting on the screen in the paper and ink colour chosen at the beginning of the program. This hardly stretches the ▶

centre, a rightmost or leftmost edge and a topmost or bottommost edge. In each case the circle should fill efficiently albeit in a fairly leisurely fashion. Now draw some squares, diamonds or triangles with the Line drawing routine and fill these. They should fill completely.

Complex shapes

Now draw a complex shape with several arms and try filling it. It will only fill one arm for each direction and then return. In practice this is not a serious defect and still allows quite complex designs to be filled if you are patient.

Modules 1.9 — Subroutine — Save
1.10 — Subroutine — Load

These two modules are very straightforward and need little comment. Most of the techniques have been met already. Note that the screen may be saved twice because the VERIFY facility will not work

```
5000 REM **********************
5001 REM      MODULE 1.10 - LOAD
5002 REM **********************
5010 BEEP .05,24: PRINT #1;AT 0,0;"LOAD ROUTINE - CONFIRM (Y/N)          ";o#
5030 IF i#="n" THEN  GO SUB 4000: RETURN
5040 IF i#<>"y" THEN  GO TO 5020
5050 INPUT "Filename? ";n#
     "; PAUSE 200: GO TO 5050
5080 LOAD n#SCREEN$
5090 BEEP .05,24: PRINT #1;AT 0,0;"Load another picture? (Y/N)          "
5100 PAUSE 0: LET i#=INKEY$
5110 IF i#="n" THEN  BEEP .05,24: GO SUB 4000: RETURN
5120 IF i#<>"y" THEN  GO TO 5100
5130 BEEP .05,24: PRINT #1;AT 0,0;o#: LOAD n#SCREEN$
5140 GO SUB 4000: RETURN
5150
5151
5152
5153
```

```
6400 REM **************************
6401 REM    MODULE 1.11 - COPY
6402 REM **************************
6410 BEEP .05,24: PRINT #1;AT 0,0;"CONFIRM COPY - Y/N          ";o$
6420 PAUSE 0: LET i$=INKEY$
6430 IF i$="n" THEN  GO SUB 4000: RETURN
6440 IF i$<>"y" THEN  GO TO 6420
6450 BEEP .05,24: COPY : GO SUB 4000: RETURN
6460
6461
6462
6463
```

```
4000 REM **************************************
4001 REM MODULE 1.12 - ERASE PICTURE & RESTART
4002 REM **************************************
4010 BEEP .05,24: PRINT #1;AT 0,0;"PLEASE CONFIRM THAT YOU WISH TO ERASE PICTURE
 AND RESTART - Y/N          "
4020 PAUSE 0: LET i$=INKEY$
4030 IF i$="n" THEN  PRINT #1;AT 0,0;o$;o$: GO SUB 4000: RETURN
4040 IF i$<>"y" THEN  GO TO 4020
4050 RUN
4060
4061
4062
4063
```

```
3000 REM **************************************
3001 REM MODULE 1.13 - BORDER OR INK CHANGE
3002 REM **************************************
3010 BEEP .05,24: PRINT #1;AT 0,0;"CHANGE - BORDER (B) - INK (I)   OR NEITHER OF
 THESE (N) ?          "
3020 PAUSE 0: LET i$=INKEY$
3030 IF i$="n" THEN  GO SUB 4000: RETURN
3060 IF i$="i" THEN  GO TO 3120
3070 IF i$<>"b" THEN  GO TO 3020
3080 BEEP .05,24: PRINT #1;AT 0,0;"CHOOSE NEW BORDER COLOUR (0-7)  ";o$
3090 PAUSE 0: LET i$=INKEY$
3100 IF i$<"0" OR i$>"7" THEN  GO TO 3090
3110 BORDER VAL i$: PRINT #1;AT 0,0;o$;o$: GO SUB 4000: RETURN
3120 BEEP .05,24: PRINT #1;AT 0,0;"CHOOSE NEW INK COLOUR (NOT ";p;")  ";o$
3130 PAUSE 0: LET i$=INKEY$
3140 IF i$<"0" OR i$>"7" OR i$=STR$ p THEN  GO TO 3130
3150 LET i=VAL i$: INK i: GO SUB 4000: RETURN
3160
3161
3162
3163
```

graphics ability of the Spectrum. The following three modules allow us considerable flexibility within the limitations of the hardware, the main limitation being the restriction to two colours within one print location. These modules will also be accessible from the secondary loop which is listed next month.

The attribute modules can also create considerable havoc on the screen in a design using several different attributes at different areas of the screen if either the pixel or print cursor is moved around carelessly. Fortunately this havoc is reversible but you have to keep your wits about you to understand how the Spectrum does what it does and when it does.

Module 1.13 — Subroutine — Border or Ink change

Lines 3080-3110 — New border colour is chosen and appears immediately the BORDER b call occurs.

Lines 3120-3150 — The new ink colour is set globally but does not affect what is already on the screen unless the cursor is allowed to cross already inked areas when corruption of the colour will occur. This effect can be put to good use for changing the ink colour of a small area.

Note how the ink colour of a whole character position changes simultaneously and that you are prevented from choosing the same ink colour as that already set globally for paper.

Module 1.14 — Subroutine — Change Paper & Ink

This is a more complicated routine which allows one to change the paper and/or ink settings of whole line($) on the screen up to the whole screen without losing any design already on the screen. Here we introduce a powerful use for o$().

Line 6315 — Paper and ink are set globally. You will find when you run the complete program that after quitting this routine, both new paper and ink colours will appear in print mode but only the new ink colour in pixel mode. Unlike print mode, the PAPER statement has not been embedded in the various pixel graphics commands. I have designed the program this way because this is the way I prefer it. Change it if you wish but I suggest you use the program extensively the way it is before you do.

Lines 6320-6365 — Finishing and starting rows (r0 & r1) are entered, checked for validity and compared to ensure that r1>=r0.

Line 6370 — By printing 32 spaces [o$()] OVER 1 a line at a time, any design on the screen is retained but with paper and ink colours changed.

Although not needed here, an even faster method which you might find useful in your own programs would be to DIM o$(704) and print this OVER 1 and with desired attributes at 0,0

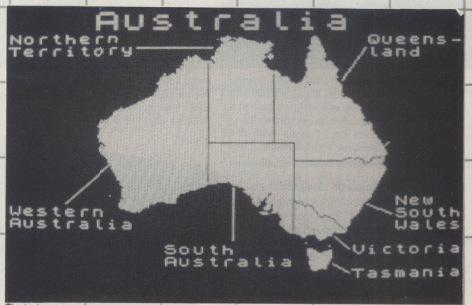
Testing Module 1.14

Try changing paper and ink over whole or portions of the screen with a design already in place. Try placing the pixel cursor in an area of the screen you intend to change and where there is some inked in places. See what happens when you return from the module and attempt to move the cursor around. Take care when using this routine to place the cursor carefully first.

Module 1.15 — Subroutine — Change attributes

This is the most complex of the three attribute routines and allows the alteration of all attributes except INVERSE over portions of the screen, a print position at a time.

Lines 4250-4320 — You may start anywhere on the screen entering print co-ordinates (Y=0-21, X=0-31) defining variables yattr and xattr.



This high resolution map of Australia shows what you can achieve with the Spectrum's graphics capabilities.

Lines 4330-4490 — The four attributes are chosen. The self-explanatory variables bright and flash are met for the first time.

Lines 4500-4560 — All the techniques used here have been met before. To change the attributes we print one space OVER 1 in each consecutive position. Cursor movement is effected either by the 5-8 keys which will be used as cursor controls in print mode or by four of the pixel cursor move keys, namely 'r', 'g', 'v' and 'd'. Pressing ENTER excapes from this loop to line 4570.

Lines 4570-4590 — RETURN to control loop or choose new co-ordinates and attributes.

Testing Module 1.15

Access routine. Try entering some illegal co-ordinate or attribute values to test the error-checking. Choose some contrasting attribute values and move the cursor around over inked in areas using both sets of cursors. Check that the cursor will not crash off the edge of the screen and that you can loop back at lines 4570-4590 to change further attributes.

Tidying up

Type in one temporary line 'GO TO 1000' at line 7000. This will ensure that if you press 'p' in error in the control loop, the program will not shudder to a halt.

The program is now usable. Although as yet only pixel graphics are supported quite sophisticated designs can be achieved with care and patience. You should develop your own tactics for dealing with attributes. I like to complete the picture in black and white before adding colour.

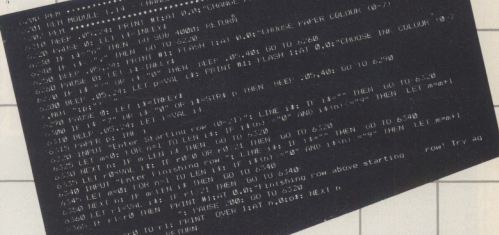
If you are using several colours plan the desing using graph paper and the co-ordinate chart on page 102 of the handbook so that more than two colours only come together at the junction of two print spaces.

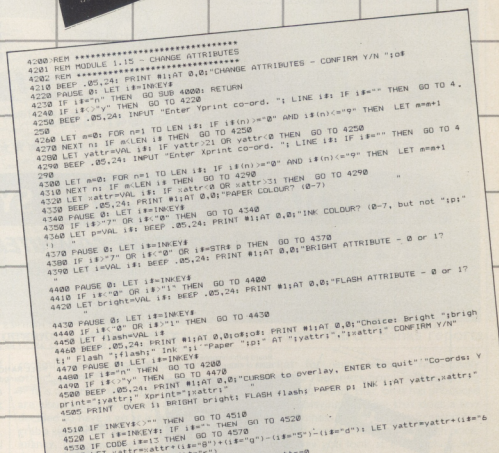
Saving money

When saving a design, change the border to the same colour as the paper at the bottom of your design since the SCREEN$ includes the lower two lines.

I have one little practical hint which may save you money if you feel the need to invest in a light-pen or a digital plotter. This program will do the same job, the only extra 'hardware' being a sheet of transparent plastic of the type sold by technical stationers and a suitable pen. To produce the Lotus Excel picture *(see April issue)*, for instance, I used a *Rotring* technical drawing pen, but any felt-tip should do so long as the ink 'takes' on the plastic. After tracing the car from an advert in a magazine, by sellotaping the plastic sheet onto the TV screen, I was able to PLOT and DRAW away under the design. The letters were plotted in a similar way by designing them first on graph paper.

The modules which will be added in the final two installments will allow the direct printing to the screen of five sizes of alphanumerics, the standard ZX graphics set and all 21 user-defined graphics, together with a user-defined graphics generator. ■





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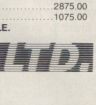

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ALPHATRONIC UP A BLIND ALLEY?



PHOTOGRAPHS BY RICK CORDELL

The first of a new breed of computers or an over-priced home micro? Martin Banks reports

The most cursory of glances at the pages of any personal computer magazine will be enough to tell most readers that there is something afoot. The clear definition that once existed between the two major classes of personal computer — home, games-playing machine and desktop, small business engine — is starting to get muddied by the appearance of a new class — the small professional.

The theory being expounded and exploited by the computer manufacturers is that there is a new group of potential users that are professional people (whatever that means) who want to use a computer at home for both business tasks and all those home-oriented bits and bobs like playing *Space Invaders* and storing recipes.

The existence of a new group of people of course requires the introduction of a new type of machine. This thinking is rumoured to have had some effect on a small company up in Cambridge which recently made some announcement or other!

It is a market that other manufacturers are also looking at closely, and some have decided to have a go at it in an attempt to grab a slice of the action while it is still in its infancy. The strengths of this tactic rest on the idea that if a company gets it right, it will corner the market as it starts and grow with it. However there is an obvious flaw in this argument: because the market sector is so new and undefined, it is just as easy to produce the wrong type of product and miss the boat completely.

The problem from the observer/reviewer's point of view lies in trying to guess which way the market will jump. What has forced us into coming to some conclusions is the arrival on the market of machines like the Alphatronic PC from one of West Germany's mega-companies, Triumph Adler. The company is one of the first to make a concerted pitch at this new market for very small, professionally oriented business/home/gamesplaying computers. Either that, or it has produced a games playing machine that does a few small business tasks with a reasonable degree of competence, but at a high price. Which way you look at the machine will depend on how it measures up to its rivals in the marketplace.

The Alphatronic PC is derived from the original Alphatronic microcomputer introduced by Triumph Adler at the end of the seventies. This was (and still is) a rather uninspiring but workmanlike rendition of the Z80 processor/64K memory/two disk drives/CP/M software package that was being produced at the time by all except Apple, Tandy and Commodore. It was a middle of the road business machine and achieved middle of the road sales.

As such it was something of a follower of the prevalent market trends, a position which Triumph Adler continued to adopt ▶

after the introduction of 8088-based 16-bit machines (for instance those produced in America by IBM).

There are times, however, when being a follower in a game sometimes allows you to end up in front, or at least provides you with that possibility. This is either how it is or how it could be with the new Alphatronic PC. The march of technology being what it is, the Z80/CP/M etc package which was once considered trendy state of the art computing (and therefore quite expensive) is now just another market where the price can be bombed.

Will the users want something different and trendy?

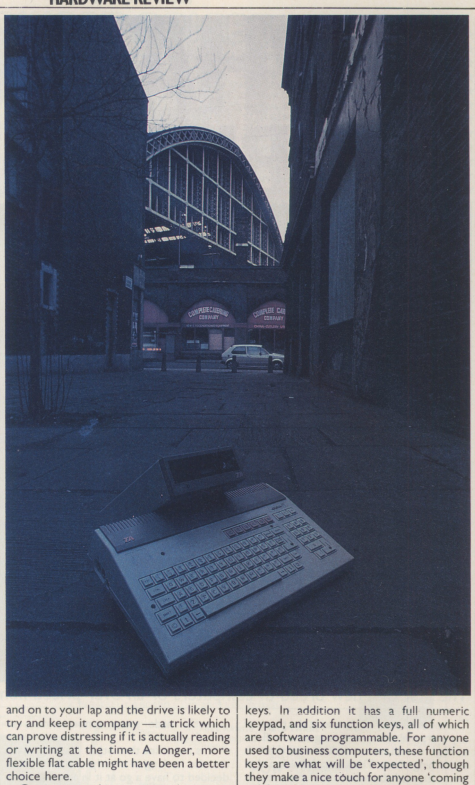
Bombing the price is, however, only part of the problem. Will the users want a low-cost CP/M running bog standard box, or will they want something different and trendy which provides a conversation point at parties? Given that a good percentage of the purposes to which such new quasi-professional machines will be put are in the standard small-business category — word processing, spreadsheet budgeting, medium complexity accounting and the like — the boring old standard box stands a good chance.

That, in essence, is what the new Alphatronic is all about, though the description is misleading. It is, for example, most unlike a 'standard box' in appearance. The packaging of the PC is really quite neat and well made, and it is full of all that is best in sound, teutonic engineering. At home either on a desktop, a shelf or on the lap, it is light and comfortable to use.

It comes with a full complement of switches and holes through which it relates with the outside world. On the right hand side as one looks at the keyboard there is a single on/off power switch. This lives alone so that there is no mistaking it for something else, such as the reset button (a failing on other machines that we could name). On the left hand side of the package are three sockets, two for video I/O and one for the cassette port. The latter requires a DIN plug. The two video ports are an RGB socket for interfacing to a colour television, and a monochrome/monitor port.

Along the back are the power-in socket, the reset button (which takes a bit of finding if groping blind for it), a serial port, a Centronics parallel port and an expansion bus socket. There is also a removable cover on the top left hand corner of the casing, for access to the ROM cartridge port.

The test system we were given came with a single disk drive in a separate box. This is connected to the computer via the expansion bus port, and is one of the weak points of the machine. The connector is one of those horrendously stiff multi-way round cables that is both amazingly inflexible and, more importantly in the context of potential home use, too short. This means that the ideal situation for the machine is a desktop, with the disk drive next to the computer. Pull the computer off the desk and on to your lap and the drive is likely to try and keep it company — a trick which can prove distressing if it is actually reading or writing at the time. A longer, more flexible flat cable might have been a better choice here.



Getting everything connected up is not too difficult, though the pins on the disk drive connectors seem to be a bit fragile, or at least a bit flexible (remedial action with a knife was necessary to straighten them out). The documentation, of which more later, is not as helpful as it could be however, and some users brand new to computing might find the lack of comprehensive information off-putting.

With everything switched on and working the next element of the machine to which the user must interface is the keyboard. On balance this is really quite good with only one possible weak point (and that is a matter of personal preference as much as anything). It is a full QWERTY board with all normal control and cursor keys. In addition it has a full numeric keypad, and six function keys, all of which are software programmable. For anyone used to business computers, these function keys are what will be 'expected', though they make a nice touch for anyone 'coming up' from the games-playing environment.

It's a noisy little beast, rumbling and chuntering away

The subject of touch leads us on to an aspect of the machine which bothered us. Although, unlike many machines in this price range, the keyboard seems well-engineered and nicely robust, it is of the limited travel type. This means that those with a tendency to be just a trifle heavy-handed on the typing front may well find the PC a bit of a finger-bender. This leads to the nagging doubt that the keyboard might not stand up to a great deal

of heavy-duty usage.

Having used the keyboard, the next thing is to look up and see what has appeared on the display. In our test, the PC was connected to a standard 14-inch colour television. In general, the quality of the display was high, especially when you consider that much of the time it was being used to run the Wordstar word processing package, under CP/M, using the 80-column display option. This is an interesting facility that is built into the Alphatronic PC. The command WIDTH, followed by either a 40 or 80 will reconfigure the display accordingly. As hinted at earlier, the documentation is somewhat remiss here. It gives no indication, for example, that using an 80-column display is probably a good idea when running CP/M applications, especially as the ability to run them in a low-cost package would seem to be one of the machine's main selling points.

Once such problems have been overcome, the display gives good quality, easily legible characters with little or no flicker. Only once in a while will the display give a momentary nervous twitch to remind one that a TV is being used rather than a monitor. It also manages to avoid all those spurious colour changes that set-ups like these can be prone to.

The single disk drive provided with the Alphatronic is a bit limiting in terms of assessing the machine's capabilities in the professional area; two would have been much more useful. It is also a rather noisy little beast, rumbling and chuntering away as if to let you know that it is still alive.

The Alphatronic PC is, for an otherwise well-specified CP/M machine, amazingly slow in certain important areas. The most noticeable of these is program loading. Though there was never quite enough time to make a cup of coffee, the Alphatronic proved to be one of the slowest machines at loading programs from disk that we've seen for some time. It took, for example, over three seconds to load CP/M from a reset. This may not seem too bad, but there are serious problems with bigger programs like Wordstar: the first time this was loaded there were grave doubts that something had gone wrong. There were no loading error messages, but no program either. It took 17 seconds to load the program which, when you are sitting there wondering what has happened, is rather unnerving. It took even longer — 23 seconds — to load Supercalc. It is only the confident chuntering of the disk drive that gives any clue that something might be happening.

Once it has overcome its reluctance to load a program, however, the PC cracks along really well. In fact the keyboard is so fast and positive that it can easily run away with the speeding typist.

It is here, of course, that the programmable function keys come into their own. In this implementation of Wordstar five of the six have been given individual editing functions, such as INSERT ON/OFF, Up a Screenful, Down a Screenful, character delete, and the search routine, FIND.

Without doubt the weakest aspect of the whole system, and the one for which Triumph Adler wins no gold stars whatsoever, is the documentation. Why it is so often the case that a perfectly acceptable computer, running perfectly acceptable software, is let down by poor instructions is one of the great mysteries of modern life. One can only conclude that it stems from an unwillingness or inability to spend the money needed to get it right. One must assume in Triumph Adler's case that it was not due to failure to find sufficient funds for the job.

A well-engineered and reasonably well thought out machine

The manual we were given was a small tome printed on the obligatory bog-paper and with the equally obligatory typographical errors needed to demonstrate that it was produced on a word processing system. It comes in two parts, a How-To-Work-It bit at the front, and a breakdown on the commands of the Basic Interpreter at the back. Neither provides adequate explanations for the uninitiated.

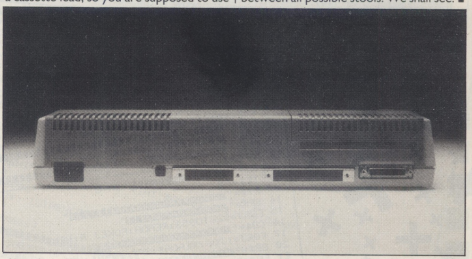
It was the little faults that annoyed us most. For example, the PC comes without a cassette lead, so you are supposed to use the one you normally use for connecting a cassette recorder to your hi fi. Well, they may use DIN connectors in West Germany, but not here. In the depths of the manual they do tell you how to make a lead, but in the section on connecting the recorder it just tells you where to stuff a lead in the box. Not terribly helpful.

Similarly, on the subject of disk drives it tells you to stick the connector in the expansion port. There is no explanation of how to get a disk running and reading, how to load an operating system by pressing the reset button or anything really useful. On the question of CP/M and getting it running on this particular machine it ducks the issue explicitly. Go get a CP/M manual from a specialist dealer, you are told (or words to that effect).

Despite these shortcomings, for a machine aimed at the home/professional/small-business-with-a-bit-of-games-playing-thrown-in market, the Alphatronic PC comes across as a well-engineered and reasonably well thought out machine. It breaks no new ground in its design, but given the character of the market it is pitched at, this is not necessarily a bad thing. There are likely to be many CP/M business users who want a cheaper machine at home, but one that works in a familiar way. The Alphatronic PC can provide just that.

On the vexed question of whether or not it provides good value for money, it is difficult to come to any firm conclusions at the moment. The basic box costs £347, which is a bit high for Z80-based, 64K byte games player. That is, essentially, what it is without the disk drives. One drive, at £330 makes it probably tolerable in terms of price/performance, while the second drive, at an additional £270 makes an all-up price of £947. This is quite reasonable for a full CP/M machine, though it is running the risk of failing to measure up to the competition from machines like the Wren transportable. One assumes, however, that the manufacturers have allowed themselves some leeway for cutting the price.

In the end, whether it succeeds or not depends on what the marketplace eventually decides it wants. The PC could strike the right chord, but it could also fall between all possible stools. We shall see. ■



Along the back are the power-in socket, the reset button, a serial port, a Centronics port and a bus socket

SPECIFICATIONS

Processor: CPU Z80A running at 4MHz

Memory: 24K Basic Interpreter ROM, 4K Monitor ROM, 64K RAM

Keyboard: 58 moving keys, soft scanned. Full upper and lower case with space bar.

Display: Will drive a monochrome monitor display or a colour television, via separate outputs. Software configurable for either 40 · 24 or 80 · 24 format.

Cassette interface: Connected via a DIN socket, 1200 baud Kansas City standard.

Serial interface: RS232 with software selectable baud rates.

Expansion bus: 50-way parallel interface

Printer interface: Standard Centronics type parallel interface allows connection to a wide range of different printers.

ROM pack interface: A 30-way connector from ROM-based applications software.

JAILHOUS

Since calculators have become so widely used in the home and in schools and colleges, the amount of mental activity needed for arithmetical calculations has been drastically reduced. Although many computerised maths programs are available for most home micros, these tend to be lacking in novelty and don't always manage to hold the user's interest.

John Consadine of North Humberside has addressed himself to this problem and has come up with Jailhouse Rock which aims to test and improve agility at mental arithmetic for all age levels — yet still provide lots of amusement. The game runs without modification on either a Commodore 64 or a Pet.

The Sheriff is standing outside his office next to a box of TNT. The baddy (off screen) is moving a lighted taper progressively nearer to the fuse. You, the player, are in the jailhouse and can prevent disaster by throwing rocks out of the cell window to shut the lid of the box.

The catch is that you can only throw rocks by answering mental arithmetic questions correctly. The level of difficulty could be adjusted by altering the speed of the approaching taper or by making the calculations more difficult.

If you successfully fill the box, the lid shuts and the Sheriff draws his gun to fire. Your time taken to complete the session is shown, but by incorporating a running time-score for yourself on screen, you could increase the game's excitement. If the taper reaches the box, the fuse is lit and the TNT explodes. Just to keep you on your toes, both the Sheriff and the Baddy throw in the odd cryptic comment.

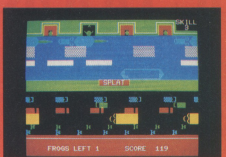
```
 1 REM ********************
 2 REM JAILHOUSE ROCK.
 3 REM J.CONSADINE.9/12/83
 4 REM ********************
 5 CR$="■■■
```

SE ROCK

```
 95 PRINT"■■■■■■■■■■ARGH!!■";:GOSUB16030
 96 PRINT"■■■■■■■■■■■■■ANOTHER ONE FOR BOOT HILL!!"
 97 PRINT"■■■■■■■■■■■IT TOOK YOU ■";60*VAL(LEFT$(TI$,4))+VAL(RIGHT$(TI$,2));
 98 PRINT"■SECONDS TO WARN"
 99 PRINT"■■■■■■■■■■■■■
```

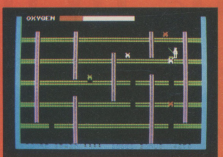
```
15045 PRINT"▒"
15050 PRINT"▒"
15060 PRINT"▒    ▒  ▒"
15070 PRINT"▒   ▒ o| "   |  |"
15080 PRINT"▒    ▒▒▒    |   |"
15090 PRINT"▒   /▒ ▒▒_      /"
15100 PRINT"▒  /▒▒▒
```

A SUPERB RANGE OF GAMES SOFTWARE FOR SHARP MZ-700 SERIES



FROGGER — £6.95

This most popular of arcade games has been totally recreated for the Sharp computer. Superb graphics and as fast as you like from beginner's level up to 'Super-human'. Get each of four frogs over the busy motorway, then hop from boat to raft to log to crocodile until safely home sitting on a lily pad. Terrific fun.



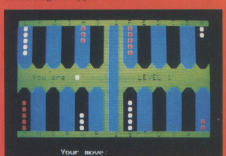
SPACE PANIC — £7.95

How long can you survive in the multi-storey building filled with alien bugs. This machine-code programme accurately simulates the arcade game where you climb ladders and dig holes to catch the aliens then fill them in again once they are caught. The red ones must fall through one floor, the green ones, two floors and white ones, three floors. Red aliens who have time to dig themselves out get rather cross and become green. PANIC!! Joy stick or keyboard control.



GALAXIANS — £7.95

A high-speed machine-code version of the popular arcade game where the massed space invaders must be cleared from the skies. After a few seconds they will begin to swoop and dive at you, showering you with scatter bombs as they go. The game becomes progressively more demanding as you kill more and more of the marauding aliens. Very entertaining — hours of fun!!! Joy stick or keyboard control.



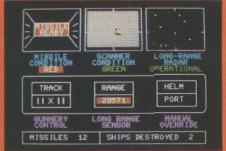
BACKGAMMON — £7.95

Now available for the MZ-700, this traditional board game can now be played against the computer. Simple to follow instructions for the beginner — higher levels available for the more experienced player.



NIGHTMARE PARK — £6.95

If you have never played this type of game before, you're in for a treat. As you make your way along the intricate pathways to the exit, you are constantly given tasks to perform or games to play. Each of these must be successfully completed before you are allowed to continue. It takes a lot of doing. You must remain quick and alert at all times. A little luck is handy. Amazing graphics and sounds!!!



FIGHTER COMMAND — £6.95

A mission flown completely on instruments where you are pursuing a fleet of ten enemy aircraft fleeing from you. They will show on your fuel gauge radar screen and you must manoeuvre your craft to get them within range of your missiles. If you get too near, they will fire at you and warp away to safety. You only have one chance to destroy incoming missiles with your lasers.

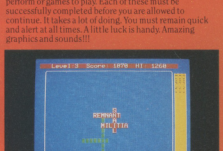


CHESS — £9.95

Suitable for the rank beginner through to the more experienced player, this Chess program may be used in three different ways.

1. As a referee between two players, checking for valid moves, CHECK and CHECKMATE situations.
2. As an opponent with 14 levels of intelligence to match your skills.
3. As a teaching aid when asked to play against itself or show you the best move if you get into difficulties.

Long games may be saved on cassette for completion at a later time and a print-out of all moves made is available.



XANAGRAMS — £9.95

Not only a terrific spelling test but also a great game. You are asked to guess up to five words, represented by blocks on the screen in a crossword format. All the letters that you need are shown on the right of the screen in alphabetical order and the computer will give you the first letter if you ask it nicely. Suits almost any age with 3 skill levels and from 1 to 5 words to be guessed. Really habit-forming!!!



LIGHTNING PATROL — £3.95

Choose your rank in the RAF and you are immediately sent on a mission to catch and shoot down ten enemy Mirage jets that are fleeing after their attack on your airbase. You must manoeuvre your plane to get them in your gun-sights whilst they are weaving about the sky to avoid being hit. Limited ammunition and fuel available so efficiency and accuracy are all important to your completion of the mission. Promotion for the successful but poor performances can mean you are asked to leave the air force. Joy stick or keyboard control.

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This program stores details of products, VAT numbers and, of course, the names and addresses of your customers. As orders come in, you simply record them. Then, when it's time to invoice, you just press a few keys and each invoice or credit note is printed automatically in seconds.



Allowing for variable terms of trading, the system calculates and prints discounts. And it should help to improve your cash flow dramatically.

The Order Processing package.

With this program, you can confirm your customers' orders, prepare and print despatch notes and make fast analyses of individual orders or of all the orders stored on disc.



The Accounts Receivable package.

Now, it couldn't be easier to keep your customer accounts under control.

In an instant, you can analyse debtors, produce statements, keep a check on any credit limit and calculate VAT output automatically.

Using this package in conjunction with the invoicing package, you can also keep tabs on payments received against payments outstanding.



The Accounts Payable package.

This package will keep you fully up-to-date on how much you owe and who to. In addition, it calculates



input VAT and, used with the Accounts Receivable package, produces instant VAT returns.

It also highlights settlement discounts, produces remittance advices and provides an immediate analysis of all creditors.

The Stock Control package.

Touch a few keys and you have instant access to stock status and automatic analysis by quantity and value.



Consequently, it's easy for you to maintain correct stocking levels, having an early warning of out-of-stock situations or the likelihood of over-stocking.



The Purchasing package.

All your suppliers' names and addresses go onto the disc. Then they can be retrieved instantly for preparing and printing orders.



All order data can be recalled in seconds, allowing you to check on orders, and suppliers' invoices and to record all deliveries.

The Mailing package.

Instead of the shotgun method of sending mailshots, this package enables you to refine each mailing down to the customers who are most likely to respond.



It gives you a rapidly accessible mailing file of your customers, according to any criterion you choose. Size of company, for instance, or type of business.

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ACORNSOFT

Next time you're browsing in your local computer store, beware! There's a terrifying new breed of micro user at large. Mike Gerrard puts you on your guard.

Don't be a Computer Wally

At *Which Micro* we spend our days slaving over hot typewriters to bring you interesting and informative articles covering all the things people need to know about micros. In a typical issue you might find features on which machine is best suited to your needs and finances, which software to buy, gentle introductions to programming or even gentler introductions to the intricacies of machine assembly language.

We've never considered it necessary to point out such crude essentials as the need to plug in the computer if you want it to work. But maybe we're wrong. For a new breed of micro user is starting to stalk the aisles of the computer stores, making hardened bug-hunters quake in their shoes and transforming even the most self-assured of pundits into a helpless jelly . . . the Computer Wally is at large.

The incidence of these unfortunate creatures is growing at a frightening rate. Let's look at some typical encounters, the victim in this case being one of Sinclair Research's customer relations staff. In conversation she revealed that many phone calls about non-functioning Spectrums involved just the problem we mentioned above: people unpack their Spectrum, connect it to their television set, discover that they don't have a picture and immediately reach for the phone to call Sinclair Research.

You haven't plugged your machine into the mains . . ! No, that black box isn't a door stop.

They then discover their problem is . . . well, "you don't seem to have plugged your machine into the mains yet". "Oh", replies the complainant, "I didn't realise you had to do that". "Well", the lucky receiver of the call sweetly points out, "if you read Chapter One of the introductory booklet you'll see a diagram showing exactly how it's done . . . no, that black box isn't a door-stop, it's a power supply and has to be connected to the computer before it will work".

Not that any reader of *Which Micro*, would be so stupid, of course, but people out there are doing this and even worse (oh yes, there's much worse) with their micros. In fact one of the newest occupations of computer journalists is shuddering over the latest horror stories in the local hostelries, so we thought it about time we passed a few on as a warning to our



readers. If you're worried that you're never going to really understand computers because you can't get to grips with machine code, spare a thought for those who can't even get to grips with the machine.

There's not a lot you can do with a blown-up Atari — or a blown-up customer either.

George West, who's in charge of customer relations at Atari, told us of the caller they had who knew all about connecting his machine to the mains. In fact he thought it would be a good idea to disconnect the transformer that steps down the current and connect his Atari direct to the mains, in the belief that it would make it run faster. Instead of zapping more aliens he merely zapped his machine by putting 240 volts straight through it, and was lucky not to zap himself in the process. As George West says, "There's not a lot you can do with a blown-up Atari". Or a blown-up customer, either.

It's rather frightening to think that someone could have the electrical know-how to bypass the transformer without being aware what the result would be. The saying that 'A little knowledge is a dangerous thing' obviously applies to micros as to everything else, and was confirmed by Cathy Hyde, who's the technical customer support manager for Dragon Data. When asked for their horror stories she said, "Where do I begin?" The first that came to her mind, though, was the Dragon user who went one better than the kamikaze Atari customer: this one somehow managed to put 240 volts through the cassette port. Perhaps they should have advised him to look on the bright side: at least he'd have no more I/O errors, with no more I/O. Or should Dragon Data have crooned down the phone to him: "I/O, I/O, it's off to the workshop we go'?

Cathy also provided a variation on the theme of "Why can't I get a picture on my TV screen?" Her advice to one caller was quite simple: you have to switch the TV on first. But reverting to the theme of a little knowledge being a dangerous thing, this leads naturally to shop assistants.

Now we don't wish to malign the majority of sales people who do actually know about the micros they're selling and have to deal patiently with computer wallies themselves, nor do we wish to be inundated with letters from them pointing out how unfair the computer press is to these hard-working people. But nevertheless, there are a few around who could perhaps do with reading the computer press a little more regularly . . . or reading instruction books, or reading anything at all to do with micros.

Cathy Hyde, again, told us of the man who bought a Dragon 32 at his local branch of a retail chain which it would obviously be unfair to name, so we shall refer to them merely as D*****. The customer took his Dragon home, set it up perfectly well, but was then confused by the copyright message which appears on the screen. For non-Dragon users this says, '(c) 1982 Dragon Data Ltd. 16K Basic Interpreter 1.0 (c) 1982 by Microsoft'.

Now it's quite reasonable for a newcomer to computing to be confused by the message, not knowing that the 16K refers to the Interpreter, so he returned to D***** and asked why his 32K machine apparently only had 16K of memory. The assistant asked what the Dragon was connected to, and when told the ordinary TV he replied knowingly, "Ah well, sir, I'm afraid that if you use an ordinary domestic TV then you do only get 16K of memory, to get the full 32K you need to use a monitor". At least he didn't go on to try to sell the customer a monitor, but the man did go away and complain to Dragon Data that they ought to mention this 'fact' in their advertising.

It's not only machines that confuse people, though. Even when they're safely plugged in, switched on, working at full memory capacity and not in imminent danger of explosion (the machines, that is, not the people), users then have to cope with the complicated problem of software.

Microdeal's John Symes told us that after he'd been at a micro-fair one weekend he came into the office on Monday morning and immediately had to deal with a call from an irate customer who harangued him for several minutes on the subject of software companies which sell defective products. He'd bought a cassette from Microdeal at the fair and had spent all weekend trying to get it to load. He'd tried every volume setting on his cassette recorder and no way would this cassette load; it was daylight robbery to charge £8 for something that wouldn't work, and if he'd typed CLOAD once that weekend he'd typed it a thousand times. "CLOAD?" John Symes asked, "but it's a machine code program, you have to type CLOADM". "Well, how am I supposed to know?" the man asked. "Didn't you read the instructions?" "Oh", he said, "I never bother with instructions". One definition of a computer wally: someone who thinks they're too clever to read instructions and would prefer instead to spend their weekends beating their heads against brick walls.

Ah well, sir, if you use an ordinary domestic TV you only get 16K of memory.

Magazines are as vulnerable as software houses when it comes to complaints and queries. At *Which Micro* we always explain when giving our flexi-discs away that you need to copy the programs onto cassette and then load them into your computer.

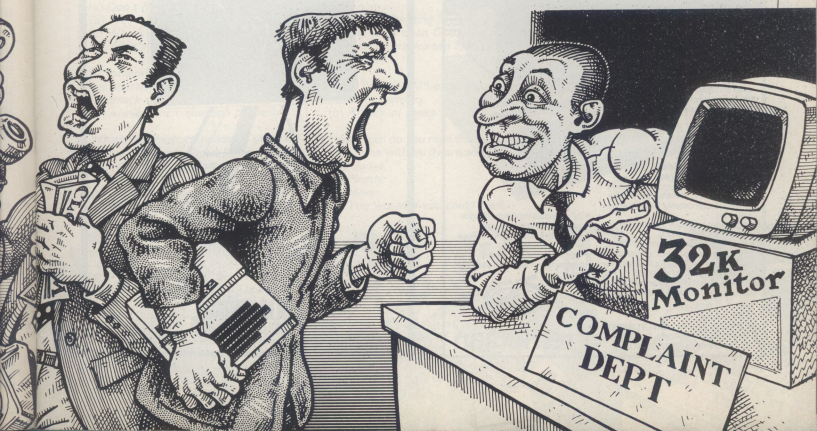

ILLUSTRATION BY JOHN STOREY

COMMODORE 64

OXFORD PASCAL

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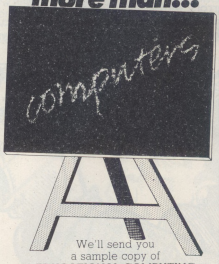

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We're always happy to deal with problems like the reader who received a disc with the hole punched not in the middle but right through the program — a reasonable complaint, we thought — but we did also get a couple of calls from readers complaining that they couldn't get the record into their disk-drives without folding it in two. We resisted the temptation to suggest they try the toaster instead, and politely pointed out where they were going wrong.

One of our contributors, Pete Gerrard, used to be editor of *Commodore Computing International* magazine and frequently had to deal with queries about program listings that don't work, as does everyone on every magazine from time to time.

"Of course", he said, "the people who ring up are always the ones who refuse to believe that they could possibly have made a typing mistake. If a program listing does have a mistake in it then you soon discover and a million people ring up to tell you, but when one solitary person rings to say a program doesn't work then it's more than likely that it's them that's wrong. But the best one I had to deal with was the chap who'd typed in a lengthy program for the 64 that we'd printed, and who couldn't get it to work.

"I knew the program was right as it had come direct from a working printer listing,

The ones who phone always refuse to believe that they could have made a typing error.

but he said he was having all kinds of trouble with it, and was sure he hadn't made a mistake, so I patiently went through it with him a line at a time. After about five minutes this silly thought dawned on me, and I didn't think anyone could be so stupid but I'd better ask to make sure. I said I had what might seem a silly question, but what kind of machine did he have? 'Oh', he said, 'a Vic-20 . . . why, does it make a difference?' So I told him that a Commodore 64 program wouldn't work on a Vic-20, and why, but I'm still waiting for the call that asks if a 64 listing will work on a ZX-81".

There seems little doubt that the spectre of the computer wally poses a serious threat to the credibility of most computer users, and it's up to all of us to try and rehabilitate these unlucky individuals so that they can take their places as normal, healthy micro enthusiasts. Preliminary research suggests that the condition is reversible if caught at an early stage — often, the loan of a few back issues of *Which Micro* or a video of *The Computer Programme* can go a long way towards preventing personal tragedy.

We have devised a simple screening test to identify the people — often perfectly normal-looking men and women — who are most vulnerable to this devastating complaint. If you meet someone who you think may be a high-risk case, it only takes a few minutes to run them through this psychological quiz. Remember, today's computer wally could be tomorrow's star programmer. You know it makes sense. ■

Wally Watcher's Checklist

1) After buying a micro and getting it home, at what point would you reach for the phone to complain to the makers:
(a) *If you'd read the instructions, set everything up correctly, double-checked all the connections, the fuses and even the power supply but still weren't getting a picture.*
(b) *If you couldn't understand the instructions.*
(c) *If you couldn't undo the shrink-wrap.*

2) What's your answer to the question: "Will a Spectrum program run on an IBM?":
(a) *Don't be stupid!*
(b) *Well it won't but I'm not sure why.*
(c) *What's an IBM?*
(d) *What's a program?*

3) If someone asked if you had any peripherals would you:
(a) *Smack them in the mouth.*
(b) *Answer their question properly.*

4) What's the most complicated program you've written for your home micro:
(a) *Your own version of an arcade favourite.*
(b) *A practical program of some kind to monitor home finance, list phone numbers and addresses or something similar.*
(c) *One that prints "Chelsea Boot Boys rule, OK?" somewhere near the middle of the screen.*

5) Is a monitor:
(a) *The same as a TV set but costs more.*
(b) *The same as a TV set but you can't watch* Minder *on it.*
(c) *Someone who hands out the milk at school.*

6) Is an Operating System:
(a) *Something that controls the use of programs on disk.*
(b) *Two hacksaws and a scalpel.*

7) Is a Disk Operating System:
(a) *The same as an Operating System.*
(b) *Two turntables and 5,000 watts per channel.*

8) What does a RAM-pack mean to you:
(a) *Extra memory.*
(b) *A flock of sheep.*

9) How often do you read the instructions that come with hardware and software:
(a) *Always.*
(b) *Mostly.*
(c) *Never.*
(d) *You would if you could read.*

10) Are you a wally for answering all these questions:
(a) *Yes.*
(b) *Yes.*

SCORING

(1)	(a) 0 pts	(b) 10 pts	(c) 20 pts	
(2)	(a) 0	(b) 10	(c) 20	(d) 25
(3)	(a) 25	(b) 0		
(4)	(a) 5	(b) 5	(c) 25	
(5)	(a) 10	(b) 5	(c) 20	
(6)	(a) 0	(b) 25		
(7)	(a) 0	(b) 25		
(8)	(a) 0	(b) 20		
(9)	(a) 0	(b) 5	(c) 20	(d) 25
(10)	(a) 20	(b) 20		

HOW WELL DID YOU DO?

0 – 25: You cheated.
30 – 50: A sensible score, with a very low W.F. (Walliness Factor).
55 – 100: You are well on the way to wallydom, though not yet irretrievable.
105 – 200: Virtually a wally, your only hope is to take out a subscription to *Which Micro* and hope it's not too late.
205 – 230: The terminal wally. The type of person who orders a QL and actually expects to get it within 28 days.



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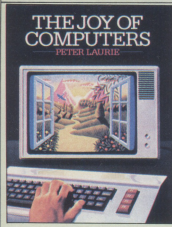
MANUAL OVERRIDE

This month's round-up of new computer books compiled by Nicky Trevett



The Joy of Computers

by Peter Laurie, Hutchinson, price £9.95

This is a celebration of the wonderful, wonderful world of computers, micro, mini and mainframe alike. The book is aimed at the non-expert on the verge of buying his or her first micro. "Exciting," says the blurb on the cover, "revolutionary," "romantic." Romantic? The whole thing is even likened to the American Wild West.

Inside, the atmosphere is a lot calmer. Yes, says the author, there are exciting developments on the way, like massive machine intelligence, weird and wonderful simulations in which you could cast yourself in a play of your own devising. There are some fascinating glimpses into the world of robots and androids, talking computers and expert systems.

But most of the book is devoted to a very detailed (and mundane) overview of computers, their inner mysteries, various peripherals, programs and programming. According to the aforementioned cover blurb, this is all written in non-technical language, but I defy anyone to write about circuit boards, graphics and the like in non-technical language. The author has, however, made strenuous efforts to define every new technical term he introduces into the text. No glossary of terms, though; this would have been a great help to the reader and is a strange omission.

It's all here, everything you ever wanted to know about computers, in a polished and glossy package with lots of arty pics and diagrams. More an encyclopaedia of computing than anything else, to be dipped into at odd moments or left on the coffee table (if you can afford it). A disappointing new arrival.

Spectrum Magic — Your First Programming Book

by Steve Betts, W Foulsham & Co, Price £4.95

Novice computer users frightened off by some of the highbrow 'introduction to computing'-type books on the marked could swallow their pride and go for a handbook written for youngsters. Not hampered by such considerations as trying not to talk down to the reader, or having to assume a certain level of intelligence, these books are generally clear, simple and jolly, and probably exactly what you need.

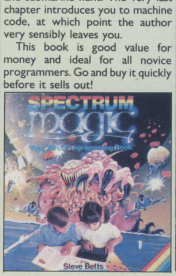
Spectrum Magic is such a book, with nothing highbrow about it at all. It provides a perfectly adequate introduction to the Spectrum and Spectrum Basic, ostensibly for children but really for anyone new to the Spectrum who wants to know.

From the beginning it takes a careful step-by-step approach, starting with setting up the computer. There is good advice on taking care of it — like not dropping butter and jam into it, or leaving it in the sun — and an introduction to the keyboard.

This is followed by a series of short and snappy chapters covering 'number crunching', making use of the colour facilities, creating your own graphics, simple programming and bug-hunting. By chapter nine (of 31) you are writing your first program.

Your newly learned programming techniques are then applied to a few simple games, like hangman and submarine hunt. The very last chapter introduces you to machine code, at which point the author very sensibly leaves you.

This book is good value for money and ideal for all novice programmers. Go and buy it quickly before it sells out!





Take Off with the Electron and BBC Micro

by Audrey and Owen Bishop, Granada, price £5.95

And another book of programs rolls off the Granada production line. Yes, make no mistake — this could equally well be called 'Eleven Programs for the Electron and BBC Micro', because that's what you get.

There's nothing much wrong with the programs themselves, although originality and excitement is conspicuously lacking and 11 programs for £5.95 isn't terrific value these days.

The programs are a familiar mix, with less emphasis on games than usual. There's Stunt Car and Attack, and a database program (Birthday Book), Pocket Money and Spellit. You know the type of thing.

Programming veterans will soon lose interest, I suspect, but novices might get something out of it. There's a potted guide to Basic programming at the start to help get you going, or refresh your memory, and each program listing is accompanied by a flowchart and explanation that does help you see how a program is put together. All the keywords that appear in the program are detailed, and if you work right through the book you should at least end up with a fair mastery of them.

There is also, with each program, a selection claiming to help you "take off", ie alter, modify and improve on the program. All this really amounts to is tinkering, changing a few lines, experimenting with variables, that sort of thing — you won't necessarily learn any really advanced techniques. I therefore repeat — not for veterans!

Word processing for Beginners

by Susan Curran, Granada, price £5.95

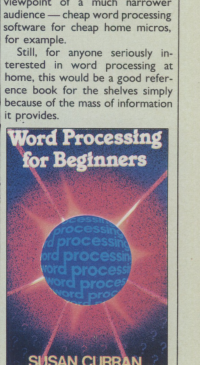
Word processing is a vast and complex subject, and the ramifications will probably come as a huge shock to anyone completely new to the idea. This is a creditable attempt to reduce it all to manageable proportions for the potential user with no previous experience.

The book tries to cover too much to be a successful buyer's guide. It looks at word processing systems in the price range £200 to £5,000, but the needs of the potential buyer of *Tasword Two* to run on a Spectrum are quite different from those of the business user likely to be interested in *Oliword* for the Olivetti M20.

It tries to be comprehensive, but comes across as a little long winded. This is a pity, because there is some very sound advice to be had on assessing your individual requirements. The chapters on hardware in particular, with a wealth of information on printer interfaces, ASCII codes, paper feeds and so on, are quite likely to make the computer novice blanch and give up.

Much more useful is a chapter that reviews 10 word processing packages currently on the market, but again I can't help feeling that it would have been better to approach the subject from the viewpoint of a much narrower audience — cheap word processing software for cheap home micros, for example.

Still, for anyone seriously interested in word processing at home, this would be a good reference book for the shelves simply because of the mass of information it provides.



Can the recently launched Spectravideo SV318 and the Memotech MTX500 challenge the more established Commodore 64?

THREE OF A KIND?

Way back in the misty depths of micro-computing history (1980-81) it was a simple task to place any micro into a neat category. There were the super-cheapies like the ZX80 and ZX81, the stripped-out versions of better specified machines such as the TRS-80 or Commodore Pet, and the 64K CP/M machines or Apple lookalikes. The computers in each category had very similar specifications and very similar price tags.

The situation today is much more complicated. Trying to find three similar computers at a similar price level is far from easy, especially if you add the criterion that the companies behind the products should use the unlikely to collapse in the near future.

For this review we have selected a trio of fairly up-market home computers — the Memotech MTX 500 and Spectravideo SV318 (two relative newcomers in the field) and that old favourite the Commodore 64.

The sole British representative, the Memotech, is the most expensive at £275, though for some users its high price may be offset by the fact that this is the only machine of the three which does not require a special cassette recorder. The SV318 is almost £100 cheaper at £185, but the cassette unit comes at an additional £39.95 and this makes up some of the price difference. Commodore's 64 can be found at a variety of prices around £200, with an additional £39.95 once again buying the manufacturer's official cassette unit.

PHOTOGRAPH BY ROB BARSON

COMMENT

Each of these micros has its strong points. The Commodore 64 is a good choice for the user who doesn't want to write his own programs. It has by far the best software selection of any computer in its price band, and is well proven and relatively good value. The Spectravideo is a much more interesting option for someone who wants to play around with the computer for its own sake, rather than just use existing software. The Memotech continues this theme as the machine we would recommend for hardened enthusiasts, or anyone wishing to explore advanced programming. You pays your money and takes your choice.

Memory advantages

One of the main selling points of this class of computer is the size of memory offered — in particular, the Commodore 64's 64K RAM is the main selling point in Commodore's aggressive advertising. Compared to the 32K specified on the Memotech and Spectravideo this might seem to be a major advantage, but programmers will quickly discover that the elephantine Commodore is more like a hippopotomas when the Basic interpreter's ROM is in use. This knocks the available RAM down to nearer 38K, and only machine code hackers will be able to use the machine to the full.

For most home programmers, then, none of these machines has a decisive memory advantage. However, the fact that the Basic interpreter can be switched out of the Commodore does mean that commercial software writers have more scope than they do with the other two. Since the 64 has sold in vast numbers both in its native US and in Europe, this has led to the creation of some quite sophisticated software, for recreational and educational purposes as well as some office applications (though the latter normally require the use of the £200 disk drive).

Keyboard considerations

Visually, all three computers are distinctive. The sleek good looks of the Memotech take in a solid, well-designed keyboard with a separate numeric pad on the right of the main alphanumeric area. The main weakness of the MTX series is the unfortunate ease with which the entire machine can be accidently reset, losing all programs and data in the process. On each side of the space bar there is an innocent-looking unmarked key. If both these are pressed simultaneously the computer is returned to the same condition it was in when newly switched on. The reset function should be accessed by a far more discreet button, preferably well away from the keyboard, so that no-one will use it by mistake. The only other fly in the ointment is a slightly short key travel which can feel somewhat disconcerting until the user becomes familiar with the sensation.

The Commodore is simply and efficiently laid out and has the best keyboard feel of the three, though the location of some punctuation marks will cause a few problems for many users. Once Commodore's keyboard is mastered, however, the method behind the company's apparent madness becomes clear. The keyboard is designed so that the punctuation marks most frequently used in Basic programming can be typed without using the shift function. This does speed up the entry of programs to a noticeable degree, but it is debatable whether or not this advantage is sufficient to outweigh the inherent disadvantages of abandoning a standard layout.

The Spectravideo is odd man out in this company. Not only does it use an arrangement of rubber pads in place of proper keys, but it also has an almost unique means of cursor control. The cursor is manipulated using the built-in joystick mounted to ▶

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the right of the keyboard, which makes screen editing both quick and easy. This arrangement is so good to use that it makes you wonder if all the fuss over the much-vaunted mouse is really worthwhile.

Talk of joysticks brings us to a remarkable feat of standardisation — these micros share a common interface for joysticks, so that any of the Atari-compatible types (9-pin D plug) can be used with all three.

Spectravideo's very nice Quickshot and Quickshot 2 sticks are among the best we have used, so try one of these before buying the rather unpleasant official Commodore type. There is no official Memotech joystick at the moment.

Programming potential

Writing programs in Basic is likely to be one of the most popular activities for owners of these computers. The quality of the interpreters involved varies widely. The limitations of Commodore's Basic 4 are well known to regular readers of *Which Micro* — it suffices to say that it is virtually impossible to do anything interesting on the 64 without resorting to machine code. What access there is from Basic to the machine's considerable sound and graphics capabilities is entirely by means of clumsy and virtually unintelligible POKE statements, interfering directly with the memory in a crude, low-level way.

The Memotech has broadly similar capabilities, but in this case the user is able to create sounds and pictures much more easily, by using meaningful Basic keywords. The Basic is still far from perfect, though, and there are meaningless error messages which need to be looked up in the manual before they can be understood. Another major flaw is the unsophisticated Basic editing system. This is heavily line-orientated, just as if the user were communicating with the computer *via* a teletype terminal rather than a visual display unit. Commodore and Spectravideo both offer full screen editors, making it much easier to alter a faulty program line.

The Memotech has a couple of aces up its sleeve for the more advanced programmer. Most computers require the purchase of additional, expensive software if extensive machine code program development is to be carried out. The MTX 500, on the other hand, has a full machine code editor/assembler built in, along with a high-class, machine code monitor. This is all the machine code programmer needs to work on his creations — even the highly-acclaimed BBC Micro with its built-in assembler is less user-friendly in this respect.

Memotech owners who do not yet feel competent to tackle Basic, let alone machine code, are catered for by the provision of a unique language called Noddy. This enables users to produce simple question/answer style programs with a minimum of specialist knowledge.

It is in the pure Basic stakes that the Spectravideo really stands out. Its programming language is a thoroughly revised and well developed descendant of the earlier versions of Microsoft Basic. There has been a lot of discussion in the computer press about the Microsoft MSX specification now being supported by the major Japanese consumer electronics corporations. The SV318 is not quite an MSX machine, but a £30 adaptor widens the machine's cartridge port so that it becomes compatible.

The advantage of this specification is the likelihood that a large amount of software will become available for MSX micros, largely because of the size of market that software authors can reach without having to convert programs from one type of computer to another.

The most obvious advantage of the Spectravideo's Basic is the way it makes graphics programming so easy. Although the ultimate capabilities of the Memotech are slightly higher, most home programmers would be able to get better results with the SV318 purely because the commands involved are so easy to understand.

Nothing is perfect, alas, and the error messages on the Spectravideo are sadly inadequate. Essentially, they are unchanged from the earliest Microsoft Basic two-letter codes, and prove that in one respect at least, Microsoft doesn't learn from its mistakes. Even the Commodore 64 is better here!

Thinking ahead

Anyone spending this amount of money on a home computer will want to make sure that the system can be expanded along with the user's needs. The Memotech offers an unusually comprehensive upgrade path, through the 64K MTX512 version towards floppy disk and even Winchester disk units.

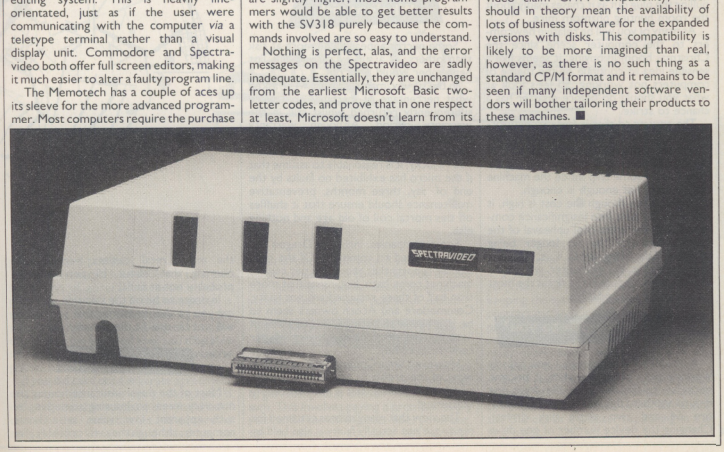
A Centronics type interface comes as standard, so the usual range of after-market printers can be used. Memotech seems to have followed IBM in offering a badge-engineered Epson as its own printer — unless you really need the co-ordinated colour scheme, the Epson will do just as well and might well be available at a lower price.

We were disappointed that neither of the two RS232 interfaces with which the Memotech can be fitted comes as standard on a £275 computer.

The Commodore 64 is a strange machine indeed when it comes to expansion. Commodore's own disk drive and dot-matrix printer are rather unsophisticated units, and the complete lack of standard interfaces makes it a tricky and expensive job to connect the 64 to normal third-party peripherals.

Expanding the Spectravideo is certainly possible, but you need a lot of desk space. The basic unit, whether the SV318 or the £265 SV328 with its full typewriter keyboard and 80K memory, is plugged into a large boxy expansion chassis. This can carry a variety of expansion cards, whether memory add-ons or peripheral controllers.

Both the Memotech and the Spectravideo claim CP/M compatibility, which should in theory mean the availability of lots of business software for the expanded versions with disks. This compatibility is likely to be more imagined than real, however, as there is no such thing as a standard CP/M format and it remains to be seen if many independent software vendors will bother tailoring their products to these machines. ■



How to avoid micro mayhem



What happens when your micro blows up? Do you really want to know? Avoid the unthinkable with Pete Gerrard's handy maintenance tips.

Just picture it. You're relaxing in front of the television set. The kids are sorting out their pocket money accounts on the home computer you bought them for Christmas, while you're waiting for them to go to bed so that you can have a game of *Pac Invaders*. Life seems idyllic.

Suddenly, kapow! The television set becomes a blur of white noise, the kids become hysterical monsters, and the computer becomes a nightmare, all because one of those chips that you really were going to learn something about — some day — has mysteriously and inexplicably blown up.

In last year's August and September issues of *Which Micro* we looked at some of the more obvious faults that can occur on a home computer, and what to do if the problem is more serious than the cat pulling the plug out as it chases madly about the room hunting phantom mice.

As many of you will be relative newcomers to the computer scene since the Christmas boom in buying, it seems like a sensible idea to continue on the theme of computers not working. So let's look at what you should do before disaster has a chance to strike.

The answer to that is fairly straightforward. If you've spent £125 on, say, a 48K Spectrum, it makes little sense to then fork out an additional £40 or £50 getting the thing fixed if some chip inside the machine has decided that enough is enough.

Indeed, even though the cost is high, it will probably pale into insignificance compared with the emotional upheaval of the family's favourite toy no longer being available. Life being what it is, you can guarantee that the computer will go to that great warehouse in the sky at the most inconvenient time possible.

It couldn't happen to you?

A couple of months ago I was happily working on a program, when it became necessary to transfer a few files from one disk to another (this was with a Commodore 64 and two single disk drives). Changing the device number of one drive was simple enough, but when I tried to communicate with the other drive . . . absolutely nothing happened.

The picture on the television screen looked fine, but the disk drives had definitely sent the computer to Coventry, and were determined not to do anything. By doing only what Commodore recommended, I had succeeded in blowing up one of the two 6526 chips inside the Commodore 64.

These chips are not only expensive, they are also markedly thin on the ground. A trip up to London on a busy day with a computer is not to be recommended to anyone, so beware. It can — and most probably will — happen to most of you at some time or another, unless you do something about it first.

Who's at risk

Some micros appear to be more at risk than others, as a survey carried out last September would bear out.

In the survey, manufacturers were asked what percentage of machines sold were subsequently returned whilst still in the warranty period. Although warranty periods on computers can vary between three months and a year, or even beyond if you're lucky, it is reasonable to assume that if the micro has exhibited no faults by the end of, say, three months, preventative maintenance should ensure that it shuffles off this mortal coil of old age and nothing else.

Some companies, including Dragon and Atari, declined to comment. Of the rest, Sinclair reports that about five per cent of machines come back, but insists that more than half of those returned are not faulty. Commodore and Acorn owners seem to be in a healthier position, with figures of 'less than one per cent' and 'under five per cent' respectively.

However, since Commodore insists that most of the problems are due to 'knocks sustained in transit', this is not particularly reassuring!

The view that many micros returned for repair are not actually faulty is also held by the major retail outlets, with Dixons claiming that 'about 15 per cent are probably not at fault'.

In order to be on the safe side, just how can you go about ensuring that your micro will not be one of the unlucky ones?

Insurance

Most of the major insurance houses are not very keen on insuring something of such apparent low value as a home computer, although they will probably give

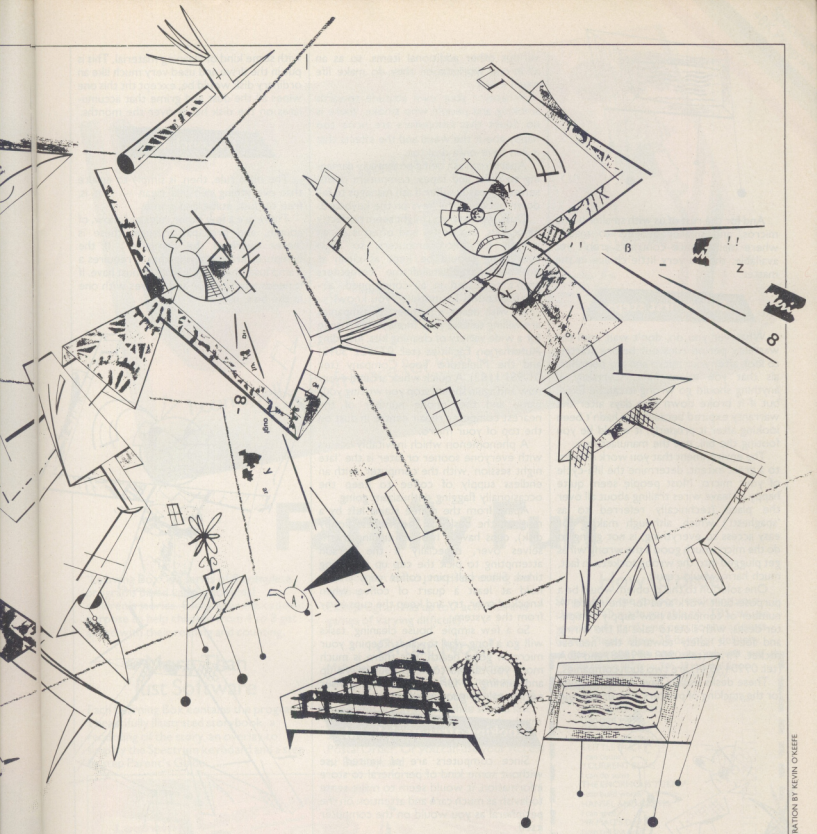


ILLUSTRATION BY KEVIN O'KEEFFE

you a quote if pushed.

However, most householders take out some kind of general insurance on their property anyway, so if the computer is stolen, the house burnt down, or the system is trampled by a herd of rampant elephants from the local zoo, you'd be able to claim the price back on your general policy.

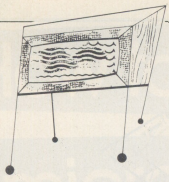
If you did take out a separate agreement on your micro, the only thing you'd definitely be able to claim on would be if one of the components developed a serious fault which would need to be repaired out of warranty. If you like taking major companies to court that's up to you, but insuring a home microcomputer is probably not the best course of action.

Maintenance contracts

No one has come up with maintenance contracts for small micros yet, although larger computers can be 'insured' for a sum. This involves paying a premium every year, and if something ever does go wrong, the maintenance company will send an engineer over immediately to fix the fault.

If you do use your micro for business purposes, and your livelihood depends on keeping the system running, a maintenance contract certainly makes sense, as the small premium charged will undoubtedly repay itself. If several people use the system, many work hours could be lost if the computer broke down.

But if you're using such a system purely at home, it will make more sense to follow the procedures outlined below to reduce the chances of a disaster happening in the first place.



And for the rest of us with smaller home micros, and smaller budgets to match, where maintenance contracts aren't yet available, there's very little choice in the matter.

Some first steps

Whatever you do, don't wait until the warranty period runs out before starting to look after your micro and any peripherals that you might have. Certainly, if anything should go wrong it can be fixed, but if it broke down two days after the warranty expired because you hadn't been looking after it properly, it would be you footing the bill, not the manufacturer.

The environment that you work in does, to a great extent, determine the life-cycle of your micro. Most people seem quite happy to leave wires trailing about all over the place (technically referred to as 'spaghetti') which, although making for easy access to everything, is not going to do the micro much good if the wrong wires get plugged into the wrong sockets. In fact, much harm would result.

One solution to this problem would be a purpose-built work area for the micro. A number of companies now supply computer desks, with slots to take all the wiring and feed it safely towards the nearest socket. Tirith (tel: 0908 679528) and IDA (tel: 09904 4944) are two such companies.

These desks usually have areas designed for the stacking of printers, disk drives, and various other additional items, so as an all-in-one workstation they do make life much easier.



Whatever your own attitude towards smoking and people who smoke, there is no doubt that computers are none too happy about the weed and the effects that it can have on a desktop.

Apart from ash being potentially damaging to disks and tapes, computers themselves can easily suffer if ash manages to fall down between the keys on the keyboard.

Dust, which to you might seem perfectly innocuous, can be — and often is — an irritant for microcomputers, so again everything should be kept as clean as possible. Large mainframe computers aren't cossetted in air-conditioned, air-filtered rooms for nothing, you know!

As with desks, a number of companies are willing to take your money in exchange for a wide variety of cleaning kits, including Automation Facilities (tel: 073522 3012) and the Miniature Tool Company (tel: 01-951 1183). A quick whisk around every now and again should stop you writing your name and the 'phone number of the nearest computer repair centre in dust on the top of your micro.

A phenomenon which inevitably occurs with everyone sooner or later is the 'late night session' with the computer, with an endless supply of coffee to keep the occasionally flagging enthusiasm going.

Apart from the coffee stains left by a mug on the desk (or the nearest floppy disk), cups have a habit of tipping themselves over, especially if the person attempting to pick the cup up is getting tired. Since half pint coffee cups always hold at least a quart of coffee when knocked over, try and keep the cups away from the system.

So a few simple 'house cleaning' tasks will go a long way towards keeping your micro in good health. But there is much more you can do to keep your micro up and running — for instance keeping your peripherals in good condition.

Looking after peripherals

Since computers are of limited use without some kind of peripheral to store information, it would seem to make sense to lavish as much care and attention on the peripheral as you would on the computer itself.

To take cassette decks first, just about every retail store in the world sells cassette head cleaning kits, although they should be tried in the shop first as quite a few of them are of limited use, to say the least. Something very few shops will stock, however, is a tape head de-magnetiser.

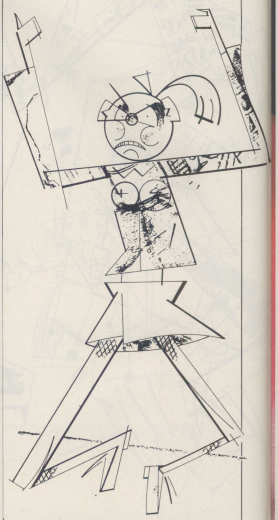
Tape heads are very prone to the build-up of great amounts of static, and just as you should remove any static you might be carrying before using the computer, so the tape heads should be de-magnetised at fairly frequent intervals.

And for the more affluent of our readers, there are a number of disk drive cleaning kits on the market, which usually take the form of a fluffy floppy disk coated with some kind of cleaning material. This is put in the drive and used very much like an ordinary disk would be, except tht this one wipes all the dust and grime that accumulates on the disk heads over the months.

To conclude

The main rule, then, is simply to ensure that everything remains clean — that is, free of dust, static and grime.

There are a few other rules to follow, of course, and principal amongst these is 'never overload the computer'. If the computer arrives saying that it requires a 3 amp fuse, then that is what it must have. If it needs a modulator and arrives with one in the box, use it.



Finally, don't attempt to wire up more than one unit into one plug, and don't use multi-plug adaptors more than is absolutely necessary. I can remember from my days at Commodore when an absurd number of disk drives (over 100!) were all ultimately connected up to *one* socket. The ensuing chaos when that socket gave up the uneven struggle was quite interesting.

So it doesn't take too much to ensure that your micro has a long and healthy life. The cost of taking a few minutes each day to keep everything clean and following a few simple guidelines is far less than the cost in time and money if anything goes wrong! Believe me, I know! ■



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The MTX Series described; straight from the author's mouth

MANUAL

The first section (of the manual) is a basic tutorial. The grass roots information is here and I could not find any major mistakes. The second part is on Noddy giving a good guide as to how it can be written. . . . The third and fourth sections are on graphics and sound. Both are quite detailed and easy to follow. The fifth section is on how to interface Assembler to Basic.
Personal Computing Today Feb 84.

The provisional manual, which runs to some 250 A4 size pages, has a wealth of detail for the machine-code specialist.
Electronics and Computing Monthly.

INTEGRATED INTERACTIVE SOFTWARE

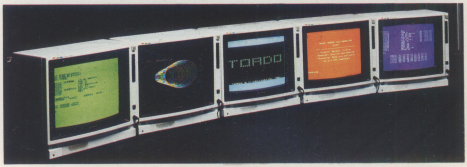
The MTX ROM has been designed to allow the maximum interaction between components of the software. A single program can be written which uses NODDY to display text and graphics, and a BASIC control program which calls routines written in assembly code. This is a feature of future generation computers not available on any other micro.

BASIC

The Basic is fast and accurate, all the calculations being done in floating point maths, so that you don't lose accuracy to gain speed.
Personal Computing Today Feb 84.

The latest addition to the Memotech range DMX80 Matrix Printer – 80 characters per second print speed, eight character formats, dot addressable graphics, **£295.00 including VAT.**





Integrated Software – a five to one advantage. Assembler/Disassembler, High resolution Graphics, Arcade style games, Noddy for easy text handling and Front Panel for testing and debugging machine code.

NODDY

A language new to me called Noddy is included in the MTX which is designed to make text handling easy, especially for beginners.
Hobby Electronics.

Also provided is the easy to use beginner's language (Noddy) and a child oriented learning language Logo.
Practical Computing Dec 83.

(Noddy has only 11 commands) that need to be mastered before some quite complex question-and-answer-type programs can be written.
Your Computer Nov 83.

Noddy's . . . main use is for displaying text and I can see applications in the computer assisted learning (CAL) field. Writing in Noddy is like a mixture of Logo and Forth.
Personal Computing Today Feb 84.

ASSEMBLER/DISASSEMBLER

The Assembler can be accessed through BASIC. When used in conjunction with the PANEL it enables the programmer to single step through and test machine code programs. This is not new to computing, but it is to a home micro.

As well as being able to modify and disassemble sections of code, you can set break points, examine and alter register values, and even single step through code. I hope other Z80 micro manufacturers (particularly in the Cambridge direction) take note of these debugging aids.
Popular Computing Weekly Nov 83.

The Assembler is called from Basic, and it assembles the code in situ, as part of the Basic listing.
Hobby Electronics.

Z80 BOARD

The MTX Series is a more powerful tool for education than the 6502 because it produces a more powerful assembler, allows the PANEL function to be used, and enables integrated software to be written.

RML's 450Z has a (PANEL) function but that is a computer which costs considerably more than the MTX 500.
Hobby Electronics.

FULLY INTEGRATED AND EXTENDED GRAPHICS

The only aspect of the series where extensions to standard language are allowed is in the most comprehensive and integrated graphics available on a home micro.

32 Sprites are supported either 8 × 8 or 16 × 16. They are easy to use and define and do not use extra memory as in the . . . because they have their own area of RAM.
Personal Computing Today Feb 84.

Graphics are very easy to create and manipulate, even for beginners.
Which Micro Jan 84.



MTX512 plus twin 5 1/4" disc **FDX**. A CP/M based business system – **£1245 inc VAT.**

SOUND

The simplification of the sound commands for ease of programming has in no way compromised the quality of the sound produced.

Sound is of great importance for use in games but on many microcomputers it is inadequate. Not so with the MTX . . .
Your Computer Nov 83.

As well as good graphics capability the MTX boasts the same sound chip as the BBC micro – the Texas 76489. It has three tone channels and one noise channel, and is easily controlled from Basic. Volume and frequency can also be controlled, using a much easier method than the 14 parameters needed by the BBC.
Popular Computing Weekly Nov 83.

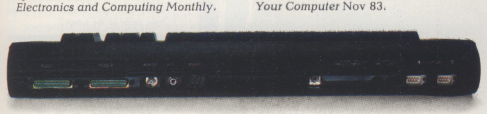
The commands are sufficiently complex to enable the computer to be used as a synthesizer.
Electronics and Computing Monthly.

CP/M OPERATING SYSTEM

The Series is designed to run under the CP/M operating system. This is the Disc Filing System used on the vast majority of microcomputers in business. Since a program written on one CP/M machine can be transferred and run on almost any other, this makes available 15,000 CP/M based business programs. The powerful LINK program can give access to any device operating under CP/M. With its excellent software support and because of it's modular nature, the series is a cost-effective and efficient entry to serious business and educational computing.

FULL-TRAVEL KEYBOARD

It has a professional quality keyboard. This and its elegant styling make it suitable for word processing and business use.
Your Computer Nov 83.



Input/Output Monitor, Hi-Fi, Power, TV, Centronics, Cassette Mic and Ear, and two Joystick ports all come as standard; the twin RS232 ports are available as expansions.

HARDWARE

Inside the case is what one comes to expect from Memotech – a very neat PCB that holds all the components including the main chips – namely a Z80A processor and TMS 9929 graphics chips as well as about 30 others.
Popular Computing Weekly Nov 83.

If you are familiar with the ZX81 peripherals that Memotech also make you will know that the company has an eye for good design and does not skimp on materials it uses.
Electronics and Computing Monthly.

NODE RING

MTX computers can operate together without expensive network systems. Units linked via the ring can share software peripherals and communicate with each other. Many other makes of computer can be interfaced with the ring as terminals.

EDUCATIONAL USAGE

There will be many people who have seen a front panel display on the 380Z computer in secondary schools or colleges, and the MTX panel is very similar.
Hobby Electronics.

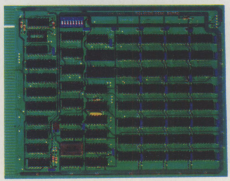
The new language Noddy and the Logo type Turtle Graphic commands would appeal particularly to the growing education market.
Your Computer Nov 83.

Applications are obviously going to suggest themselves in areas of the school curriculum, the fast-training of personnel in commerce, and in adventure-game writing.
Hobby Electronics.

The MTX expansion potential is well thought out. The key to both the MTX Ring system and to the Disc Drive systems is the communications (RS232) board mentioned earlier.
Electronics and Computing Monthly.

UPGRADABILITY

The MTX 500/512 is part of an existing range of products which can be bought separately and integrated into a single powerful system, now.



Silicon Disc RAM Board 256K fast access RAM

There is plenty of room for expansion with the MTX and Memotech have planned a progression up to their small business machine with 80 column display (instead of the standard 40 × 24) Floppy discs, Silicon (or RAM) discs, and a hard disc under development.
Personal Computing Today Feb 84.

There are a multitude of sockets along the back consisting of two Joystick sockets, cassette connections, Centronics printer circuit, aerial socket, power socket and audio and video output. There is also provision for two RS232 sockets . . .
Popular Computing Weekly Nov 83.

CP/M is a registered trademark of Digital Research Inc.

MEMOTECH

Station Lane Industrial Estate
Witney, Oxon, OX8 6BX.
Telephone (0993) 2977
Telex: 83372 MemtecG.

MTX 500 – VOTED PRODUCT OF THE YEAR BY COMPUTER TRADE ASSOCIATION
MEMOTECH MTX SERIES



SOFTWARE FOR THE MTX SERIES

CHESS

A fully comprehensive chess package. Ten levels of play, from novice to championship standard. Pitch your wits against the computer with this fast, versatile machine code program.

TOADO

The object of the game is to navigate each of **five toads** across a **road** and **two rivers** without being run down or drowning (toads can't swim).

ALICE IN WONDERLAND

A fully interactive machine code adventure game set in **Wonderland**. You play the part of **Alice**, and explore the fascinating world of Wonderland, full of excitement and suspense. Delve deep into tunnels, caves and wells in search of hidden treasure.

KILOPEDE

Eliminate **mushrooms** and the descending segmented **Kilopede** to gain bonus points – avoid killer **crabs**, **fleas**, **spiders** and **jellyfish** which chase you across multiple levels of increasing difficulty.

SUPER MINEFIELD

The object of the game is to get from one side of the minefield to the other without being **blown up**. You only get one life so be careful – not all the mines are visible. The only way you can tell how many mines are nearby is by looking at the **mine detector** in the top right hand corner of the screen.

BLOBBO

Run at high speed around the maze collecting **treasure** and **fruit** worth bonus points – but don't get caught by the **Blobbo-eaters**! Tactical dodging must be employed to avoid them. If you're caught or step on a skull and crossbones you lose one of your three lives.

KNUCKLES

Move **Knuckles** around his maze, using a joystick to kick **Roks** and **Magic Squares**. The object is to line up the Magic Squares, using the fire key, and so advance to the next level, gaining a level bonus.

Please send for our free colour catalogue of Business, Education and Games Software.

Illustration: Nick Mynheer.

Continental Software Limited,
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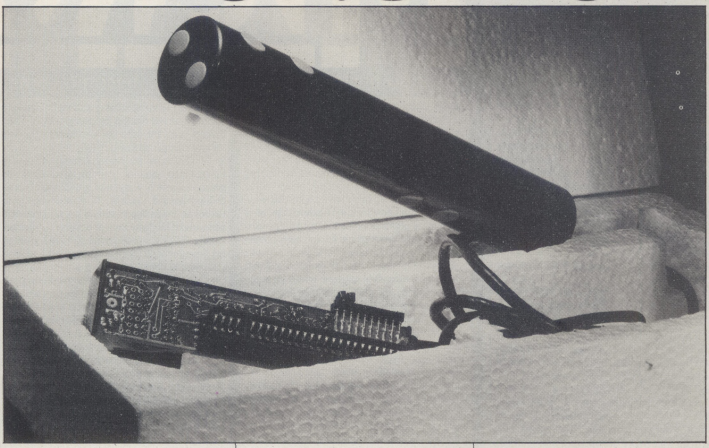
Withey, Oxon

TRICKSTICK



Just about everyone with a home computer knows what a joystick is. They have been with us ever since Atari launched its VCS games machine about five years or so ago.

The Trickstick, however, may not be quite so familiar. It is an attempt by East London Robotics to make joysticks more modern — and more attractive for the Spectrum user. Although the model we tested was a pre-production model, the difference between the Trickstick and a more conventional joystick can be clearly seen.

The unit plugs into the Spectrum via a small interface, which in our model has more glue than solder, and the glue is more evenly spread. This interface allows you to select the player number of each of a possible maximum of eight joysticks, each with its own interface and requisite setting. There is also an option of choosing on-off type operation, or what East London Robotics calls 'proportional' operation. In the latter mode, each joystick movement enhances the effect of the previous movement.

The joystick is a large cylindrical tube about eight inches long and an inch in diameter, with six red buttons, a small white adjustment potentiometer and a cable coming from the end. Each of the red buttons is a sensor, and each has its own particular effect. The two on the top are for left and right movement, the two at the upper end are for up and down movement, and the bottom two are firing buttons. You do not actually *press* these buttons, and here lies the secret of the Trickstick.

Its whole *modus operandi* is quite different from that of other joysticks, and as will be seen, this is not necessarily an advantage. The Trickstick relies on capacitance i.e. the ability to store charge. The ambient mains hum picked up (or is it transmitted?) by humans is used by the Trickstick to detect the presence or absence of fingers, so that a finger's proximity to a red button determines whether or not that button is considered to be pressed or not. Of course, the actual distance from the finger to the button can also be used to determine the 'pressure' that would have been applied if this were a normal stick.

The little white potentiometer is used to adjust the sensitivity of these buttons, and this was probably the greatest problem that we encountered in the Trickstick's use.

Although a program is provided on cassette to ease this adjustment, it is by no means an easy process and in fact took a frustratingly large amount of time. The first problem was that the cassette would not even load — sheer annoyance drove us to attempt to load the other side. This, of course, worked! You then take a screwdriver and twiddle this knob until a little blue aeroplane moves only when you tell it to — and only in the direction in which you tell it to move. Finally, we had the plane spinning on its axis in time with our fingers, which was such a relief that we were actually impressed.

Another cassette is provided that demonstrates the Trickstick in games use, the game in question being a specially written one called *Attactics*. This program features even more of these planes, and you are in control of the red one(s). Although it could captivate your interest for about a minute until you had got used to the Trickstick, it is difficult to imagine anyone seriously considering selling this as a commercial proposition. But that isn't the point.

The game *does* show you how to use the Trickstick, and brings in what is probably the joystick manufacturers' worst fear — personal preference. I rarely use a joystick because the lack of tactile acknowledgement of contact makes any game far harder to play — you just cannot get yourself involved. In this way, it would be even more unlikely that I'd use a Trickstick.

In all, the Trickstick is almost certainly a viable alternative to joysticks if you are the sort of person who would ever consider using such a device, but it does come across as a bit of a wasted gimmick. Far better to get yourself a Microdrive, which isn't so foolish when you consider that there is not that much of a price difference.

If you stick at tricks, then the Trickstick is for you. ■

MICRO

Why *do* perfectly ordinary people become computer

One thing must be established at the start: there are few, if any, sensible reasons to own a home computer. Why is it, then, that Americans have bought at least four *million* home computers while Britons are expected to buy a million and a quarter this year?

Because of Platt's First Law of Computers:

Whether a computer can do anything useful has always been beside the point. Simply fiddling with the thing is an obsession in itself.

Computer people will talk a lot about efficiency, education science, and technical matters that are "too complicated for you to understand". This way, they make themselves sound rational. But let's face it, the man who sits for hours hunched over a keyboard, programming his computer to print recipes or whistle "Three Blind Mice", is no more rational than the man who toils in his basement to build a replica of the Taj Mahal out of matchsticks.

Both are in the grip of obsessions; the only difference is that Micromania is more widespread, costs much more, and tends to escalate into a permanent, full-time occupation.

Who catches Micromania? Males, mostly, from ages 10 to 80. In adults, watch for these early warning signs:

- The "casual" remark that a friend at the office uses a word processor these days.
- The "accidental" pause to tie a shoelace while walking past the Tandy shop.
- The "idle" (but lingering) glance at computer magazines on the news stand.
- The "offhand" observation that we live in an "information age" (or other buzzwords that make computers sound important, serious, and necessary).
- The "humorous" comment that even people like you could probably learn to use a computer, if you really wanted to.

Be on your guard, also, for warning signs in children. You may think the child is too young. You may imagine he's been trained to stay clear of "that kind of thing". But watch out for:

- Computer magazines furtively smuggled into the bathroom.
- Sudden embarrassing questions such as "Mummy, what's an expansion slot?"
- New slang in everyday speech — words like "software", "hard disk", "peek", and "poke".
- Older children who offer "one free game" — remember, the first byte of the Apple is always free. The rest cost more than you can imagine.
- Bloodshot eyes — may be from excessive use of video screens.
- Pallid complexion — can indicate whole days spent in game arcades.
- Slurred speech, trembling hands, and vacant stare — frequently a symptom of playing Pac-Man for five or six hours at a stretch.

It may seem impossible to you now. But overnight, a child can turn into a delinquent whom you can no longer control, a deviant who will throw tantrums if you don't buy his silence with software, and may even threaten to electrocute you if you dust his floppy disks.

The pictures tell the ugly story. From healthy, sociable, bright-eyed, computer-free humans, they collapse into insomniac, square-eyed, obese, robotized Micromaniacs, gabbling about baud rates and string space.

Of course, it doesn't have to be this way. Most people can drink in moderation, and, given wise guidance, you can use computers without becoming terminally obsessed.

But the history of the field is riddled with cases who didn't know when to stop, didn't listen to the warnings of their friends, and plunged so deep into the world of data that they never emerged again.

Charles Babbage, the "father of the computer" was himself a classic case. This British eccentric laboured for thirty-five years, till his death in 1871, to build what he called an analytical engine. He claimed it would be useful for all kinds of mathematical calculations. In fact, if he'd simply sat down with pencil and paper and done the calculations himself, this would have taken him a fraction of the time and money that he spent trying to build his gadget — which he never did get to work properly.

Things haven't changed a bit. Computer people still tend to start with a simple problem, decide it would be "interesting" or "fun" to solve it with a computer — and become so wrapped up with flowcharts and code, they forget all about their original objective. Simply fiddling with the thing becomes an obsession in itself. Platt's First Law prevails.

To be fair, some of the earliest electronic computers did have an important use. At Bletchley Park they cracked German codes during World War II.

But after that, the computer was a laboratory curiosity. No one was quite sure what it could usefully do, especially since the early models (great big metal boxes stuffed with wires and valves) had a bad habit of breaking down. It was standard practice to feed the machine a problem three times; if it gave the same answer two times out of three, that was considered a success.

But computer people weren't discouraged by this lack of reliability, and lack of suitable applications. Put yourself into their position. Imagine having a vast room-full of radio parts, so complicated that hardly anyone else in the world could understand how it worked . . . and all of it *under your control*! It was the ultimate power fantasy for electronics experts and mathematicians. To them, reliability and right answers seemed trivial details by comparison. They talked and thought in terms of dazzling "theoretical capabilities".

This is how so many companies were lured into buying computers, only to discover, once they had purchased some million-pound system, it wasn't quite as useful as it was supposed to be, and created all kinds of horrendous problems. Unfortunately, having squandered so much money on "modernization", no one liked to admit the whole thing had been a mistake. The only way to save face was by modifying the system, or by buying an even bigger one. This was a great incentive for manufacturers to develop "enhanced" models. And so it went on.

By this time, computers were being used to count census returns, keep track of corporate accounts, and process junk mail. They were dealing with words, as well as numbers. And this, in turn, allowed computer freaks to write programs like "Guess the Animal".

You'd visit the mathematics department of a big university, and everyone would seem very serious and intelligent, and you'd be given the impression that highly important research was going on here. You'd be admitted to a specially-locked room, usually in the basement. Even at the height of summer, it would be air-conditioned down to sixty-eight degrees — because that temperature was good for the computer. There'd be shiny blue-and-white cabinets, with reels of tape inside them, and a thing like a giant typewriter, with a huge roll of paper feeding through it, and people would be wearing special clothes so as not to bring any dirt and dust into this holy inner sanctum. You'd be given the full scientific spiel about millions of operations per second, vast data storage capabilities, and so on. And then, if you were lucky, someone would sidle up to you with a guilty smile, as if he was ashamed to admit what *really* went on down here, and he'd say, "Would you like a game of 'Guess the Animal'?"

You'd sit at the impressive console. The computer would print on to the roll of paper: "Think of an animal." Then it would print a whole list of instructions like, "Does it have spots? Does it fly? Does it have a trunk?" and you'd type "Yes" or "No" to each question, until the computer guessed your animal.

Naturally, the university didn't encourage this use of a million-pound mainframe computer for idiot games. The university

MANIA

ter

fanatics? Charles Platt and David Langford investigate.

had bought the system, originally, because a bunch of computer addicts had made the usual claims about how "useful" it would be, for solving differential equations, or doing Fourier transforms, or printing everyone's payslips. But once the system was installed, the addicts got all the boring calculations out of the way as quickly as possible, and started doing what they had secretly wanted to do all along — play games, fiddling with the computer as an obsession in itself.

Pretty soon they had their computers casting horoscopes and challenging all comers at noughts-and-crosses; and then the artificial intelligence labs started writing programs that would imitate the responses of a psychotherapist ("Do you want to tell me about it? When did you first feel this hostility toward your mother?") . . . until finally the word got out: *computers could be cute*. Moreover, with the advent of NASA, and miniaturized circuits on little chips of silicon, computers became reliable, and costs went down — and down. By around 1975, a few hardware-crazy American college dropouts realized they could design a little computer around one of the cheap new "chips" and sell it for a mere $2000. (For comparison: when the Apple II reached Britain in 1977, the cheapest version cost £1000.)

Why would any consumer spend that much money, on something with no practical application whatsoever? Silly question! Merely owning the machine, and fiddling with it, would be enough.

And so, the first people to market home computers got rich. This was a surprise to veterans like IBM, who knew that computers were really only useful for science, government, and business applications. IBM reckoned that Apples were selling to a few diehard hobbyists, and that this market would soon be saturated.

But of course, it didn't stop at hobbyists. Every kid wanted a computer, not just to be first on his block but because kids dearly love to have some power over their lives, and a computer will do your bidding no matter how young you are. Adults, too, were seduced by the idea of a tame gadget that could be trained like a pet. In fact one of the early home computers was actually called PET.

This leads us to Platt's Second Law of Computers:

People like computers because computers do what they're told. The job they actually perform is less important than their obedience in doing it.

Computer people tend not to talk about this in so many words, but a lot of the real pleasure in writing programs comes from giving commands that the machine slavishly obeys. Many programmers were the kinds of kids who studied too hard, suffered from acne, were beaten up by the big boys, rejected by girls, and laughed off the football team. After a childhood like that, issuing instructions to a wonderfully complex machine that speaks your special secret code, and always does exactly what you tell it to do, is a great compensation. It even creates a sense of empathy which becomes a real substitute for social interaction. Programmers feel so intimate with computers, they talk as if they're "inside" the machine intelligence: "I had to get into the operating system to chase down that bug", and so on.

But what does all this mean to you, as a computer sceptic, hesitating on the brink?

First, it means you should question people who claim that computers are useful. Even when this turns out to be true, it's not necessarily the real reason why someone uses a computer. It's more likely to be his way of justifying all the money he's spent, and all the time he now wastes playing with the thing.

Second, remember what happened to Charles Babbage. Thirty-five years wasted, in the grip of Micromania! If you think gadgets are fun, and you have a playful or obsessive personality, this little hobby could absorb more time and money than you imagine.

And now, having given a few Dire Warnings about the field and its history, let's get obsessed ourselves. Let's get inside the machine and find out where the fascination really comes from.

What exactly *is* a computer? It's hard to give a single, simple answer, because computers do so many clever, different things — like destroying your credit rating, creating mass unemployment, sending you junk mail with your name in big letters all over it, and accidentally launching missiles at Nigeria.

"A computer is a system for processing information", is the kind of definition you'll find in textbooks. Well, true, but so is a telephone or an ouija board.

"A computer is just a number-cruncher", is the kind of explanation you'll hear from fatherly experts, who want to reassure you about the whole subject, by making computers sound as human as a kid eating sweets or as harmless as a dog chewing on a bone. Well, fair enough, but you might as well say "dynamite is just a chemical that burns very quickly".

Somehow, when computer experts define what they do, and the equipment they use to do it, they aren't very helpful. There are two reasons for this. First, computer types are so much in love with computers, they can't easily step back and see things the way *you* see them. This makes communication a problem. And second, computer types may not really *want* to communicate. Working with machines, year after year, creates an evasive, slightly elitist outlook. You have your private machine-language, your little world of programs completely under your control — you wouldn't want to let just *anyone* into it, would you?

This leads us to Platt's Third Law of Computers:

When experts say that they want the public to understand computers, they really mean they want the public to accept computers, and stop causing such a fuss about the subject, so programmers can do what they like without outsiders checking up on them.

All right, let's try to demystify the whole business.

The one ability that sets computers apart from any other device is that they can be programmed. What does this really mean? Well, suppose you send your son out shopping. You write a shopping list on the back of an envelope, including instructions such as "Buy a large tin of Germolene" or "Get your hair cut". After the kid follows each instruction, he follows the next instruction, until he's done all of them, at which point he sneaks £1.75 out of your wallet, shoplifts some smarties from Woolworth's, loiters by the newsagent's ogling covers of men's magazines, and finally returns home.

To a computer person, your shopping list is really a *program* (also generally referred to as *software*). The back of the envelope is a *storage device* (it stores the program). Your son's mind and body are the *hardware* being used to *execute* the program. If he uses a bicycle to go out on his mission, and he carries a shopping bag, these would be called *peripheral devices* — extra hardware "added on to" the basic information-processing system (i.e. him).

Suppose he misunderstands one line of the list, and buys the wrong item by mistake. This would be a *malfunction*. It might be caused by a *hardware error* (defective eyesight), or it could be a *programming error* (bad handwriting).

If, on the other hand, the unfortunate child fails in his mission because he is run over by a bus, this would be a *crash*, likely to be followed by a prolonged period of *down time*.

Computer people like to use all this jargon because it makes everything seem so important and technical. For instance, "something's gone wrong with the computer" isn't nearly as impressive as, "We have a computer malfunction", which even sounds slightly intentional, as if computers are *supposed* to do this once in a while.

Among themselves, computer types loosen up a bit. They might use, for ▶

instance, the word *glitch*, which can describe anything from a blown fuse to a programming error that transfers a billion pounds of bank credits to Bucharest. In public, however, they stick with the long words, and even add some ornamental touches — such as *mode*, which means absolutely nothing, but sounds good, as in "The computer is in text-display mode", which really means, "The computer is displaying text".

But to get back to our example of the kid doing the shopping: Suppose that you're clean out of storage devices (i.e. old envelopes), so you can't write a program (shopping list). Also, suppose your son is so stupid, he can only remember one item at a time. You would have to send him out on a separate trip for each item on the list.

Obviously, a programmed servant is much more useful than a servant who can only deal with one instruction at a time. This is the difference between a computer, which can be programmed with a whole series of instructions and will follow them without further help, and a cheap electronic calculator, which can only accept and obey one instruction at a time (e.g. "add this to that" and "now multiply that by this").

Before you give your son the shopping list, he doesn't know what to buy, doesn't even realise that you want him to go shopping, and is likely to sit around watching Saturday morning cartoons on TV. Likewise, with a computer: until you give it some instructions, it is empty-headed, and idle.

You can give a computer its instructions (its program) in the form of a series of complex, cryptic codes that you must type on its keyboard. Or, you can buy a ready-made storage device — a *disk*, *tape*, or *cartridge* on which the codes have been pre-recorded, ready to be played straight into the computer's own electronic memory. Then you set it running, and it does whatever the program tells it to do. It plays "Guess the Animal", cracks military codes, sends out debt-collection letters, or whatever.

But how does the computer actually understand these so-called "electronic instructions"? The fatherly type of computer expert will tell you that computers are very stupid. This is true: they can only count up to one. Actually, to be more accurate, they count with zeroes and ones, in what is known as *binary code*.

Suppose a computer wants to count from zero to four. It starts with a 0, which means the same in any language. Then it goes to 1, which also means what you normally assume it means. But then, because the computer doesn't understand the numeral 2, it goes from 1 to 10. Then it goes from 10 to 11, and then, because it still can't use a 2, it goes from 11 to 100, which means "four" as far as its concerned, and if you think it means "one hundred", that's your problem.

If this seems confusing, I'm not surprised — you've counted in tens all your life, and computers don't do it that way. Well, think of binary code like this. If you see a binary number that consists of eight digits — the number 11111111 for instance — you can figure out what it means in normal, ten-based numbering, by a simple formula. Start at the right-hand end of the number. The 1 in the first place means simply "one". But the 1 in the next place (moving from right to left) means, in your numbering system, "two". The 1 in the next place means "four". The 1 in the next place means "eight".

Continuing leftwards, the numeral 1 in each place is translated by a computer as 16, 32, 64, and 128. You may notice that these values double each time. No matter how long the binary number is, the code value for each place in the number keeps doubling as you continue to the left.

So 11111111 means, in your numbering system:

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1

— which adds up to 255. If there had been any zeroes in the number, we would omit the code value for those places; for instance, the binary number 10000101 would be equal to 128 + 4 + 1 in your numbering system, or 133 total.

To a computer, the year 1984 is 11111000000. That's:

1024 + 512 + 256 + 128 + 64 + 0 + 0 + 0 + 0 + 0

Well, if none of this makes any sense, you needn't worry — you don't really need to know about it, to hold your own in the world of high tech. What you really need to know is that each 1 or 0 in a binary number is called a binary digit, or *bit* for short. Most computers can handle binary numbers that are eight bits long, and this length of number is called a *byte*

Now we get to that famous computer-addict sense of humour: a set of four bits is called a *nybble*. After all, it's half a byte, right? Many home-computer users aren't familiar with the word "nybble", incidentally. This means you now know something that they don't know. Next time you want to impress a friend, ask a casual question such as "Are your colour-video memory addresses nybbles or bytes?" This can do wonders to destroy his concentration and confidence, while enhancing your high-tech status.

But how does the computer actually store and handle its bits? Simple. The computer contains millions of tiny *transistors*, and each one works like an on-off switch. When one of the switches turns on, it sends a tiny pulse of electricity — hundreds of times less than you'd get from a torch battery. This pulse means, to the computer, a numeral 1. Gaps between such pulses mean, to the computer, the numeral 0. Patterns of these pulses can be used to send messages — like Morse code.

The computer shuffles the pulses around with its *CPU*, or *central processing unit*. This is the "brains" of the operation, all on one *silicon chip*, identified by a product number such as 6502, Z-80, or 8080.

But if a computer can only count in ones and zeroes, how does it cope with words and games like "Guess the Animal"? Answer: it uses a code. Suppose you were in jail and wanted to talk to someone in another cell. You could agree that letter A would be one bang on the water pipe, letter B would be two bangs, and so on. It would take you a long time to communicate like this, especially if you wanted to send a message such as "Think I'll get some zzzzz", but it would be possible.

This is more or less how the computer does it. When your bank divulges to the Inland Revenue every detail of your private financial life, it can send the data from one computer to another, by converting words such as "alimony" and "undischarged bankrupt" into binary numbers. Letter A in Alimony will be 01000001, letter B in Bankrupt will be 01000010 (remember, the transistors in a computer can only be on or off, representing number 1 or number 0, so number 2 is not allowed) . . . and so forth, assuming that the computers are using the American Standard Code for Information Interchange, or *ASCII* (pronounced "asskey") *code*. Note that this code represents each letter with one byte — i.e. a set of eight ones/zeroes.

You might think that all this coding and decoding would take a long time. But computers work fast. They can add, shift, and compare bytes several million times per second. This allows them to divulge not only *your* personal details, but those of *every* depositor. What an advantage!

The adding, comparing, and shuffling of data all takes place in the tiny CPU chip. The rest of the computer consists of *random-access memory*, or *RAM* (chips whose tiny on-off transistors are used only for holding data), and *read-only memory*, or *ROM*. These chips are pre-set by the manufacturer, and do things like convert a user's instructions into numbers the computer understands, and convert the computer's numbers back into messages that the user can understand, usually *via* the *video screen*.

Since computers are designed by people who tend to feel more at home with numbers and logic code than with the English language, they sometimes don't do a very good job of turning computer-numbers into words for the rest of us. That sort of task is considered boring. It's known, in the trade, as making the machine *user-friendly*, which everyone agrees is a good idea, but no one really enjoys doing.

However, the conversion of human language into code that the computer can understand is much better organized. It has to be, otherwise it would be difficult to write programs. And writing programs is half the fun of using computers. ■



This is an extract from *Micromania* by Charles Platt with David Langford. The book is published by Gollancz at £7.95

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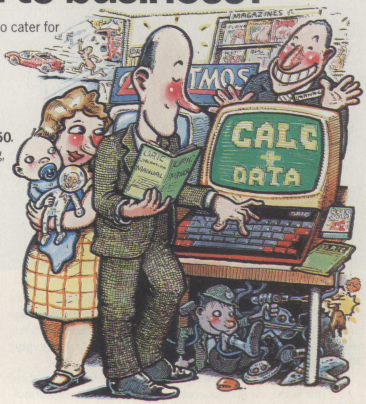



TANSOFT

Three cu
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A rubbish bin for your old has been.



Yet more money for bolt ons

■ Believe it or not, computers often suffer from amnesia.

99% start off with large enough memories, but operating functions like text, colour, sound and more particularly high resolution graphics, take large bytes out of them. Leaving very little "useable" memory for programming and games.

Not so the new Oric Atmos 48K.

This is the one home computer that takes these normal working functions in its stride.

Unlike other home computers it uses the highly sophisticated serial attribute handling method used by Viewdata and Teletext, in which the attributes are stored on the screen alongside the data, instead of taking up space in the memory.

Thus the Oric Atmos never offers less than a healthy 37K of useable memory – even when the new colour printer and disc drive unit are attached. (Technical buffs see details overleaf).

So it rivals the performance of the supposedly larger, more expensive Commodore 64K, which unfortunately loses 26K of its "elephantine" memory in high resolution graphics.

It beats its immediate competitors like the Sinclair Spectrum, Dragon 32K, Vic 20 and Atari 600.

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ney for yet more
bolt ons.

The new Oric Atmos 48K.

It beats the Lynx 48K, which costs over a third more, yet loses 34K.

It even beats the Acorn Electron and the BBC Micro which costs more than twice as much, yet loses 23K in high resolution graphics.

And while this may surprise you, it's totally in keeping with a company recognised in the computer industry for performance and innovation.

Like its predecessor, the Oric-1, the Oric Atmos has the powerful loudspeaker and amplifier unit that prompted "Which Micro" (November issue) to comment... "Its sound facilities have more in common with those of the £400 Beeb, than the rather pathetic beep of the Spectrum. At full volume it can compete with most arcade games..."

Yet the Oric Atmos 48K costs a mere £170, including all the leads and adaptors you need to get it going.

So if you're buying a computer, remember our name. We could save you a fortune on bolt-ons... or wastepaper bins.

The new Oric Atmos 48K. ORIC

Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed: (horizontal)	52 mm/sec (2.05ips)
(vertical)	73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n+1) *6) for 0=n=15
Accuracy (repetition)	0.2 mm max
(movement)	0.3 mm max
(distance)	0.5% max (x—axis) 1% (y—axis)
Pen life	250 metres (825 feet)
Parallel interface	8—bit parallel Uses STROBE and ACKNOWLEDGE
Temperature range storage	18.3 to 35°C (65 to 96°F) —40 to 71°C (.40 to 160°F)
Humidity range	10% to 80% relative non-condensing
Power supply	Switching power supply input 100—120 VAC 200—240 VAC
Dimensions	10¾" wide 6⅞" deep 2½" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch, 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor.
Text format	40 line x 28 rows
Character set	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Graphics	240 x 200, 8 colours
Graphic Facilities	Points, lines, circles
Sound	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Storage	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Interface	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Other	Warm reset to regain control without clearing program or data

Micro Disc Technical Specifications

Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at a future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec

Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 ¼" (five and a quarter inch)
Extensive wild card facilities
Copy allows merging of basic and machine code files

Utilities

The Utilities are as follows:

1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
12. Store	Store a basic array as a data file
13. Sys	Change system configuration

Prices and data correct at time of going to press.
Specifications on the above models may change without notice.

Available at Allders, Currys, Dixons, Greens, Harrods, Laskys, Rumbelows, Spectrum and Zappo Computer Centres.



NEXT MONTH

Contents subject to late revision



Super, new look Which Micro

- Incorporating *Your 64*, our special feature supplement with reviews, programming tips and all the latest releases for Commodore 64 owners.

More Competitions

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Lightpen Drawbacks

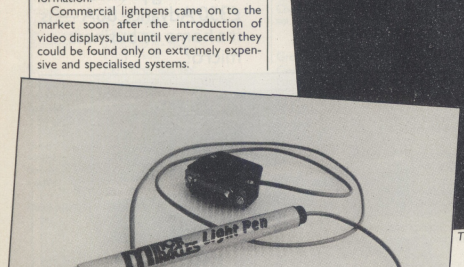
"There are a number of devices which enable the user to interact with a computer. The standard ASCII keyboard is the most common of these devices with lightpens probably a close second. A lightpen allows manipulation of information on a video display."

Here the RH Electronics lightpen manual puts it in a nutshell for us. Lightpens are, indeed, just another input device, and their existence is wholly due to the fact that almost all computers these days use a television-style screen for displaying information.

Commercial lightpens came on to the market soon after the introduction of video displays, but until very recently they could be found only on extremely expensive and specialised systems.



The Datapen has a push switch and red LED built-in



Minor Miracles light pen — only £12.95 but very insensitive

There are perhaps two main reasons for the large-scale adoption of lightpens: first, they are a more convincing teaching aid than a keyboard and second, it is very difficult to use a computer's graphic capabilities creatively without a pen or brush-like device.

WHAT'S AVAILABLE

This need has, of course, at last extended to the home micro user, and models varying in price from as little as £15 to as much as £200 can now be bought for all machines. The BBC Micro owner is, as ever, in a better position than many other micro owners when it comes to lightpen usage as the BBC machine has a dedicated socket specifically for the device. Not only that, but one of the chips inside the machine — the 6845 CRTC (Cathode Ray Tube Controller) — also has decidated lightpen registers.

This chip allows the BBC Micro to calculate the position more accurately and more often (which is, in fact, an important consideration) than most other home machines. This is because the actual scanning line of the television is used to tell the software where the pen is. Cheaper pens tend to detect only the presence or absence of light and are therefore of rather more limited use.

We look at four different lightpens here — three for the BBC Micro and one for the Commodore 64, Dragon 32 and Vic 20. The first is the Minor Miracles lightpen — the most basic of the units. This consists very simply of a photodiode in the body of what was once going to be a felt-tipped pen. This terminates in a very thin lead, about a metre in length, going to a 15 pin D plug. This D plug fits into the analogue input of the BBC Micro. In common with all of the lightpens examined, a cassette of set-up and demonstration programs is provided. At £12.95 this lightpen is the cheapest of the four, but this is reflected in the quality of the product. It is very insensitive which means that the brightness of the picture has to be increased to an abnormally high level.

The software provided with the pen is also fairly simple; you are given a range of eight colours and a choice of three different widths. As a cheap introduction to lightpens this product serves reasonably well. But the photocopied instruction sheet and lack of adequate operating instructions means that it is very unlikely that the pen would ever be put to professional use.

The second pen costs £25 and looks much nicer. This is the Datapen, made by a company of the same name. It looks far more like a computer peripheral than a biro and has a push switch and red LED built in. It is available for the BBC B, Dragon 32, Vic 20 and Commodore 64. This time the instructions are printed in an

18-page A6 booklet. You are given instructions for using the pen with all four computers, but the information is not as complete as it might be.



DAMS Pikstick for the Commodore 64

The BBC model of Datapen is also accompanied by an A4 photocopied sheet giving a listing of the important lightpen procedures and functions, plus details of all the example programs on the demonstration cassette. This brief but educational data should enable most people to write very exciting and useful programs. The demonstration programs are much more informative than those supplied with the Minor Miracles pen, and on the whole this pen is by far the better of the two.

Both the position of the lightpen on the screen and the state of the switch on the side can be read, and the demonstration programs show this admirably. Accuracy and sensitivity are far better than with the cheaper pen; for the person who wants to experiment with lightpens without spending too much, this is the ideal choice.

THE TOP END OF THE MARKET

However, there is one pen which is, quite simply, the Rolls Royce of the lightpen market. It is made by RH Electronics for the BBC B only (at present), and is officially approved by Acorn. This is quite different to all the others. Instead of being plugged straight into the BBC, the pen is permanently connected to a metal box that in turn plugs into the analogue port of the machine. This box is about an inch and a half high, five inches wide and five inches deep. It is finished in the same style and colour as the BBC Micro and has a small adjusting screw on what approximates to the front cover of the unit.

Naturally, this pen is far more expensive than the others — £45.95 — but for scientific and professional applications, this is the only one to buy. The demonstration software is normally provided on cassette, but we managed to get a disk version for this review. Apart from set-up and introduction programs, there are also two large applications programs called *Artmaster* and *Artfun*. The pen itself is cased in metal and is about one centimetre in diameter.

The instructions provided with this pen are copious; they detail all aspects of its use and also deal with programs which take advantage of the facilities that it offers.

Finally, we looked at the Computapix Pixstick from DAMS for the Commodore 64. Again this is a fairly substantial unit, all black and looking rather like a long flat stick of liquorice. It is attached by a metre-long black curly lead to a large 9-pin D plug that contains a little circuitry and plugs into Port 1 on the Commodore. The instructions for this lightpen take up roughly 10 double sided A4 sheets. There's a lot of information, but the English is a bit dodgy, which is surprising considering that the pen is made in the U.K. The demonstration cassette contains four programs which serve as an introduction to the lightpen and its concepts. The cost is a reasonable £29.95.

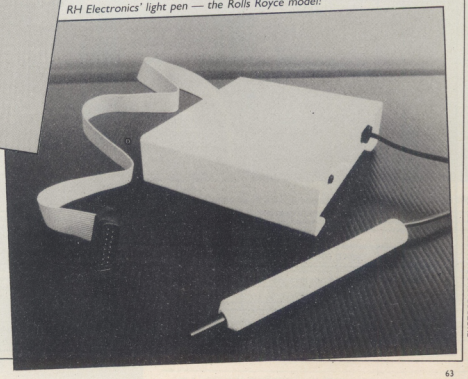
THINK BEFORE YOU BUY

Having spent money on a lightpen, what can you do with it? Apart from drawing and painting on the screen (for which the RH device and programs are best), lightpens can be used for all sorts of 'user friendly' inputs, from menu selection to games playing. Whilst in most cases the reaction times of both player and pen are too slow for the pens to be used as arcade games controllers, they are ideal for slower games such as chess or solitaire.

Do remember that although on-screen drawing and screen design is what lightpens are claimed to be particularly good at, for the non-artists among us the difficulties inherent in drawing freehand on a vertical television screen are daunting.

Probably the fairest advice we can give you is to recommend that before you spend your money you think hard and long about whether you can really justify the purchase. For those of you with money to burn a lightpen will be another gadget to add to your collection. But for the rest of you, we can only suggest that you seek further enlight(!)enment on the subject. ■

RH Electronics' light pen — the Rolls Royce model!



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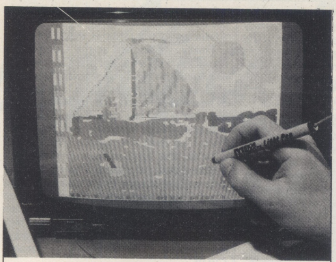

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How I wrote a successful g

Do you want to write a successful games program? We asked Justin Whittaker, who has done just that with his *Lone Raider* game for Atari, to pass on some pearls of wisdom on the design and writing of a best-selling computer program.

Although the techniques described here apply mainly to game design, a few are applicable to serious programming as well. So if your interest lies in more serious directions, don't be put off!

Games software design is, in effect, an art form, and all artists will develop their own style and their own techniques. The techniques I use are the ones that suit me best, but, of course, they might not necessarily be the only or the most effective way for you to achieve results.

Before you can sit down and write your masterpiece, you must first think about the style of game you want. This preliminary stage is without doubt the most crucial and possibly the hardest of all, so do not rush it! An obvious but important point to remember is that you should choose a style of game that *you* would enjoy playing. It is definitely the case that enthusiasm in what you're doing is reflected in the work you produce.

Most modern video games fall into two categories. The first of these is games which, in order to even out the huge gap between our intelligence (I hope) and the enemy's stupidity, rely on large numbers of opponents. This is evident in *Space Invaders*, *Defender*, plus hundreds of other 'arcade'games. With these games we immediately feel at a disadvantage. This is because the ratio of enemy attacks to you, the player, is very large. When we destroy a screenful of invaders we feel heroic and clever — and that is what entertainment is all about.

The feeling of excitement with some games in this category explains the popularity of 'shoot 'em up' or reaction based games. If you decide to have more intelligent opponents you must either slow down the action or cut down on their numbers. A somewhat extreme example is computer chess, which has to be slow so the computer has a chance to think about its next move. It is easier to program the movements of large numbers of unthinking opponents than it is to develop artificial intelligence algorithms, to control anything to match our thought processes.

If the market trend moved away from fast action games, we would definitely see a decrease in choice in the games arena. This

> ‘Think of a very simple idea and gradually build on it, adding more features as you go along.’

would simply be due to the fact that most software authors are not clever enough to create artificial intelligence routines.

Once you have decided upon the category of game you are going to write, you must then think of the theme and general idea of the game.

Try to think of a idea that has not been used before. It is very tempting to copy someone else's idea, but the original games stand out from the vast amounts of predictable lookalikes.

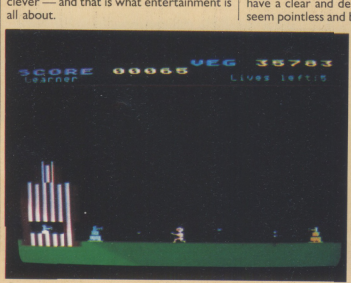
One of the most common questions games programmers are asked is, "How do you think up ideas for games?" This is a bit like asking a musician how he composes a song. There is no straightforward answer, but all games should have an easily understandable objective. If a game does not have a clear and definable purpose, it will seem pointless and boring. The best idea is to think of a very simple idea and gradually build on it, adding features as you go along.

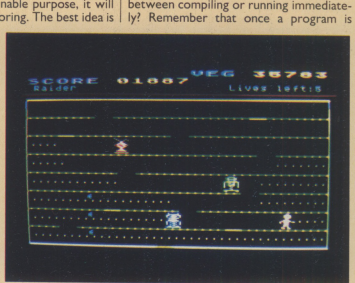
Why not look around you and pick an object on which you could base a game? Because games themes have no limitations, they can be as odd as you like. Or maybe jot down a list of features you would like to see in a game and then design your creation around these guidelines.

Once you hit upon a general idea which you could possibly implement on your micro, you must then consider the language to write it in. If you require fast-moving graphics, or time-consuming calculations, it will probably have to be written in machine code. If the mere mention of machine code makes your hair stand on end, don't worry. There are quite a few commercially available programs which, although written in Basic, run up to 10 times as fast as Basic. This seemingly impossible feat can be achieved by using a 'compiler'.

Compilers are available for most makes of computer at quite a reasonable price, considering what they achieve. As for what they do, normally when a Basic program is running the computer spends a *lot* of time converting each program instruction (which you can understand) into machine language (which it can understand), before it is executed. Compilers have a different approach; they convert the entire Basic program into machine code before it is run. When it does run it is 100 per cent machine code, with much greater speeds than Basic could ever achieve.

You may be asking why this system is not generally used by home computers. The drawback is that 'compiling' a program takes about 30 seconds for an average program. This is not acceptable if you want to run a program as soon as you have modified it. When you type "RUN", you do not want a large delay before seeing results. If there are any micro manufacturers reading this, why not include the choice between compiling or running immediately? Remember that once a program is





Graphic characters will probably look completely different as soon as you transfer them from paper to screen.

ul games program



compiled it can be executed without delay as many times as required.

Although these compiled programs are not as fast as custom-written machine code, they do open up new fields for the Basic programmer. Some manufacturers demand a royalty on any program sold which was written using their compiler. Read the fine print on the packaging. Also, do not expect the compiler to convert any programs you have already written. They can only convert a sub-set of Basic keywords.

All games must have a random element to them, otherwise they would be repetitive and easily mastered. Having said that, there should be some kind of pattern which can be learnt by the player. In this way you can increase your scores with practise: with a totally random game, you could never improve. Imagine, for instance, a game which asked you to guess a random number between one and 10. There would be no chance of improving your performance, unless you happen to be Uri Geller. In arcade games, such as *Galaxian*, you learn to predict the patterns of invaders, so your scores improve with time.

A good way to make the enemy's movements 'random' — yet slightly predictable — is to use data tables as well as considering the player's current position. Because humans are not as precise as computers, it would be impossible to recreate exactly the movements of previous games. In fact, the player can be seen as an outside source for randomness. A 'flight pattern' for an alien might be recorded as a list of numbers, but the actual pattern would be created, for example, by adding the player's position on the screen. A typical example of this technique is *Joust* where the opposing jousters react to your current position vertically and horizontally.

Obviously, it is far easier to talk about ideas than it is to program them. Let's consider, therefore, program logic and plan.

Before you start typing in your program, you will probably need to do some paperwork. Flowcharting is a common method of organising how and when different segments of the program will execute. Some programmers swear by flowcharts, some swear at them. It is really up to you to decide if they are helpful or not. I believe in the basic principles of flowcharting, but the thought of designing an active program in detail, before typing in, seems extremely tedious.

However, if you use subroutines for each important part of a program, flowcharting comes into its own. Draw each subroutine as a large box, with details of what it actually does written inside. The interconnections between these boxes will then be an exact replica of your program flow. Each major junction will be a 'jump-subroutine' command (JSR in machine code and GOSUB or PROC in Basic).

> 'Some programmers swear by flowcharts, some swear at them. It's up to you to decide if they are helpful.'

A major advantage of using subroutines for each part of a program is the ease of debugging. If a bug occurs, it is simple to find out where it resides. For example, if a bullet goes haywire, you know just where to look: the 'move bullet' routine. Although I never place comments against any source code (the human-readable part), you will more than likely find that what made perfect sense a month ago now seems more like a load of gibberish. If there is any complex logic used, you will be thankful that you took the time to put a remark by it. Bear in mind, though, that it is what the public actually sees that counts, so put a lot of effort into graphics and sound.

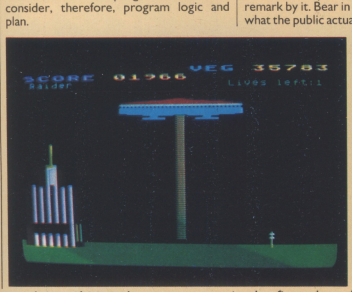
When designing graphic characters, create them on screen, not on paper. The difference in appearance between something on paper and something on screen is startling. It is fairly easy to write a program that lets you create shapes on screen, so it is time well spent.

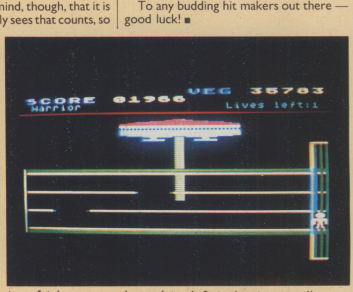
The power of sound is often underestimated by programmers. It allows us to enter the player's subconscious because it cannot be ignored. Appropriate sound effects can create moods of panic or calm. Next time you watch a film, listen to how music and noise are used to create the required atmosphere. Copying this technique will make your games far more enjoyable. For instance, the 'stomping' of space invaders gets faster, until when the last invader is left it is so fast our pulses are racing. You will find that 'noise' is far more effective than musical tones.

Do not make the mistake of playing a repetitive tune throughout a game, though. It may seem fun to begin with, but it soon becomes *unbearable*.

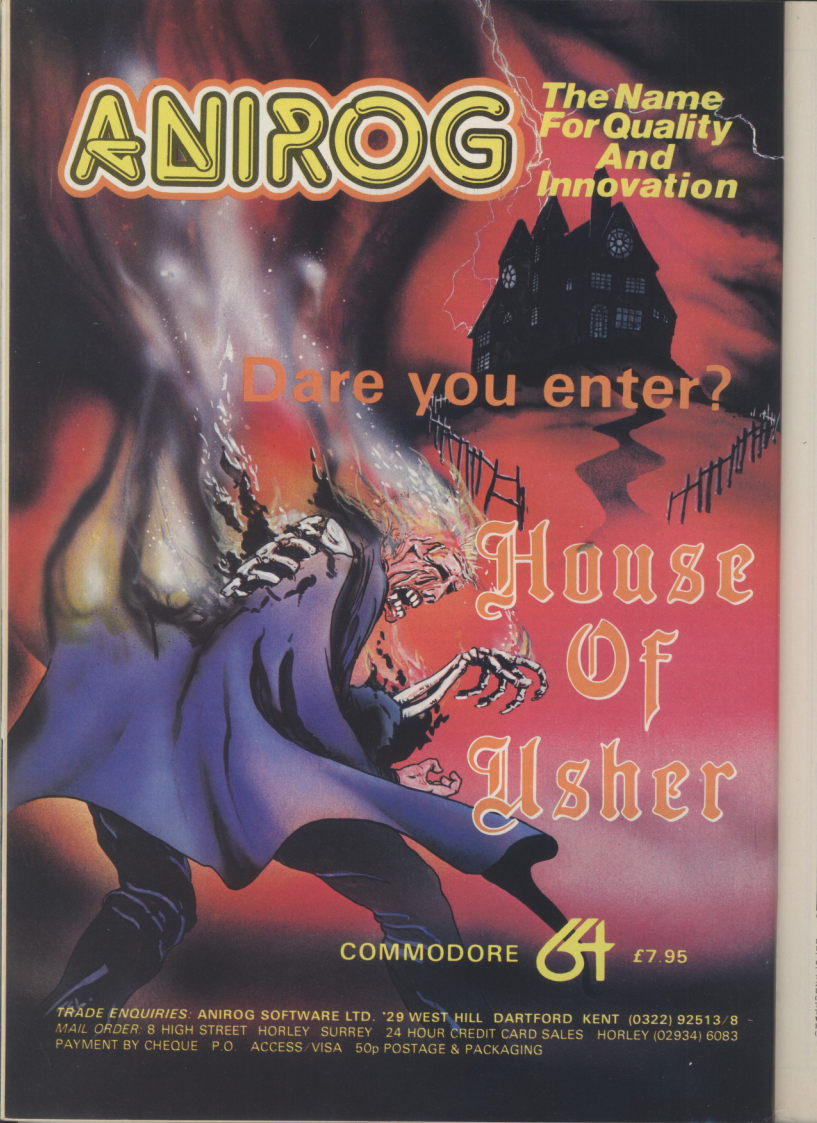
With perseverance, patience and a little luck, you could find you have a saleable game on your hands. All that is left to decide is who and how to market it — but that's another story altogether.

To any budding hit makers out there — good luck! ■





so always design them on screen in the first place. It is a fairly easy task, and is definitely time well spent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Just two comments from full length reviews of our powerful and virtually full implementation of Standard Pascal. The advantages of using the Pascal language are many; fast, self-documenting and truly structured programming — many schools and universities insist on a good knowledge and understanding of Pascal for their Computer Studies courses.
Now you can learn and use Pascal on your home micro; Hisoft Pascal is available for a wide range of home computers, including the 48K Spectrum. Typically, compiled programs run 40 times faster than their interpreted BASIC equivalent — and sometimes up to 1,000 times faster!
Hisoft Pascal supports all the Standard Pascal data structures and statements: INTEGERs, REALs, CHARacters, ARRAYs, SETs, RECORDs, POINTERs, Enumerated types, FOR . . . DO, REPEAT . . . UNTIL, WHILE . . . DO, CASE . . . OF and many pre-defined Procedures and Functions (e.g. SQRT, TAN, SIN, COS, INLINE, PEEK, POKE etc. etc.) — it is **not** a Tiny Pascal but a powerful educational and development tool which allows the user to develop true high-level language skills while attaining execution speed close to that of machine-code.
Hisoft Pascal for the ZX Spectrum now comes complete with ZX Microdrive support (anything you can do with tape you can do with Microdrive) and a Turtle Graphics package which allows easy creation of complex graphic programs.

HISOFT DEVPAC 3

". . . DEVPAC is most highly recommended. The documentation is first class" . . . *Your Computer — May 1983.*
". . . it is impossible to recommend any other development package for the Spectrum over DEVPAC." . . . *Adam Denning — ECM April 1984.*
Need we say more? DEVPAC 3 is a very powerful assembler, editor and disassembler/debugger. Forget about buying lots of separate packages for your machine-code development — it's all in DEVPAC 3. A full Z80 assembler with conditional assembly, all standard directives, full arithmetic (*, /, +, –, OR, XOR, AND, MOD), many assembler commands for controlling object code generation, listing, printing etc., full line editor with advanced facilities like search/replace string, 'include' facility that lets you assemble from tape (or Microdrive) without taking up memory for your source text **AND** a superb disassembler/debugger with 'front panel' display of Z80 registers and flags with commands like search for string of bytes, copy memory, disassemble memory (to an assembler textfile, if you wish), list memory in ASCII, set multiple breakpoints, and, above all, single-step through machine code programs, one instruction at a time, **EVEN IN ROM!**
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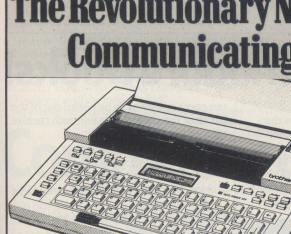

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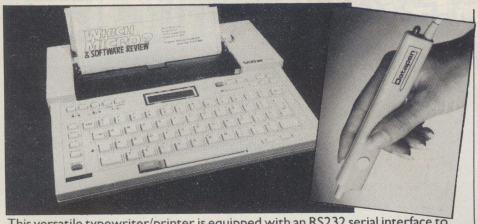

This versatile typewriter/printer is equipped with an RS232 serial interface to enable connection with computers using this standard, including the BBC Model B, Dragon 64, Sinclair Spectrum with Interface 1, and the QL. In conjunction with Brother distributor Thame Systems we are offering this £220 machine FREE. Just answer the questions below and send in the coupon — the first correct entry to be pulled out of the hat after our closing date of Monday 14th May will win the machine. Incidentally, those who are baffled by any of the questions should examine last month's issue.

2nd Prize — BBC Micro Lightpen

Don't worry if your entry is the *second* to be selected. You won't win the Brother, but you *will* win a BBC Micro Lightpen, from Datapen Technology Limited. These lightpens have a retail price of £25.

1. *How many operating modes does the EP44 have?*
2. *How much does it weigh?*
3. *What is the lowest speed for data transfer supported by the EP44's serial interface?*
4. *What is the EP44's maximum printing speed?*
5. *How many characters can be displayed on the LCD screen?*

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COUPON

Name .....

Address .....

.....

.....

The answers are:

1. .....
2. .....
3. .....
4. .....
5. .....

Competition Results

Sinclair QL — March 1984
Dr. Andrew Brown, John Radcliffe Hospital, Oxford.
The winning answers were:
1 Thorn EMI Datatech, Feltham.
2 Motorola 68008, Intel 8049
3 Nigel Searle
4 Science of Cambridge MK14
5 British Telecom 600 series jack

Speech Synthesizers — April 1984
R. Goli, Wolverhampton
P. C. Clift, Sharpness
D. Matless, Norwich
G. Pomery, Edinburgh
K. Wolstenholme, Manchester
The winning order of features was:
A C B D E

Lightpens — April 1984
S. R. Cook, Maastricht, BFPO 18
I. Good, Meriden
I. Meredith, Bridstow, Ross-on-Wye
W. T. Wilkes, Reepham
A. C. Povah, Stockport
The winning order of features was:
B A E C D

Free Commodore Books!

Ten copies of *The Elementary Commodore 64* from Softalk go to the winners of our easy-to-enter competition. Read our comparative review of the Commodore 64, Spectravideo SV318 and Memotech MTX500 starting on page 42. Then answer the following questions taken from the review. The senders of the first ten correct entries to be pulled out of the hat after the closing date will each receive a copy of the book.

COUPON

Name .....

Address .....

.....

.....

1. .....
2. .....
3. .....
4. .....

1. What is the list price of the Commodore cassette recorder?
2. How much does the Commodore 64's disk drive cost?
3. Can all of the Commodore 64's RAM be used for Basic programming?
4. What is the phone number of Commodore UK?

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Win five days gliding!

The popularity of flight simulation programs for home computers proves that there are a lot of would-be pilots among *Which Micro* readers. Unfortunately flying is an expensive pastime, and therefore the keyboard of a micro is as near as many people get to the controls of an aircraft.

But for the winner of the *Which Micro High Flyer* competition that dream will come true. In conjunction with Hewson Consultants, publisher of the *Nightflite II* and *Dragonfly II* flight simulators, we are offering a five-day residential gliding course at the Midland Gliding Club. All residential, flying and instruction fees will be covered.

For the runner-up the prize is a flight in a light aeroplane with Mike Male, the Hewson Consultants programmer who wrote *Nightflite II*.

The competition is simple. Answer the five multiple-choice questions below with the appropriate letters, and then complete the limerick. The winner, in the event of a tie, will be the author of the most witty and original (preferably printable) conclusion to the poem.

1. The first non-stop transatlantic flight in an aeroplane was carried out by:
a) Charles Lindbergh; b) Alcock and Brown; c) Amy Johnson.

2. An aeroplane is said to stall when:
a) The engine overheats because of insufficient cooling air at low speed;
b) The pilot 'blacks out' under excessive 'g' forces; c) The smooth airflow over the wings breaks down because the angle of attack is too high.

3. The last single-engine piston fighter to be flown in combat by British military forces was the:
a) Hawker Sea Fury; b) Supermarine Spitfire; c) Grumman F8F Bearcat.

4. Which of the following countries is **not** equipped with vertical take-off aeroplanes?:
a) Britain; b) USA; c) Spain; d) South Africa.

5. If a glider has a best lift/drag ratio of 40:1, approximately how far should it be able to glide from a height of 10,000 feet under ideal conditions?:
a) 75 miles; b) 400 miles; c) 250 miles.

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COUPON

Name .....

Address .....

.....

I think the right answers are:

1. .....
2. .....
3. .....
4. .....
5. .....

TIE-BREAKER

Make up the last three lines to complete this limerick:

A high flier once boldly declared
For the air I'm now fully prepared

.....

.....

.....

.....

Commodore 64 must be won!

The Commodore 64 is one of the world's best-selling micros. Together with Mr. Chip Software we are giving one away. Your task is to rank the seven Mr. Chip computer games in order of total sales. The seven titles are *Darts* for the Spectrum 48K, *Jackpot* for Commodore 64 and Vic 20, *Westminster* for the Commodore 64, *Pacmania* for the Vic with 3K expansion, *Kwazy Kwaks* for the Vic, and *Red Alert* for the Commodore 64. All retail for the same £5.50.
The first correct entry out of the hat after the closing date of Monday 14th May wins the computer.

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COUPON

I think the correct order is:

1. .....
2. .....
3. .....
4. .....
5. .....

Name .....

Address .....

.....

.....

OUR STOCKS ARE FALLING!

Back issues of *Which Micro? & Software Review* are in short supply but there are still some copies left of most issues:—

December 1982
Reviews: The Lynx, the Colour Genie and the Microwriter with the Newbrain from Grundy, plus Epson's MX80 printer. Features: Adventure games, telesoftware and a special 20 page Home Computer Buying supplement.

February 1983
Reviews: Oric 1 comparison with Spectrum, IBM Personal Computer, Fortune 32:16. Features: Prestel Under Attack, CP/M explained, 16 bits and Phil Manchester on User Friendly.

March 1983
Reviews: Commodore 64, Apple IIe, Lisa, the Zita and Epson's HX20. Features: How to sell games software, Printing on the cheap, Touch'n Go — learn to type with Caxton.

May 1983
Reviews: Oric comparison with Vic 20, ZX81 Add-ons, BBC business, IBM PC compatibles. Features: Micro Home, Computer Bluff, Playing chess on your home computer. FREE 1983 Home Software Directory.

June 1983
Reviews: Multitech MPF11, Texas CC40, Sage, home micro round-up including Atari 400, 800, BBC micro, Commodore 64, Commodore Vic 20, Lynx, Oric, Texas TI99/4A, Spectrum and ZX81. Features: The Musician and the Micro, Robots, Micronet, Forth and of course a full Software Review.

July 1983
Reviews: Olivetti M20, Sord M5, Joysticks and the 16-bit Globe. Features: NCC Report, Apple II lookalikes, computerising your business, playing the game, more memory and Software Review.

August 1983
Reviews: Mattel's Aquarius, Comx 35, Tandy TRS-80 Model 100 and Osborne's Executive. Features: Software bootlegging, Software versus hardware, Acorn Angle, Dragon Tales, Commodore and Atari columns as well as the usual full section of program listings.

January 1984
Reviews: Memotech in reality, with comparison to BBC, Acorn Angle, make a cheap printer with a Brother EP22. Features: Dragon 64, viable software writing, copying 'protected' programs, Death of the cassette, plus lots more.

February 1984
Reviews: Spectrum additions, Atari disk drive plus, IBM PC junior. Features: writing games well, ZX84 information, Oric in print, education's soft touch, and a race with the BBC Micro.

March 1984
Reviews: Sinclair QL, Spectravideo Compumate, budget printers. Features: micros in education, computer clubs, Spectrum languages, and Atari's programming ace Justin Whittaker on converting software from one computer to another.

April 1984
Reviews: Brother EP44, Atmos, NEC PC8021A. Features: war and strategy games, peripherals, using the Spectrum sketchpad, how to make music with your micro.

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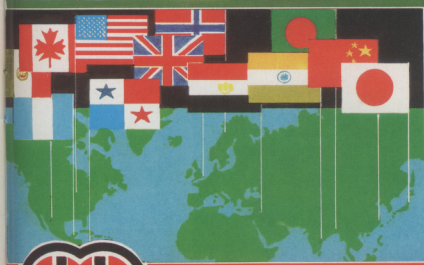

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Recently Which Micro? and What Micro? tested the Spectravideo SV 318. Here's what they had to say:

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"Double precision numbers... are ideal for companies with turnovers under £999,999,999,999.99."

Spectravideo SV 318: Memory – 32K ROM expandable to 96K, 32K RAM expandable to 144K: **Keyboard** – calculator type, 71 keys, 10 function keys, built in joystick/cursor control: **Graphics** – 16 colours, 256 x 192 high resolution graphics, 32 sprites: **Sound** – 3 channels, 8 octaves per channel: **CP/M* compatibility** – over 3000 existing software packages: **Storage** – cassette drive, 256K disc drive capacity: **Suggested retail price** – £186.

Spectravideo SV 328: Memory – 32K ROM expandable to 96K, 80K RAM expandable to 144K: **Keyboard** – full word processor type, 87 keys, 10 function keys, built in cursor control: **Graphics** – 16 colours, 256 x 192 high resolution graphics, 32 sprites: **Sound** – 3 channels, 8 octaves per channel: **CP/M* compatibility** – over 3000 existing software packages: **Storage** – cassette drive, 256K disc drive capacity: **Suggested retail price** – £262.

A full range of peripherals are also available.

** Which Micro Hardware Revue – Spectravideo SV 318.

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agon, Commodore 64
x for dead."

Which Micro? Dec 83. **



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DRAGON 32/64

TANK ATTACK

From Paul Garner in Birmingham comes this two-player arcade type game for the Dragon 32 with joystick control. The program uses a high-speed POKE statement in line 10. Some Dragons crash when this statement is used — if yours is one of these, simply delete the statement.

Each player uses a joystick to control a tank with the intention of hitting the opponent's tank with his shots. The program prompts the players for the number of rounds the game is to last, the winner being the player with the highest number of hits.

Joystick movement is relative to the direction in which your tank is pointing — to go forwards, push the stick away from you, to move backwards pull back, and use left and right movements to rotate on to different headings.

Tank Attack has not been tested on the Dragon 64 but there are no likely trouble spots.

```
TANK ATTACK by P.J.GARNER

10 POKE&HFFD7,0:GOTO1430
20 '***start of main loop***checks for b
lue tank movement***
30 BX=BJ:BY=BK:BH=JOYSTK(0):BU=JOYSTK(1)
:ONBF GOSUB280,350,420,490
40 '***checks for firing***
50 IFBC=1 THENGOTO60 ELSE CF=BF
60 IF RC=1 THENGOTO70 ELSE SF=RF
70 FB=PEEK(65280):IF FB=126 OR FB=254 TH
EN BC=1
80 IFFB=125 ORFB=253 THEN RC=1
90 IFFB=124 ORFB=252 THEN BC=1
100 IFFB=124 OR FB=252 THEN RC=1
110 IFRC=1 THEN ON SF GOSUB850,900,1020,
1080
120 IFKB+KR=NB THEN GOTO1880
130 IF BC=1 THEN ON CF GOSUB560,670,730,
790
140 IFKB+KR=NB THEN GOTO1880
150 '***cheska for red tank movement***
160 RX=RJ:RY=RK:RH=JOYSTK(2):RU=JOYSTK(3
):ONRF GOSUB1150,1220,1290,1360
170 '***checks for firing***
180 IFRC=1 THENGOTO190 ELSESF=RF
190 IFBC=1 THENGOTO200 ELSECF=BF
200 FB=PEEK(65280):IF FB=126 OR FB=254 T
HEN BC=1
210 IFFB=125 OR FB=253 THEN RC=1 ▶
```

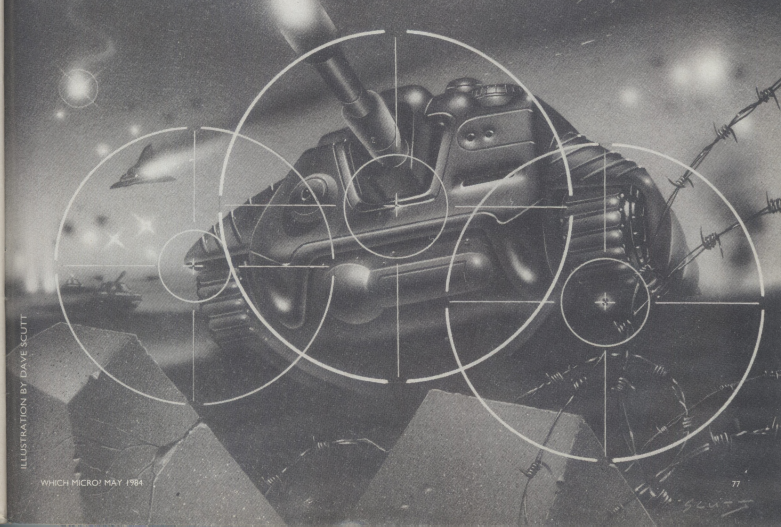

ILLUSTRATION BY DAVE SCUTT

TANK ATTACK

```
220 IFFB=124 OR FB=252 THEN BC=1:RC=1
230 IF BC=1 THEN ON CF GOSUB850,670,730,
790
240 IFKR+KB=NB THEN GOTO 1080
250 IFRC=1 THEN ON SF GOSUB850,960,1020,
1080
260 IFKR+KB=NB THEN GOTO 1080 ELSE GOTO3
0
270 '***end of main loop***blue movement
 routine***
280 IFBU=0THENBK=BY-4
290 IFBU=63THENBK=BY+4
300 IFBK() OR BK)184 THEN BK=BY
310 IFBH=0THENGOTO 540
320 IFBH=63THENGOTO 400
330 BF=1:IFBK=BY AND BJ=BX THENGOTO340 E
LSE PUT(BX,BY)-(BX+8,BY+8),B
340 PUT(BJ,BK)-(BJ+8,BK+8),BU,PSET:RETUR
N
350 IFBU=0THENBJ=BX+4
360 IFBU=63THENBJ=BX-4
370 IFBJ>248 OR BJ<1 THEN BJ=BX
380 IFBH=0 THENGOTO 330
390 IFBH=63THENGOTO 470
400 BF=2:IFBJ=BX AND BK=BY THENGOTO410 E
LSE PUT(BX,BY)-(BX+8,BY+8),B
410 PUT(BJ,BK)-(BJ+8,BK+8),BR,PSET:RETUR
N
420 IFBU=0THENBK=BY+4
430 IFBU=63THENBK=BY-4
440 IFBK() OR BK)184 THEN BK=BY
450 IFBH=0THENGOTO 400
460 IFBH=63THENGOTO 540
470 BF=3:IFBK=BY ANDBJ=BX THENGOTO480 EL
SE PUT(BX,BY)-(BX+8,BY+8),B
480 PUT(BJ,BK)-(BJ+8,BK+8),BD,PSET:RETUR
N
490 IFBU=0THENBJ=BX-4
500 IFBU=63THENBJ=BX+4
510 IFBJ<1 OR BJ>248 THEN BJ=BX
520 IFBH=0THENGOTO 470
530 IFBH=63THENGOTO 330
540 BF=4:IFBJ=BX AND BK=BY THENGOTO550 E
LSE PUT(BX,BY)-(BX+8,BY+8),B
550 PUT(BJ,BK)-(BJ+8,BK+8),BL,PSET:RETUR
N
560 '***btue fire routine***
570 IFJP=1 THENGOTO590
580 BN=BX+4:BM=BY:SOUND1,1
590 PRESET(BN,BM):BN=BN-6:IF BN<1 THENGO
TO630
600 IFPPOINT(BN,BM)=4THENGOTO640
610 IF PPOINT(BN,BM)=2 THENGOTO630
620 PSET(BN,BM,2):IP=1:RETURN
630 IP=0:BC=0:RETURN
640 IP=0:BC=0:PUT(RJ,RK)-(RJ+8,RK+8),B
650 FORP=1TO3:PLAY"T255;O1;V31;L15;L255
;B;V15;L10;B-;L255;B-;V2;L100;A;L255;A";:
NEXTP
660 KR=KR+1:GOSUB1850:RETURN
670 IFJP=1 THENGOTO690
680 BN=BX+8:BM=BY+4:SOUND1,1
690 PRESET(BN,BM):BN=BN+6:IF BN>255 THEN
GOTO630
700 IFPPOINT(BN,BM)=4 THENGOTO640
710 IF PPOINT(BN,BM)=2 THENGOTO630
720 PSET(BN,BM,2):IP=1:RETURN
730 IFJP=1 THEN GOTO750
740 BN=BX+4:BM=BY+8:SOUND1,1
750 PRESET(BN,BM):BM=BM+6:IF BM>191 THEN
GOTO630
760 IFPPOINT(BN,BM)=2 THENGOTO630
770 IFPPOINT(BN,BM)=4 THENGOTO640
780 PSET(BN,BM,2):IP=1:RETURN
790 IFJP=1 THENGOTO810
800 BN=BX:BM=BY+4:SOUND1,1
810 PRESET(BN,BM):BN=BN-6:IF BN<1 THENGO
TO630
820 IFPPOINT(BN,BM)=2 THENGOTO630
830 IFPPOINT(BN,BM)=4 THENGOTO640
840 PSET(BN,BM,2):IP=1:RETURN
850 '***red fire routine***
860 IFOP=1THENGOTO880
870 RN=RX+4:RM=RY+4:SOUND100,1
880 PRESET(RN,RM):RM=RM-6:IF RM<1 THENGO
TO920
890 IFPPOINT(RN,RM)=3 THENGOTO930
900 IFPPOINT(RN,RM)=2 THENGOTO920
910 PSET(RN,RM,2):OP=1:RETURN
920 OP=0:RC=0:RETURN
930 OP=0:RC=0:PUT(BJ,BK)-(BJ+8,BK+8),B
940 FORL=1TO3:PLAY"T255;O1;V31;L1;B;L255
;B;V15;L10;B-;L255;B-;V2;L100;A;L255;A":
NEXTL
950 KB=KB+1:GOSUB1860:RETURN
960 IFOP=1 THENGOTO980
970 RN=RX+8:RM=RY+4:SOUND100,1
980 PRESET(RN,RM):RN=RN+6:IF RN>255 THEN
GOTO920
990 IFPPOINT(RN,RM)=3 THENGOTO930
1000 IF PPOINT(RN,RM)=2 THENGOTO920
1010 PSET(RN,RM,2):OP=1:RETURN
1020 IFOP=1 THENGOTO1040
1030 RN=RX+4:RM=RY+8:SOUND100,1
1040 PRESET(RN,RM):RM=RM+6:IF RM>191 THE
NGOTO920
1050 IF PPOINT(RN,RM)=2 THENGOTO920
1060 IFPPOINT(RN,RM)=3 THENGOTO930
1070 PSET(RN,RM,2):OP=1:RETURN
1080 IFOP=1 THEN GOTO1100
1090 RN=RX:RM=RY+4:SOUND100,1
1100 PRESET(RN,RM):RN=RN-6:IF RN<1 THENG
OTO920
1110 IFPPOINT(RN,RM)=2 THENGOTO920
1120 IFPPOINT(RN,RM)=3 THENGOTO930
1130 PSET(RN,RM,2):OP=1:RETURN
1140 '***red movement routine***
1150 IFRU=0THENRK=RK-4
1160 IFRU=63THENRK=RK+4
1170 IFRK<1 OR RK>184 THENRK=RY
1180 IFRH=0THENGOTO 1410
1190 IFRH=63THENGOTO 1270
1200 RF=1:IFRK=RY AND RJ=RX  THENGOTO121
0 ELSE PUT(RX,RY)-(RX+8,RY+8),B
1210 PUT(RJ,RK)-(RJ+8,RK+8),RU,PSET:RETU
RN
1220 IFRU=0THENRJ=RX+4
1230 IFRU=63THENRJ=RX-4
1240 IFRJ<1 OR RJ>248 THEN RJ=RX
1250 IFRH=0THENGOTO 1200
1260 IFRH=63THENGOTO 1340
1270 RF=2:IFRJ=RX AND RK=RY THENGOTO1280
 ELSE PUT(RX,RY)-(RX+8,RY+8),B
1280 PUT(RJ,RK)-(RJ+8,RK+8),RR,PSET:RETU
RN
1290 IFRU=0THENRK=RY+4
1300 IFRU=63THENRK=RY-4
1310 IFRK<1 OR RK>184 THEN RK=RY
1320 IFRH=0THENGOTO 1220
1330 IFRH=63THENGOTO 1410
1340 RF=3:IFRK=RY AND RJ=RX THENGOTO1350
 ELSE PUT(RX,RY)-(RX+8,RY+8),B
1350 PUT(RJ,RK)-(RJ+8,RK+8),RD,PSET:RETU
RN
```

```
1360 JFRU=0THENRJ=RX-4
1370 JFRU=63THENRJ=RX+4
1380 IFRJ<1 OR RJ>248 THEN RJ=RX
1390 IFRH=0THENGOTO 1340
1400 IFRH=63THENGOTO 1200
1410 RF=4:IFRJ=RX AND RK=RY THENGOTO1420
 ELSE PUT(RX,RY)-(RX+8,RY+8),B
1420 PUT(RJ,RK)-(RJ+8,RK+8),RL,PSET:RETU
RN
1430 IFFL=1GOTO1480
1440 '***sets up dims***
1450 DIMA(8,8),B(2),RU(2),RR(2),RD(2),RL
(2),BU(2),BR(2),BD(2),BL(2)
1460 FORC=0TO8:FORD=0TO8:READA(C,D):NEXT
D,C
1470 '***starts title page***
1480 CLS0:F=1030:FORG=0TO8:FORH=0TO8:POK
EF,A(G,H):F=F+1:IFF=1118THENF=1123
1490 IFF=1149THENF=1155
1500 NEXTH,G
1510 FORH=1058TO1085:POKEH,156:NEXTH:FOR
I=1057TO1313STEP32:POKEI,140:NEXTI
1520 FORJ=1066TO1342STEP32:POKEJ,154:NEX
TJ:FORK=1314TO1341:POKEK,142:NEXTK
1530 FORL=1378TO1405:POKEL,106:NEXTL:FOR
M=1506TO1533:POKEM,108:NEXTM
1540 PRINT@201,"(C) P.J.GARNER", PRINT@2
50,"WITH HELP FROM P.THOMAS. ";PRINT@419
,"THIS IS A GAME OF TANK WAR";
1550 IFBB=1 THENGOTO1910
1560 PLAY"U1SOA1L40O0AP3GL1A";:FORTD=1T
O1000:NEXTD
1570 '***draws red tanks***
1580 IFFL=1GOTO1740 ELSE PMODE1,1:PCLS
1590 DRAW"BM120,20;UBD2R4U2D2R4U2D8U2L8U2
R8"
1600 DRAW"BM40,12;R8L2D4R2L2D4R2L8R2U8R2
D8"
1610 DRAW"BM60,12;DBU2R4D2U2R4D2U8D2L8D2
R8"
1620 DRAW"BM88,12;LBR2D4L2R2D4L2R8L2U8L2
D8"
1630 '***draws blue tanks***
1640 COLOR3:DRAW"BM120,40;UBD2R4U2D2R4U2D
8U2L8U2R8"
1650 DRAW"BM40,32;R8L2D4R2L2D4R2L8R2U8R2
D8"
1660 DRAW"BM60,32;DBU2R4D2U2R4D2U8D2L8D2
R8"
1670 DRAW"BM88,32;LBR2D4L2R2D4L2R8L2U8L2
D8"
1680 '***places tanks in dims***
1690 GET(20,12)-(28,20),RU,G:GET(20,32)-
(28,40),BU,G
1700 GET(42,12)-(48,20),RR,G:GET(40,32)-
(48,40),BR,G
1710 GET(60,12)-(68,20),RD,G:GET(60,32)-
(68,40),BD,G
1720 GET(80,12)-(88,20),RL,G:GET(80,32)-
(88,40),BL,G:GET(50,70)-(58,78),B
1730 '***finishes title page***
1740 GOSUB1800:PLAY1:PRINT@386,"EACH WAR
 IS DECIDED OVER A ";
1750 PRINT@418,"NUMBER OF BATTLES.HOW M
ANY "; PRINT@450,"BATTLES WOULD YOU LI
KE ? ";: SOUND1,1
1760 NB=VAL(INKEY$):IFNB=0GOTO1760
1770 '***puts in screen***
1780 SCREEN1,0:PLAY"U15L15CDEFGAB"
1790 GOSUB1850:GOSUB1860:GOTO30
1800 '***draws screen***
1810 PMODE1,1:COLOR2,1:PCLS:FORA=1TO20
1820 B=RND(190)+18:C=RND(120):D=RND(20)+
6:E=RND(18)+4
1830 LINE(B,C)-(B+D,C+E),PSET,BF:NEXTA:R
ETURN
1840 '***places tanks in starting posit
ons***
1850 IFKR+KB=NB THENRETURN ELSE RY=RND(1
82):PUT(3,RY)-(13,RY+8),RR,PSET:RX=3:RJ=
RX:RK=RY:RF=2:RETURN
1860 IFKR+KB=NB THENRETURN ELSE BY=RND(1
82):PUT(243,BY)-(251,BY+8),BL,PSET:BX=24
3:BK=BY:BJ=BX:BF=4:RETURN
1870 '***score routine***
1880 IF KR=NB THEN PRINT@ 387,"THIS WAR
IS A DRAW.WAS UC ; ELSEBB=1:GOTO 190
1890 PRINT@419, "IT END IN DRAWS. YOU M
ST ";PRINT@452," FIGHT ANOTHER BATTLE
";
1900 FORB=1TO1500:NEXTO:NB=NB+1:GOSUB180
0:GOSUB1850:GOSUB1860:SCREEN1,0:GOTO30
1910 IFKR>KB '''GOTO1930 ELSE PRINT@418
, "RED WINS BY BATTLES TO ";:PRINT@430
,KB;:PRINT@448,"
1920 GOTO1940
1930 PRINT@418, "BLUE WON BY BATTLES T
O ";:PRINT@430,KB;:PRINT@448,"
1940 BB=1:OP=0:IFKR>KB-0.KB=0:FORK=1TO15
00:NEXTK:GOTO 1860
1950 '***data for title page***
1960 DATA164,123,172,161,172,162,121,128
,130,130,166,128,166,163,164,173,172,164
,175,172,161,172,162,166,172,168,161,166
1970 DATA161,128,181,186,196,196,185,196,
190,178,128,190,189,128,181,128,128,181
,128,181,188,196,186,128,181,185
1980 DATA180,128,182,128,184,184,128,184
,184,180,128,184,180,128,182,128,128,182
,128,180,129,184,180,188,180,128,184
```

TANK ATTACK VARIABLES

BX,BY = BLUE X,Y CO-ORDS BEFORE MOVE
RX,RY = RED X,Y CO-ORDS BEFORE MOVE
BJ,BK = BLUE X,Y CO-ORDS AFTER MOVE
RJ,RK = RED X,Y CO-ORDS AFTER MOVE
SF = DIRECTION OF RED SHOT
FF = DIRECTION OF BLUE SHOT
BF = BLUE TANK FACING
RF = RED TANK FACING
BH,BU,RH,RU = JOYSTICK READINGS
FB = FIRE BUTTON READINGS
BR,BM = X,Y CO-ORDS OF BLUE SHOTS
RR,RM = X,Y CO-ORDS OF RED SHOTS
KB = NUMBER OF BLUE TANKS DESTROYED
KR = NUMBER OF RED TANKS KILLED
NB = NUMBER OF BATTLES
RD,RL,RU,RR = DIM ARRAYS FOR RED TANK
BD,BL,BU,BR = DIM ARRAYS FOR BLUE TANK
B = BLANK ARRAY TO RUB OUT

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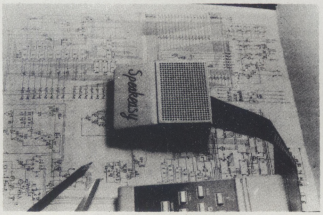

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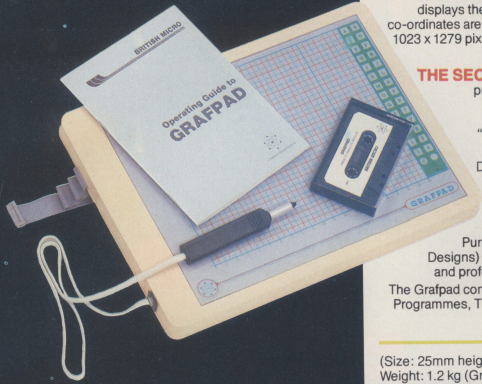

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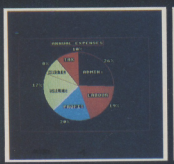

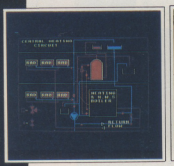

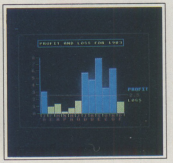

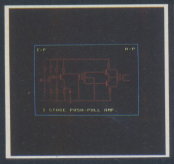

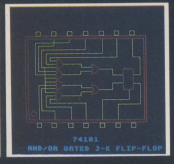

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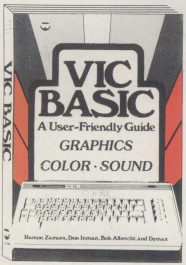

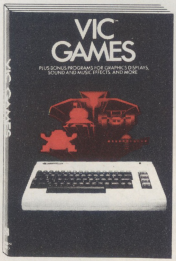

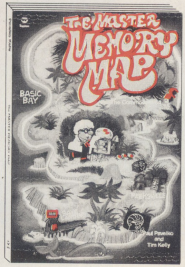

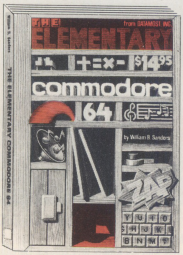

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ACORNS IN THE PARK

The last couple of years have seen the introduction of microcomputers into thousands of UK secondary schools. Ken Young investigates how a London comprehensive has set up and is using a large BBC Micro network

You don't have to be a mathematical wizard to understand how computers are being used in schools — but it helps: one computer available all day every day to a school of 1000 students would need to be in use for 32 weeks before all students had just one hours 'hands on' use. It's not surprising, then, that secondary schools are investing heavily in computer networks. We went to Holland Park School in west London to see what life with a network really means.

As Britain's first comprehensive, Holland Park is no newcomer to innovation. The use of computers in the school is an issue it has recently tackled — with implications for the whole school. As of this academic year, a 16-station BBC Econet system has been installed and a dedicated computer classroom created.

For a 1700-place secondary school it's an impressive investment. The BBC machines are connected together in a horseshoe style layout to a centrally placed System Five fileserver. An Acorn Atom runs a printer server program and is connected to an Epsom FX80 printer, giving high quality dot matrix printout for graphics and text.

As well as being able to access a range of software centrally from the fileserver's twin 5 inch drives, each station has also been fitted with *View*, the Acornsoft ROM-based word processing system.

Econets don't come cheap. The school has had to dig deep for the £15,000 required to buy the hardware, install purpose-built tables and two 13 amp ring wiring systems.

Dave Watkins is the teacher in charge of computer education and is responsible for the day to day management of the unit. Dave sees the role of the unit as one of "teaching a human skill as opposed to a particular aspect of computing or programming in a particular language".

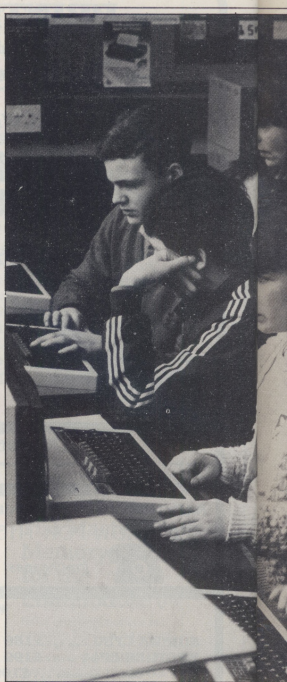
Rather than being part of a maths or science department, as is often the case, the unit is a wing of the Pastoral and Learning Support Services — a special faculty in the school. Consequently the aim of the unit is to introduce computers to as many students as possible and to make the facility available to teachers throughout the school.

Timetable

With such a wide brief, how do they solve the problem of Econet overload? Dave explained: "Half the time is spent with the room timetabled for computers in education classes. The other half is open for computer clubs and other teachers to book for special use." The computers in education classes are for all students up to the fourth year and consist of six 50 minute lessons for each class. The aim is not to baffle the students with binary digits or puzzle them with programming, but to help them develop necessary keyboard skills and gain an overall understanding of how computers can be used. Dave explained how the lessons are structured.

Lesson one — this session familiarises a class with the computer keyboard and, using software written by the school, illustrates how personal information can be fed into a computer and stored for later use. Students type in their sex, name and address and watch the information being stored by the fileserver on completion. Then the *Keyboard* program from the BBC 'welcome pack' is put through its paces. Finally a typing tutor program is run to brush up the Qwerty style a little more.

Lesson Two shows how the computer can be used to work on numbers and then present the results graphically. To begin with, the Holland Park calculator is displayed and students invited to make various calculations via the keyboard. Most find it sobering that the computer has such a down-to-earth use. The second part of the lesson is taken less lightly. All students are weighed and the details fed into a program that displays the results in various graphical ways, including pie charts line graphs and bar charts.



Lesson three — all hands on joysticks for this lesson as each machine is kitted out for a scaled-down version of computer aided design using Beebug's *Artist* preogram. It's a popular session — budding artists can draw pictures in eight colours using lines, triangles, rectangles and other such preprogrammed functions. Completed masterpieces can be sent to the Epson printer and hung appropriately when dry.

Lesson four is titled 'How to produce perfect homework and amaze your teachers'. It shows a class how to convert a micro into a word processor by utilizing the *View* chip resident in each machine. Over a 20 minute period, the essentials of using *View* are taught, concentrating on the features of wraparound, replace, delete and insert. After the world's quickest



needed to steer the country toward economic prosperity.

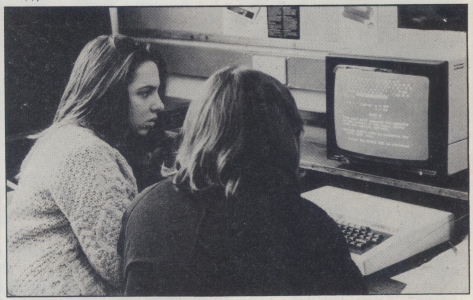
Students are presented with information about the current state of inflation, unemployment, the exchange rate, and other 'major indicators,' and they then set levels of taxation and benefit payments. Although most students have rather short-lived political careers, it is proving to be an enjoyable way of seeing how modelling works. It also shows why the Government consult a computer for predictions on the effects of policy.

Lesson Six stresses the use of links to larger computers to access wider ranges of information. Students are shown how to connect to Prestel and Teletext and given examples of viewdata frame creation. The shool is fortunate in that it is capable of downloading software from both Micronet 800 and the telesoftware pages on Ceefax.

The course is not geared to a standardized syllabus or exam schedule. Students wanting to take CSE, 'O' or 'A' level computing do so within another faculty of the school. But Dave Watkins sees exams like CSE computing as "confronting students with irrelevant information with no real application to their lives." He compares introducing computers to introducing television to a non-TV culture: "We would teach them how to become experienced TV users — not all about the cathode ray tube; similarly I say 'no' to binary numbers and programming in Basic, but instead teach the use of the machine."

The real acid test of a computer network in a school has to be how well it's used by other teachers and how well integrated it is into the school as a whole. At present the main task seems to be one of teaching the teachers how to use the system and to be aware of the software available. To this end, one afternoon a week is put aside, and a rotating system of assigning teachers from the various faculties is taking place.

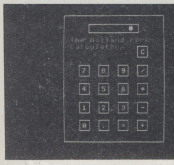
Left and below: Pupils using the BBC Econet system. The screen pics are of (l) the Holland Park calculator and (r) part of lesson one.

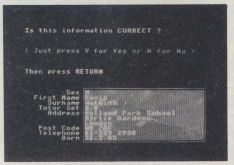


Computer-based English, Geography & French

In the mean time, some subject work is already going on: an English teacher is teaching a group to construct a magazine using the unit's word processing software. They spend half the time discussing the magazine content and the other half typing it into the computer.

Geography is another area of experimentation. Classes are shown the *Kingdom* program — a freebie from the Welcome pack — to see how economic factors can be affected by geographic locality. The student, as leader of a small tribe, decides how much food to grow and how much protection to take against imminent floods to ensure survival.





crash course in word processing, the class does some homework in the 'old fashioned way' writing it out, changing amending and re-writing it as much as necessary.

Lesson Five — a major application of computers is that of modelling, and particularly financial modelling. This lesson gives the class an impression of such an application by letting the students run the country for themselves — well almost. The program in question is Simon Hessel's *Great Britain Ltd.* in which the user takes the role of Prime Minister and makes the decisions

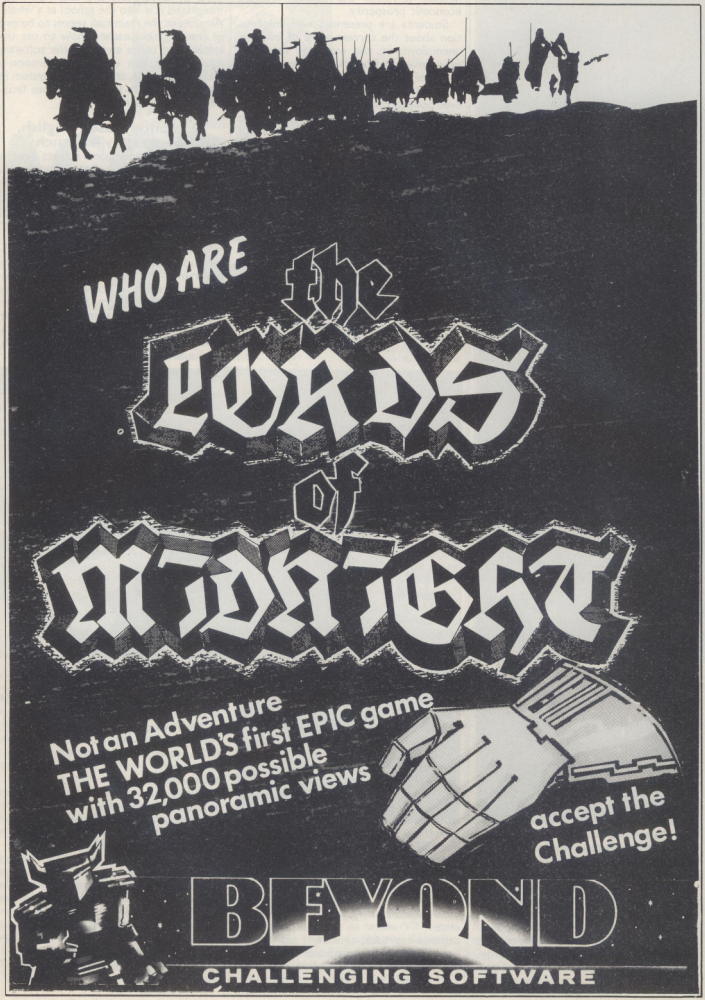
Please Sir, what's a Space Invader?

To play or not to play, that is the question when it comes to the use of invader-type games in schools. At Holland Park they have tackled the problem by setting up lunchtime computer clubs and a once-weekly 'vidiots club' for the real arcade addicts.

During club sessions, students have free access to 16 programs on the network by simply typing *I AM READY or *I AM NEW which automatically leads to a menu of action, board and adventure games.

The school is aware that girls are slipping behind boys in the race to get computer literate and is doing its best to redress the balance. A girls-only club has been formed and is well attended. It can only be hoped that software houses will take note of such trends and start producing less male orientated software. ■

*Ken young is in charge of Micronet 800's Education area. *8007.*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Soft Release Special

Tale of a M.U.L.E.

An innovative game has just emerged from the States. Ron Stewart reports.

Atari owners are in for a treat. A new US software house, Electronic Arts, has just released a batch of new games including *M.U.L.E.* which represents, to say the least, a new direction for home entertainment software. So different, in fact, that we thought it warranted a little more attention than we normally pay in our Soft Release section.

M.U.L.E. represents the type of software that computers were meant for. Not a gun or missile to be seen anywhere, it is highly entertaining, educational and most of all fun with a capital F. *M.U.L.E.* is a game of exploration and resource development on another planet. It involves four players, all of whom can be human, or you can play it yourself against three computer players. There are three versions included, each one adding more to the game system.

In case you were trying to work it out for yourself, *M.U.L.E.* stands for Multiple Use Labour Element and you will use your *M.U.L.E.*s to produce three commodities on the planet where you have been left. The commodities are food, energy and smithore.

At the start of the game the players choose which characters they will play. There is a choice of eight, and these range from a Flapper to a human. Each has different characteristics; the Flapper is a beginner's species giving you more money and time, while the human is for expert players. Handicapping like this can make for a really tight game.

On the screen is a map of part of the planet Irata, the planet you will be trying to colonise. The map is divided up into a number of plots. Each plot will be capable of producing the three commodities but some will do it better than others. For instance, the river valley is good for producing food and the number of food units produced will be greater than if you tried to farm in the flatlands or mountains. Energy is best produced on the flatlands and smithore in the mountains. The amount of smithore produced will also depend on the number of mountains within the plot selected.

Each round of play in *M.U.L.E.* has a number of phases, the first of which is the land grant phase. This phase occurs every turn and plots of land are selected by pushing the joystick trigger button while the computer highlights each plot. This often means that you can't get the plot you desparately need because another player has pressed his trigger button first.

The second phase is outfitting and installing your *M.U.L.E.* In the middle of the map is a town containing a store where the *M.U.L.E.*s are coralled, outfitting stores where *M.U.L.E.*s are equipped for producing one of the three commodities, and a pub. When you have decided what you want to produce, you guide your player character into the corral and pick up a *M.U.L.E.*, outfit it and install it on your plot of land.

Once the *M.U.L.E.* is installed a symbol indicating the commodity produced is displayed. If you have any time left after that you can spend it gambling in the pub or go Wampus hunting in the mountains. Each will get you more money — the Wampus will pay you to let him go if you manage to capture him. But be warned; Wampii are difficult animals to catch.

When all the players have played their turn the computer will display in each plot of land the amount of units produced.

The third phase, the auction, now begins. The computer will go through each commodity in turn. At the bottom of the auction screen each character is displayed along with the amount of money he has and the number of units he has to sell. These are also depicted on a bar graph above the character's head. The store will also buy production units from you so there are two store symbols, one with the store buying price alongside and the other at the top of the screen with the selling price.

You must now declare yourself as a buyer or a seller by moving your player character to the top or the bottom of the screen. When the auction starts you move your character up and down the screen, the price at which you are prepared to buy or sell produce changes as you go. Each auction is timed, so you will have to be quick if you want to sell at a top price. This ends the three turn phases and after a status report the next turn begins.

All this may seem to you to be just another *Monopoly* variant but the subtleties incorporated with the *M.U.L.E.* are numerous. Each player must have food and energy to operate. This means that if you have cornered the market in energy then it will sell at a high price. You will, however, be forced to buy in energy from another player and his price might be high because you have stung him for food. The store also needs energy and smithore to produce more *M.U.L.E.*s and players may prefer to sell there rather than to you.

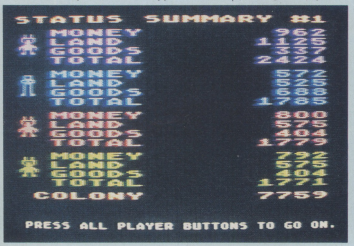
The educational aspects of the game also make it unusual. For a start it will teach the economics of supply and demand, as prices will rise when demand is high and supply is small, and fall when demand is low and supply is plentiful.

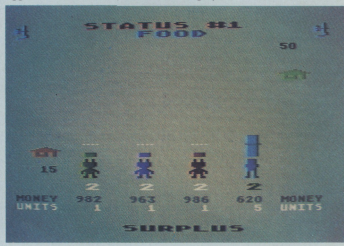
M.U.L.E. also teaches the economy of scale. This states that the bigger you are the better you get. If you double the size of your operation then you will double your effectiveness, taking into account mass production and volume buying.

M.U.L.E. is certainly addictive. It not only demands that players are competitive enough to increase their holdings, but also a certain amount of co-operation between players. If the colony on Irata is not worth enough at the end of the game then all players are deemed to have lost.

Most of all *M.U.L.E.* is a fun game. Played with four humans it becomes a battle — friendships could be a little frayed by the end of an evening's game. The game is certainly original, and only goes to show that Atari's decision to lop the two joystick ports off the XL models was short sighted.

So, Atari owners, this one's definitely recommended. *M.U.L.E.* can be obtained in the UK from the Atari Centre, Broad Street, Birmingham. ■





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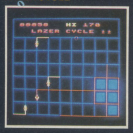



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STUDYING THES

We sent Mike Gerrard down to Brighton to ask Sa

Our interview with Salamander Software was interrupted by the arrival of the chief programmer who proceeded to leap across the furniture and then chase a rolled-up ball of paper round the floor. Eccentric behaviour, even for a programmer. Well, they *said* he was their chief programmer — they being the seven people now behind Salamander, all, incidentally, graduates of Sussex University.

Paul Kuczora, the marketing manager, and Jul Carson, who looks after the art department, had the original idea for Salamander and asked a friend, Pete (The Hat) Nale, a systems programmer, to join them.

Pete is known as The Hat not just because of his distinctive headgear, which enables him to be spotted at shows from a distance of six stands, but also to distinguish him from Pete Ohlsen, who joined Salamander later as its software projects manager. However, they emphasise that their titles have come to mean less and less, with everyone tending to be involved with all aspects of running the business.

The other people behind the venture are Lucy Parker who works with Jul in the art department, Chris Holland who deals mostly with sales, and Tina Kuczora who looks after circulation. Tina is Paul's sister and the only member of the group not to have studied at the university of Sussex.

"We started Salamander the summer before last. At first it was meant to be a part-time thing, evenings and weekends, but after a month Pete left his job, then I did the same a month or so later, and Chris joined us in January."

Although they are now bringing out software for several machines, the company started with just four Dragon titles, simply because Pete Nale had recently bought a Dragon 32.

"I like the Dragon very much," he said. "The graphics and display are good, though the sound is a problem. But the 6809 is a wonderful chip to work with, particularly for machine code. Originally we brought out one games compendium, a 3-D Noughts and Crosses, and two titles which are still selling well, *Wizard's War* and *Dragon Trek*. We've just converted *Wizard's War* for the Commodore 64, but *Dragon Trek* was the best seller of the four. I'd played the original mainframe *Star Trek* on several machines and wrote our Dragon version in 10 days — though later it took me two and a half months to convert it for the Oric."

The company soon added a couple of BBC machines to Pete's lone Dragon, and is now also going into the Commodore 64, Electron and Oric. Some Spectrum software is being marketed for Salamander by Quicksilva; this is mainly Spectrum conversions of several Jeff Minter titles which Salamander has already started putting out on the Dragon.

> **Although they are now bringing out software for several machines the company started with just four Dragon titles**

"We made the connection with Jeff Minter through a friend of his who used to help us at shows," Pete Ohlsen explained. "He said he knew this amazing programmer who we ought to meet, but we didn't know then that he was the man behind Llamasoft, as his name wasn't as well-known then as it is now. Jeff is an excellent games programmer and he's also a very good bloke to work with. Even now we only have a kind of gentleman's agreement with him, but it works. We've already done *Gridrunner* and *Laser Zone* for the Dragon. We thought *Gridrunner* lost a little in conversion, but we think *Laser Zone* is one of the best conversions we've done of one of Jeff's games, which are dificult to do. The two-player game is excellent, and it's even possible to have a three-player game. Those two and *Traxx* are also out for the Spectrum, with *Matrix* due around March. We're also doing *Hover Bovver* for the BBC, but we've had a problem finding a good enough BBC machine code programmer who can cope with the speed of Jeff's games. We're also busily converting *Metagalactic Llamas* for almost every machine you can think of."

We asked Pete Ohlsen about Salamander's freelance programmers and the work sent in to them on spec. "We do have several people working for us on a freelance basis. If someone sends us something that we think is very good, then we'll probably sign them up and talk to them about future projects. We're still happy to see programs that people have written, because although a lot of what comes in is pretty mediocre stuff, just occasionally you'll find a winner. But we are now rejecting material that we might have accepted several months ago, because our standards are going up.

"There seems to be a dividing line of some kind at about the age of 15 or 16. We get a lot of material from kids under



E SALAMANDER

ask Salamander Software about its future plans

that age who are very good at writing another *Pac-Man* or whatever, but not so good at coming up with the original ideas. And that's what we really want. Most of our programmers aren't in that whizz-kid age group, though we do have one who's about 16 and another of 17.

We are now rejecting material that we might have accepted several months ago as our standards are going up

"Mind you, having said all that, we are putting out an excellent 3-D version of *Pac-Man* as one of our eight Dragon titles in March. It'll probably be called *Red Meanies*. We've spent ages sitting round trying to come up with a good title for it — good titles are very hard to find."

Red Meanies came into Salamander as just another of the many submissions it receives every week. Pete found it in a batch of four he was having a quick look at before going home. It surprised him by being very good and very fast, taking the player down to the level of the famous maze through which you have to find your way, collecting the usual dots and power pills while watching out for the ghosts which will suddenly pop up in those 3-D corridors. A few minor changes are being made in the introductory music and high-score table.

Having seen an early version of the game, we can confirm that it is one for Dragon owners to watch out for. The high standards of *Pac-Man* and the other prototypes we were shown are a clear indication that Salamander's output is indeed increasing in quality. A smooth-moving and entertaining graphics game for the BBC called *Eagle* was also impressive, as was a lengthy racing game for the Oric which allows the player to train and bet on horses over a season. However, it was generally agreed that there was rather a heavy bias towards a certain M. Thatcher, who might well consider running a tipster service on the side.

Fans of Dan Diamond will be pleased to know that the next trilogy is already on the way, called *Franklin in Wonderland*. According to Pete there is now quite a cult following for Dan. "In fact we've had lots of letters from Dan Diamond himself, though he does seem to change his hand-writing pretty regularly — he's obviously a master of disguise. But we have had a lot of response from the first trilogy, and it's sold very well."

Adventures are suddenly featuring quite prominently in Salamander's plans, which is good news for Dragon owners. In addition to *Franklin in Wonderland* there's a two-part wartime adventure game, the first being *Wings of War* in which you are parachuted into Germany to infiltrate a castle held by the Nazis. You have to bring back various items, including the blueprint for a bomb that is being developed. The sequel is to be called *The White Cliffs of Dover* and requires you to return your hero Lieutenant Roger Wilcoe to safety, with a little help from the Resistance movement.

Due out now is the infamous *Cricklewood Incident*, a mad adventure that seems to have been seen in slightly different forms on other machines, but is at last ready for the Dragon. The game requires you to travel round London and other cities, provided you've got your bus pass. The funniest parts of this adventure are repeated encounters with a chain-wielding Hell's Angel who you must fight by choosing from a list of options on the screen. These include some pretty dire tactics such as waving your armpits at him.

On the more serious side is some educational and business software which includes turtle graphics and a file-handling and storage system which comes on cassette but which works with the Premier and Dragon disk drive systems. A demonstration suggested that this is head and shoulders above anything else available for the machine as yet. In fact the Salamander team were so impressed with it when it was submitted to them that they now use it themselves to help the running of their own business.

Adventures are suddenly featuring quite prominently in Salamander's plans, which is good news for Dragon owners

It seems that Salamander has built well on its initial games success. Its software is now handled by both Boots and Websters. Shop sales do provide the occasional problem, however, and this was one reason why Salamander began packaging its software in plastic video-style wallets. Formerly, booklets became separated from cassettes, and this resulted in an endless stream of phone calls from puzzled customers. One man had spent hours studying his manual yet was unable to get any kind of logical response from Salamander's *Dragon Trek*. He hadn't noticed that the instructions were in fact for the Wintersoft version of the game. ■

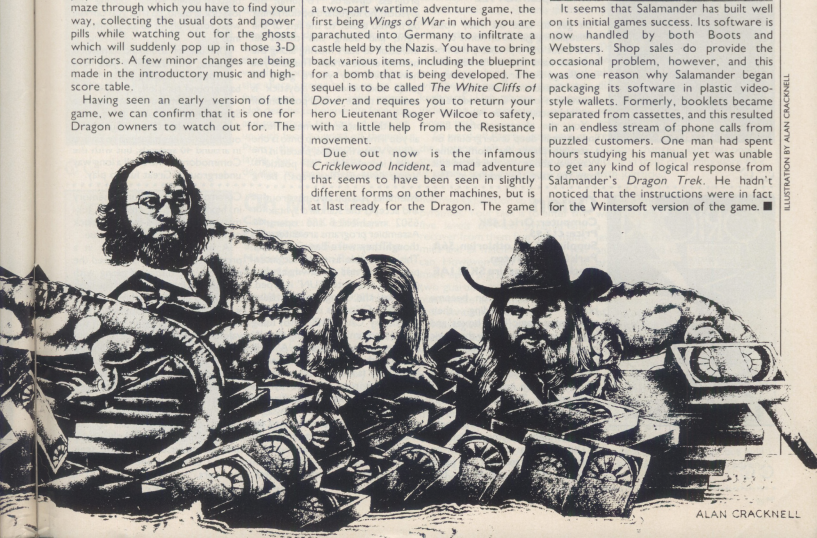


ILLUSTRATION BY ALAN CRACKNELL

ALAN CRACKNELL

SOFT RELEASE



Pedro

Computer: Dragon 32
Price: £5.50
Supplier: Imagine, 5 Sir Thomas Street, Liverpool, Merseyside L1 6BW

Imagine took long enough to get round to producing any Dragon software, but now that they have they've come up with some impressive results. The first game, *Jumping Jack*, was good, but with *Pedro* they have produced one of the best games programs we've seen on the Dragon in the past few months.

Pedro has been tending his flower garden in Old Mexico for some years, and just when he has it how he wants it the local animals develop a taste for his blooms, and the local tramp takes to wandering in and pinching his seeds.

At the top of the screen are four entrances from which the animals appear, and to the left is the gate through which the tramp wanders in. At the foot of the screen is Pedro's seed-box, along with a pile of bricks and a heap of manure. Both these can be used to block off the animals' paths. Bricks take the animals longer to break through, but, unfortunately, they take Pedro longer to carry.

If the animals get through they start to nibble at the flowers, and Pedro must frighten them off by jumping on the malevolent beasts — not an easy maneouvre at all.

If the tramp appears he will be scared away if Pedro frightens him by jumping nearby. The problem is that Pedro cannot jump when he's carrying something, nor can he carry two items at one time. When not seeing off tramps, ants, dogs, cats, rats (and at one point what appear to be reindeer), Pedro has to try to plant new seeds to fill in the gaps in his beds.

There are bonus points and extra seeds and the screens get harder as you succeed in wiping out each wave of pests. The graphics and sound are both excellent. The 'Boing!' Pedro produces when he jumps is hilarious, as is the way the tramp turns and rushes away.

Although there's a certain amount of 'flicker' to the figures, this in no way mars an amusing and first class game. *Pedro* is for keyboard or joystick, and has a Hall of Fame for up to eight people — can you beat Ford Prefect's irritatingly high score of 1400?



Booga-Boo (The Flea)

Computer: Commodore 64
Price: £7.95
Supplier: Quicksilva, 13 Palmerston Road, Southampton SO1 1LL

You get to take on many roles whilst playing games on home computers, but this is probably the first one that casts you in the role of a flea! *Booga-Boo* originally appeared on the Spectrum a while ago, and this version for the Commodore 64 has only recently been released.

You, the aforementioned flea, find yourself deep underground on a strange planet far from home. Way, way above you there is an exit from the cave that you're in. The object is to reach that exit in the shortest time possible, and thus give yourself a chance of escaping from this strange new world.

Conveniently located around the cave is an abundance of colourful rocks and boulders that you jump onto in order to try and make some progress upwards. To jump, the joystick (no keyboard option) must be moved either to the left or the right, and doing this causes an indicator to start moving along the bottom of the screen. This tells you how powerfully you're going to jump, and when the joystick is returned to the central position, off you go.

For the first few games at least, all you'll manage to jump onto is one of two Venus fly-traps, placed in the most inconvenient of positions. Venus fly-traps (flea-traps?) being what they are, this is the end of the road as far as the flea is concerned, and it's back to the start for another game.

The graphics are very well designed, and you can even scroll the screen around in all four directions. This is achieved by pressing the fire button down whilst moving the joystick around, so that you can see what you're about to jump onto (or into!).

The use of sound is somewhat irritating, but thankfully you have the option of turning the annoying background tune off.

A definite improvement over the Spectrum version, and a lot more difficult to play. On the Spectrum, our little flea has managed to escape in around 40 seconds, but with the Commodore 64 he's still a long way underground. Great fun to play.



Orion

Computer: Oric 1 48K
Price: £12.95
Supplier: M.C. Lothlorien, 56A Park Lane, Poynton, Stockport, Cheshire SK12 1AE

Most micro users soon become bored with regarding their machines as magic 'black boxes' and begin to wonder just how the magic is achieved. This is usually accompanied by the realisation that Basic is perhaps not the best language with which to probe into the heart of their micros. The assemblers released so far for the Oric 1 have been a mixed bunch and this package puts them into the shade.

The program contains both an assembler and a monitor and loads at 8000, finishing at 9538. The assembler is a full two-pass routine and accepts the standard syntax for 6502 mnemonics and operands. Assembler programs are entered as though they were Basic programs. This is possible as the Basic interpreter does not check what is in a program line until 'RUN' is typed.

Once the program has been entered Orion is called either directly by 'CALL 8100' or by using the '!' command. When the '*' prompt appears typing 'A' will assemble the program. The assembler is very fast and produces a full listing as it runs followed by the symbol table. Error handling is reasonable with error messages rather than codes that have to be looked up. The usual set of assembler directives is accepted.

The monitor has all of the commands that you would expect. Commands exist to dump memory in hexadecimal or character formats and to move a memory block or fill one with a specified value.

A breakpoint can be set in a program and when it is reached the registers are displayed along with the current instruction and the next one. An 8 byte area whose address is user defined is also displayed. This is useful for keeping an eye on the values of variables as the program executes. The program can then be single stepped or another break point can be set. The contents of the registers can also be changed.

The only criticism that we can level at this package is that its output can't be directed to the printer. Apart from that this is the best assembler that we have seen for the Oric and one of the best monitors.

RULE OF THUMB!

Each review carries our exclusive "Rule of Thumb" to give you an instant guide to how we rate it. Here's how the system works.

Brilliant!

Better than most — probably a good bet.

Only average, but no major faults.

Noticeable, though not crippling, defects.

Contains flaws which affect the value of the program.

Avoid at all costs.



Creator's Revenge

Computer: Commodore 64
Price £7.95
Supplier: Mogul Communications Ltd., 90 Regent Street, London W1

This program got off to a bad start by having virtually no instructions on the inlay card. Even worse, after loading it the screen was filled with a display of such verbage that we almost gave up on the spot. Nothing happened for a while, so some random pressing of keys got us to a display asking us to select the level of play, with a choice of two different levels.

Basically, you control a spaceship that moves around the bottom of the screen, firing away at anything that moves above you. That 'anything' is quite an assortment of nasties, ranging from spaceships to flying beetles. Shooting a certain number of these takes you onto the next stage of the game. A strange ship appears on the screen, docks with yours, and informs you that you are now armed to destroy the nuclear reactor.

The nuclear reactor, you vaguely recall from the earlier introductory screen, has to be destroyed in order to save the earth from the mad creator, whoever he might be.

This second stage is much the same as the first, with various meanies flying about everywhere, to the accompaniment of a suitably menacing sound track. After a minute or so of shooting away at anything that moves, the nuclear reactor falls onto the screen.

Destroy that and you've defeated the creator, the game goes back to the first screen, and everything starts off from the beginning again.

However, the game gets much more interesting if you allow the reactor to fall to earth and explode. After it's been detonated, the screen clears to reveal that your spaceship has shrunk remarkably in size, and that you are surrounded on all sides by mutants from the nuclear holocaust.

There are literally hundreds of mutants moving about, and to defeat the creator from this screen you have to shoot every one of them. Not easy, since they follow you around the screen with a rare degree of intelligence.

An average game that's quite fun.



Ugh!

Computer: Commodore 64
Price: £7.95
Supplier: Softek International Ltd, 12/13 Henrietta Street, Covent Garden, London WC2

An unusual name for a game, but then *Ugh!* is a pretty unusual game.

Back in the time when Raquel Welch and dinosaurs stalked the land, you take on the role of Ugh, the heroic caveman. Long range weather forecasts have predicted that there's going to be an ice age fairly soon. Being a solid citizen, Ugh decides to believe the forecast, and sets about the task of stocking up with food to ward off the cold. Pterry the Pterrodactyl has been laying her eggs nearby, so Ugh decides to steal them and store them in his cave.

With some amusing and excellent graphics, the early part of the game is quite easy, since the only thing to prevent you making off with the eggs at the top left of the screen is Pterry herself, who lobs rocks at your head with unerring accuracy.

Still, at this stage the only difficult thing is keeping your caveman on one of the appointed paths. You're not free to roam about the screen at will, you must stick to a set of pre-determined routes. And whether you use the joystick or the keyboard, Ugh shows a strong inclination to move off on the wrong path.

To ward off Pterry, your cave at the bottom left of the screen is stocked with a never-ending supply of spears, and a swift throw in the right direction will temporarily deter the pterodactyl. Mind you, these eggs must be pretty heavy, since Ugh seems incapable of carrying an egg and a spear at the same time. This means that for the run back to the cage you are defenceless.

After a while some other characters begin to appear, and succeed in making your task increasingly difficult. Rex the tyrannosaurus and Trici the triceratops come along to help Pterry out, and chase you about the screen in a touching display of dinosaur solidarity.

An interesting and amusing game, for anyone with a sense of fun. It just goes to prove that dinosaurs weren't wiped out by comets or climate changes, but by people sitting in front of Commodore 64's with joysticks!



Oh Mummy

Computer: 48K & 96K Lynx
Price: £7.95
Supplier: Gem Software, The Maltings, Station Road, Sawbridgeworth, Herts.

On 25th November 1922, Howard Carter and Lord Carnarvon discovered one of the greatest archaeological finds of all times — the tomb of Tutankhamen. It is this and the story of the ill-fated expedition party that probably inspired Gem software to let their latest offering loose on an unsuspecting world. *Oh Mummy* is a machine code game whose pedigree is best described as a *Painter/Pacman* hybrid. However, as with other Gem games, the similarity ends there.

You play the role of the head of a five man expedition to the Egyptian pyramids. Your task is to enter the five levels of each pyramid and recover from them five royal mummies and as much treasure as you can. However each level, which is made up of a grid of 20 boxes, has two guardian mummies which you must evade at all cost if you value your continued existence.

Moving around the four sides of a particular box reveals its contents which might be treasure, a royal mummy, a guardian mummy, a key, a scroll, or a disappointing nothing. Being in possession of the scroll temporarily mutes the power of the guardian mummy allowing you to destroy it. Points are gained by collecting treasure and uncovering the royal mummy. Uncovering the key and the royal mummy unlocks the door to the next level.

The game can be played either with the keys of your choice or with a joystick. There are three skill levels and five different speed levels, and the sound can be switched on or off (or somewhere in between) as desired.

Oh Mummy is a fast action game which needs joysticks if any degree of success is to be achieved, although full marks to Gem for giving you the option of your own choice of keys if you don't have a joystick. The game should provide many hours of frenzied activity although it is somewhat predictable after repeated playing in that each level contains the same number of treasures and mummies.

A game which will not give the faint-hearted nightmares but will certainly satisfy the armchair adventurers.

SOFT RELEASE



Chuckie Egg

Computer: Dragon 32
Price: £7.90
Supplier: A & F Software, Unit 8, Canal Side Industrial Estate, Woodbine Street East, Rochdale, Lancashire OL16 5LB

Chuckie Egg has you as a farmer wandering round the hen-house trying to collect a dozen eggs, and it keeps up its eggy theme by giving you half-a-dozen lives. You could also hard-boil an egg while waiting for the game to load, but we presume that's unintentional. The loading wait is certainly worthwhile, though.

Despite the fact that this Spectrum success inevitably loses some of its speed and graphics appeal in conversion, it is nevertheless one of the best and most amusing arcade-style games you're likely to find anywhere outside the Microdeal range for the Dragon.

Between one and four players are catered for, and while, sadly, there's no joystick option you are given the opportunity to redefine the control keys. If you don't the keys used are cursor keys for the four directions of movement and the space bar to jump.

Four directions and jumping . . . what kind of a hen-house is this? The answer is that it's one on *Donkey Kong* lines, with just a hint of *Manic Miner* thrown in.

There are several platforms filling the screen, with ladders to run up and down and gaps to jump across. Each level has 12 eggs that you must collect. In addition there are a number of . . . well, we don't like to say what they look like, but you get a well-deserved bonus for treading in them. Impeding your progress are a couple of hens who are also adept at ladder-climbing, but not gap-jumping. You're told to watch out for the Crazy Duck in the cage at the top-left corner of each screen. Quite what happens if the duck escapes we don't know as it never happened while we were playing, and we gave the game a pretty good going-over.

The game is accompanied by jaunty sounds, but either the graphics are a little fuzzy or our monitor really does need cleaning. What they lost in definition, though, they make up for in amusement value. Next time you're in the software shop you really should put a *Chuckie Egg* in your basket.



Toolkit

Computer: Oric 1 48K
Price: £8.95
Supplier: IMS Software, 143-145 Uxbridge Road, Ealing, London WW13 9AV

Oric Basic has often been criticised for its lack of features. One of the main areas that could be improved is the cassette interface and six of the 14 functions supplied by this program are dedicated to improving just that. Two of these functions are general utilities and allow the user to obtain a catalog of the programs stored on a tape along with their starting addresses, and skip past named files on a tape. The other tape routines make it possible to verify and merge Basic programs and save and load data files. The merge command will not look out for duplicate line numbers but is still a welcome addition to Oric Basic.

The remaining eight functions are designed to make Basic programming a more enjoyable(?) task. These can also be split into general commands and extra Basic functions. DEL, OLD, RENUM and AUTO are found in the first category while RESTORE, DEFCHAR, @ and STRING$ are in the second.

OLD will restore a program that has accidently NEWed while DEL allows a number of lines to be deleted in one go. RENUMBER provides a full renumber function that looks after GOSUBS etc. AUTO will generate line numbers for program entry (something that every computer should have!)

RESTORE will set the data pointer to a particular line number and @ provides a 'print at' function for text mode. Perhaps more usefully, DEFCHAR redefines characters. It takes as parameters the ASCII code of the character to be redefined and a string of 16 hex digits that represents the new character. The last function provides a simple way to print a character several times.

The Toolkit program resides at 8D00 and does not clash with the high resolution screen. All of the extra commands behave just like Basic if used incorrectly and we have found no errors in any of them. They can be switched off if desired (and re-enabled) by direct calls to the Toolkit code.

This is an excellent program and can be recommended even for Atmos owners who will find that some of the functions are in the new ROM.



Space Pilot

Computer: Commodore 64
Price: £7.95
Supplier: Anirog Software, 8 High Street, Horley, Surrey

Not content with destroying mere spaceships, *Space Pilot* also features bi-planes, Spitfires, helicopters and jet fighters, with a sprinkling of Zeppelins and Junkers thrown in for good measure.

The game has five levels of action, and the first one starts off in the year 1919. Using either the keyboard or a joystick, you have to control your own spacecraft and shoot down the hordes of bi-planes that roam around the skies chasing after you.

Fortunately for you, your spacecraft can move faster than the bi-planes. This is just as well, since controlling your ship is not the easiest of tasks. Rather than an up, down, left and right approach, *Space Pilot* responds to the joystick by turning the ship either clockwise or anti-clockwise. This can lead to hilarious disasters as you move around the screen in a series of what seems like ever-increasing circles.

You have to destroy 56 bi-planes to proceed to the next level. This can be tricky in the extreme, especially when half a dozen of the blighters come at you in formation. At the same time as fighting this lot off, you can also charge about and rescue one of the three intrepid parachutists who appear from time to time.

Towards the end of your task, the bi-planes start throwing bombs around in addition to the missiles that they've been firing at you from the start. Still, shoot 56 of them, destroy the large Zeppelin that appears after that, and you've survived the First World War and made it on to level two.

This level is set in the year 1940, with the bi-planes replaced by Spitfires. These move faster and fire more often. And so it goes on, up to the fifth and final stage which is set in the year 2001 and features some very nasty aliens.

A better than average game, with the added bonus of being supplied on tape in turbo format, which means that the program loads faster from tape than from disk.

Cheaper by far than buying your own space ship, and a lot less dangerous, *Space Pilot* should do very well.

SOFT RELEASE



Eagle

BBC Micro
Price: £7.95
Supplier: Salamander Software, 17 Norfolk Road, Brighton, Sussex BN1 3AA

This is essentially Acornsoft's *Rocket Raid* on a tight budget. As with all Salamander products, this program comes in a neat mini video case with typical arcade game artwork and a small instruction leaflet. The aim of the game is to explore deeper and deeper into the Moon of Thrug to survey and get rich quick. The problem is that *Rocket Raid* is an infinitely better game.

While there is nothing actually wrong with this game, it is neither original nor exciting, and seasoned (or even slightly salted) arcaders are not going to put up with that.

The graphics are quite effective, if a little small. The game is named after your ship which, if you're sitting more than two feet away from the television screen, is nothing more than a coloured blob. There are a few extremely passive aliens around in the first parts of the game, along with thousands (well, almost!) of launching rockets. So long as you have your wits about you these are quite easy to shoot down.

But the catch (as in *Rocket Raid* and the earlier *Scramble*) is that you slowly run out of fuel. You therefore have to ensure that you hit a fuel dump at frequent intervals. This is harder than in most versions of this game because the dumps are so small. Not only that, but the bombs defy the laws of nature (maybe they don't apply on this moon) and fall straight down.

As you might expect, each level is more difficult than the last until eventually you reach the stage where you must be either zap-crazy or bored silly to go any further. Your reviewer was bored silly, but with selfless devotion to duty he carried on playing in the hope that he could bring enlightenment to *Which Micro* readers.

The failure of this offering from Salamander is a little sad, as games of this sort seemed so much fun to play in the old days when computing was still next year's 'thing' — if you owned a ZX81 and Quicksilva's *Scramble* you were cool. But I'm afraid we've now reached the point where rushing out and buying this game will only mean that you're a terminal games addict.



Galaxy

Computer: Commodore 64
Price: £7.95
Supplier: Anirog Software, 8 High Street, Horley, Surrey

Now, stop me if you've heard this one before. You are in control of a spaceship that can move left and right at the bottom of the screen, and fire vertically upwards. Above you there is a formation of alien craft, which bob about from left to right and back again. Periodically, some of the aliens will peel away from the main group and come dive bombing down the screen at you, firing as they do so.

Yes indeed, *Galaxy* is a version of our old friend *Galaxians*, the first arcade game to appear after the dreaded *Space Invaders*, and easily recognizable as a souped-up version of that early classic.

However, if you must have a version of *Galaxians* in your home and if you own a Commodore 64, there are far worse offerings around than this one. Indeed, this is one of the best reproductions of *Galaxians* that we've ever seen.

Before the aliens start attacking you, they fly into their starting position, so you get the chance to have a go at them before they can hit back. After that you're in very familiar territory (even the sound is almost identical to the original), with one or two variations on the main theme thrown in.

At the top of the alien formation are a number of mother ships which, unlike the others, have to be hit twice before they die. When attacking you, these will either follow the traditional game and come down in convoy with a couple of smaller aliens, or come down by themselves and try to capture you with a tractor beam.

If you're caught you don't necessarily lose a life. Your space ship is taken back by the mother ship up to the top of the screen and another one appears to take it's place. If you can then hit that mother ship whilst it's attacking, you get your original ship back again. The two ships then join together to give you double fire power.

This game even has one screen where the aliens don't actually attack you. They just dance about and you have to hit as many as possible before they all waltz off again. This massages both the high score and the player's ego very effectively. One for the collection.



The Cricklewood Incident

Computer: Dragon 32
Price: £7.95
Supplier: Salamander, 17 Norfolk Road, Brighton, East Sussex BN1 3AA

Trying to describe *The Cricklewood Incident* is like trying to explain *Monty Python* to an Eskimo. In fact the adventure draws heavily on the humour of the Pythons and is very silly indeed. Enjoyably silly, though. The instructions leaflet explains your objectives: "As Arnold Q. Volestrangler, bored millionaire eccentric, you have decided to venture forth, find the Holy Grail, and return to the privacy of your padded cell."

You start in the padded cell, with the location description on the top two lines of the screen. Beneath that are listed the available exits, the amount of money you have, and your state of health. This varies along the lines of "You feel great," "You're a bit depressed," or "You've fallen over." The amount of cash you start with varies according to which of the five skill levels you choose.

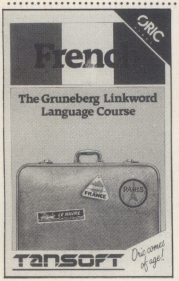
The first hazard you're likely to come up against is a Hell's Angel. Should he come at you with his bike chain a running battle takes place which is hilarious.

You press the appropriate number according to whether you attempt to knee him in the groin, poke him in the eye, wave your armpits at him or beat a retreat. You're also taken in for questioning and captured by alien spaceships and dumped in random locations.

The initial locations are all in London, though apparently the game opens out for you to visit other more exotic places. We got nothing more exotic than a visit from Doug Piranha and the boys. We woke up trapped in a small room and our health reports said, "You have a headache". This was perhaps due to the fact that we had a coffee table nailed to our head. The only exit was east, but we couldn't escape because the table wouldn't fit through the door!

If that type of humour appeals to you then you should certainly give *The Cricklewood Incident* a try, but don't ask us where Cricklewood comes into it.

SOFT RELEASE



French

Computer: Oric 1 48K, Atmos 48K
Price: £12.95
Supplier: Tansoft, Units 1 & 2, Cambridge Techno Park, Newmarket Road, Cambridge CB5 8PB

The designer of this course, Dr. Michael Gruneberg, has used techniques taken from psychology (he is senior lecturer in psychology at University College, Swansea) to produce a course that takes much of the boredom out of learning a language.

The package comes in a large video cassette style case that contains two cassettes and a short manual. The manual gives general information about the course and includes a glossary of the words that are taught in the course.

The first cassette contains 10 programs, one for each lesson, and the second is an audio cassette that illustrates the correct pronunciation of all the words. Each lesson starts by introducing a set of words and their French equivalents along with an image to help associate the two. At times the images get quite surreal, for example hedgehog (herisson in french) is memorised by imagining 'your *hairy son* looking like a hedgehog'.

The next part of the lesson describes the gender of each word. These are memorised by using the image of a boxer for masculine words and a bottle of perfume for feminine words. (e.g. LE herisson — a boxer sitting on a hedgehog, LA chevre — pouring perfume over a goat to get rid of the smell).

After another selection of words comes a description of some elementary grammar rules followed by a test in which the user is asked to translate various sentences from French to English and vice-versa. At the end of a lesson the user can repeat it, load the next one or return to Basic.

The lessons each have an overall theme such as places and people, clothes etc. We found the course great fun and at the end a surprisingly large amount had sunk in. The high quality of the package was marred by a problem with the '^' key. We found that when entering words like l'orange the '^' key would generate about 10 characters of garbage on the screen. Presumably this is a minor coding which Tansoft will correct.



Romik Cube

Computer: Dragon 32
Price: £6.99
Supplier: Romik, 272 Argyll Avenue, Slough, Berks

If you're the type who can do the conventional Rubik Cube in about 30 seconds then this software from Romik is just the ticket. It isn't as dated as it might seem as, in addition to the ordinary cube (used here as a Practice Cube to familiarise you with the commands needed to manipulate the faces), it sets you the challenge of a Time Cube and a Space Cube.

You might think that someone who can cope with the complexities that this entails should be able to design his programs a little better.

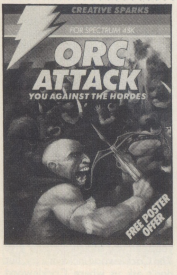
The first question you are asked on side one of the cassette is "Do you want the practice or the four dimention (*sic*) cube?" If you type 'F' for Four Dimension, which is meant to be on side two, you in fact get the Time Cube. Unfortunately, if you elect to go for the Practice Cube there is no provision to switch to the Time Cube when you're ready — you have to BREAK and RUN the program again.

For the Practice Cube you have three inputs, the first choosing the axis of rotation (top, left or right face), the second selecting which of the various cube segments is to be rotated, and the third deciding on the direction, clockwise or anti-clockwise. All the various possibilities are listed on the cassette insert, and you also have the option of rotating the whole cube so that you can see what's happening round the back and sides.

The Time Cube might at first seem easier, with just two faces each of red, blue and yellow. But you have only 80 seconds to sort these out before all the faces change colour.

The Four Dimensional Cube allows you one input for all four cubes, the move you make being carried out on all four simultaneously. However, you can also move any segment from one cube to another. And if that doesn't boggle your mind, nothing will.

Normal human beings — those of us who still haven't managed to solve the original Rubik Cube — might be inclined to give this one a miss. Even for dedicated cube-twiddlers, the minor design bugs are irritating.



Orc Attack

Computer: 48K Spectrum
Price £6.95
Supplier: Thorn EMI Computer Software, Film House, 142 Wardour Street, London W1V 3AU

It's knight-time once again and you must defend your castle's battlements from the awkward Orcs and other evil creatures who are trying to get in and get you. The loading screen looks promising, with good scary graphics of a menacing knight, but it's a pity this isn't repeated in the graphics of the game itself. Most of the single screen is taken up with a plain one-colour castle wall with no decoration or even bricks, which does give the game rather a boring appearance.

You patrol the top of the wall, control being through either keyboard or a variety of joysticks (Sinclair, Fuller, AGF, Kempston or Protek) while your assorted enemies enter at the bottom. In the first screen these are the Orcs, who carry crossbows which they fire up at you to try to part you from one of your nine lives, and when they're not doing that they start building ladders to scale the ramparts.

Your initial defence is to collect rocks from either side of the screen and drop these down on the 'eads of the Orcs, then when you've used up your rock supply you're provided with swords to attack the Orcs who've made it to the top of the ladders.

The second screen has a Sorcerer who floats skulls up the screen at you, and these again have rocks dropped on them, though you can't do anything about the Sorcerer. If a skull reaches the top then a spell is unleashed, and as happens throughout the game, if you lose a life you're stunned for a few seconds and also lose the weapon you were carrying.

Get to the third screen and you face the return of the Orcs. The fourth screen presents you with Demon Trolls who also succumb to a well-placed rock, preferably before they've unleashed a deadly bolt upwards. The final menace is the dreaded Stone Warts who try to scale the walls. We didn't make it to that final level, but just a few plays took us through five screens before a bout of boredom set in with the repetitive nature of the game and the regular appearance of the Orcs every other screen.

SOFT RELEASE



Flying Feathers

Computer: Commodore 64
Price: £6.99
Supplier: Bubble Bus Software, 87 High Street, Tonbridge, Kent.

This game should appeal to all those who like watching Jackie Charlton showing us how to shoot various forms of wildlife on Sunday afternoon TV. You take on the role of a gamekeeper, sitting in a boat in the middle of a lake that seems to be amazingly well stocked with fish.

Armed with a shotgun, your duty is to protect the fish in the lake from the hordes of annoyingly persistent eagles which continually fly down the screen trying to grab them out of the water.

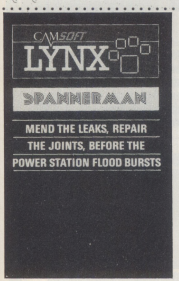
Firing the shotgun is done with a *Missile Command* approach. You have to move a set of sights about the screen with either the joystick or the keyboard, and when in position, fire.

On skill levels one to four (selectable at the start of the game), you simply position the cross and fire, and a blast from the shotgun will go in the chosen direction. However, on levels five to eight, the blast will explode as soon as you take your finger off the fire button. This means that you have to hold the button down until you want the explosion to take place.

The whole game is played out over a nicely drawn high resolution background, and considerable attention has been paid to detail. Little touches (like moving the gamekeeper around in the boat when he fires, so that he's pointing in the right direction) should all add up to an interesting and addictive game.

Unfortunately, this game is about as addictive as noughts and crosses, and just as boring. Although the eagles gradually speed up as the game progresses until you inevitably end up losing your quota of fish, nothing else changes throughout the game. It just becomes a question of how long you can be bothered to play it.

Eventually you tend to reach the stage where you couldn't care less about what happens to the fish, and are quite content to let the eagles take as many as they want. The high standard of programming is unfortunately not matched by the quality of the original concept.



Spannerman

Computer: 48K & 96K Lynx
Price: £7.95
Supplier: Camsoft, 33a Bridge Street, Cambridge, CB2 1UL

If we were to describe a game which involved moving around on various levels connected by ladders, evading certain objects, then you would certainly be forgiven for thinking that it was yet another version of *Donkey Kong*. However, *Spanner Man* from Gem Software combines this standard setting with an original theme which results in not only a very enjoyable arcade-style game, but the best we have yet seen for the Lynx.

The game is set in a nuclear power station which has just undergone a minor earthquake. In your capacity as local plumber extraordinaire, you have been summoned to wield your trusty spanner and cure the many leaks developing in the cooling system pipes, thereby saving the nearby town and becoming a super hero.

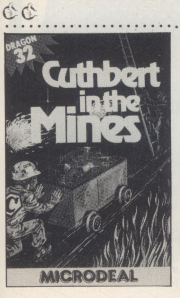
There are, however, some dangers that you need to be wary of before you rush off, spanner at the ready. The cooling water gushing from the leaking pipes has nowhere to go apart from making your feet very damp.

The rising water level also disturbs the resident colony of rats, not ordinary rats but super rats; giant anti-matter rats mutated by exposure to radiation. If they get close enough to nibble your ankles then that's the end of both of you and your spanner.

Your steel-capped boots provide a means of defence but lose you points as you upset the local Wildlife Preservation Society. Attacking you from above are not mutated bats but falling girders as further earth tremors disturb the foundations and cause yet more damage to the ruptured cooling system.

You are given three lives and there are three levels of play with a level three Hall of Fame. Movement is controlled by the cursor keys with boot-action activated by the Return Key. You also have the ability to jump over obstacles (the 'J' key) but this is not recommended for novices.

The display is very impressive. The movement on screen is very fluid and the graphics show up the true potential of the Lynx when it comes to gaming. Do-it-yourself plumbing will never be the same.



Cuthbert in the Mines

Computer: Dragon 32
Price: £8
Supplier: Microdeal, 41 Truro Road, St. Austell, Cornwall

It seems that Cuthbert has been caught by the Moronians, an unpleasant experience by the sound of it, and he has been put to work down their mines. His only hope of escape is to make it up to the exit in the surface at the top of the screen, his route passing through several conveyor belts on which trucks move back and forth at various speeds. If that makes it sound a little like *Frogger*, then yes, it does have a touch of that game about it as well as more than a shade of Imagine's *Jumping Jack*.

If Cuthbert gets clobbered by a truck he falls down to the conveyor beneath, and if he falls from the last one he is doomed to the fiery furnace at the bottom of the screen. As if he didn't have enough problems, Old Nick himself is climbing up and down a ladder on the right, stopping to look along each level and unleashing the occasional fireball if he catches a glimpse of an escaping Cuthbert. Needless to say, this doesn't do much for Cuthbert's chances of getting a breath of fresh air.

This machine code game is presented with Microdeal's usual professionalism. It has five skill levels for you to choose from, and the higher levels are very hard indeed. You have four lives, and if you manage to get eight Cuthberts up to the surface then you automatically move up one skill level. There is a joystick or keyboard option (cursor keys), a pause facility and a high-score table at the end. The sound and graphics are both good, though the colours are inevitably limited to the green, yellow, blue and red of the Dragon's PMODE 3 screen capabilities.

Having said all this, though, it's a shame that the game itself isn't quite up to the standard of either *Cuthbert Goes Walkabout* or *Cuthbert in the Jungle*. The lack of originality is the main drawback. It's not that anyone buying the game should have cause for complaint, it's just that the game is not quite as good as some of the other new Dragon releases and didn't have us burning the midnight oil to knock out a new high score.

CLWYD PERSONAL COMPUTERS

Unit 19, Daniel Owen Precinct, Mold CH7 1AP. Tel: Mold 56842

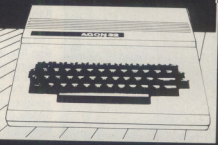
ATARI

ATARI 400 inc. Basic,
2 Joysticks, Recorder + £5.00 software voucher £150.00
ATARI 800,
2 Joysticks, Recorder + £10 software voucher £320.00



DRAGON 32

DRAGON 32 + 2 Joysticks £175.00
DRAGON DISC DRIVE £275.00



LYNX

48K LYNX £200.00
96K LYNX £290.00



ORIC 1

ORIC 1 48K £135.00



COMMODORE 64

CBM 64
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1541 DISC DRIVE £220.00
1526 PRINTER £340.00



B.B.C.

MODEL B £399.00



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VIC STARTER PACK £139.99

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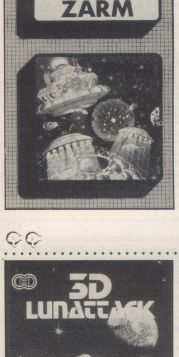

Zarm

Computer: BBC Micro
Price: £7.95
Supplier: Program Power, 8/8a Regent Street, Chapel Allerton, Leeds

Zarm is another cassette from Micro Power that fails to show the level of innovation we expect from them.

A great pity, as games like *Killer Gorilla* were masterpieces of the genre — this, put simply, isn't. I suppose there is a remote possibility that a few BBC Micro owners haven't read the User Guide and therefore haven't seen the *Lunar Lander* program therein. Just a chance. Well, this game is a very slight improvement on that. Nothing more.

Zarm takes the essentials of *Lunar Landing* and throws them out of the window, leaving you with a piece of tedium that has the added extra bonus of being well-nigh impossible to play.

The first stage (there are five) has you in a small craft currently held tightly by a mother ship, below which a million meteriods fly. When you think it's safe, you press the SHIFT key to hover slowly to the surface of the great planet (or is it a star — they're all the same in these days of interstellar travel).

It is not recommended that you hit any of the meteors, as this tends to reduce the number of shields you have with depressing speed. You have left and right controls, along with what appears to be rudimentary up and down keys.

On each of the five screens there are four dots. These dots would seem to have some special kind of significance since they are placed on the screen with great hullabaloo. Picking one of these up by simply flying into it generates a lot of noise and gives you a bigger score. Not only that, but it increases your bonus too! Such fun.

The next stage is a randomly generated 'maze', about as hard to navigate as the M1 motorway. However, it must be said that collecting the aforementioned four dots is not really worth the effort as they are (of course!) in the most inaccessible parts of the screen.

The next stage is much the same, with laser beams across the screen. Although these disappear occasionally for a couple of seconds, negotiating all five is virtually impossible.



3D Lunattack

Computer: 48K Spectrum
Price: £7.95
Supplier: Hewson Consultants, 56b Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX

3D or not 3D, that is the question these days, and most companies seem to feel obliged to put out software that makes at least an attempt at bringing perspective to our screens. Cynics might call it jumping on the bandwagon, but that wouldn't matter too much if the results were good. This software from Hewson has some good things about it, but it doesn't really stand comparison in terms of its 3D graphics with other games that are available.

Here your screen shows you the view from your spacecraft as you skim over the surface of a planet. There are the usual readouts at the foot of the screen: fuel, radar, hull temperature, weapons in use. Above the view from your cockpit is the score (1 or 2 player options), the high score and lives remaining out of three. Most joysticks are catered for, or alternatively there's a sensible keyboard arrangement giving you a range of choices.

The first section you fly through in your attempt to reach your target, the Command Base, is an enemy tank zone, requiring ground fire from you to see off the tanks and score points. Your sights can be moved around the screen, and the speed with which the landscape scrolls around is impressive. If you make it safely through the tank zone, which is no mean feat, you come to an aerial minefield, and this has to be got through in one piece — bob and weave, as they say. This then takes you to your enemy's Missile Silo Zone, and these can be blasted provided you manage to avoid their self-activating warheads. If you survive beyond that, which we didn't, you at last get your strike at the Command Base.

There are other features, such as the Hover Fighters also out for your blood, and the navigation aids which point you in the direction of the Command Base, but with graphics of the standard of *Ant Attack* or *Zaxxon* leading the field, this looks a little too simple and is also rather over-priced for Spectrum software.

Enjoyable but hardly an essential buy.



Wings of War

Computer: Dragon 32
Price: £7.95
Supplier: Salamander Software, 17 Norfolk Road, Brighton, East Sussex

After offering us the delights of the Dan Diamond games, which some were able to resist but many enjoyed, Salamander now introduce us to Lieutenant Roger Wilcoe in the first of a two-part wartime adventure, *Wings of War*.

The time is 0200 hours, the date 21st November 1942, the place somewhere over occupied France, and your mission is to infiltrate a German occupied chateau where, it is rumoured, Jerry is working on a new kind of bomb. You must find the six items on the list you are given, including the bomb, and find a safe escape route back to England.

The screen layout is similar to the Dan Diamond adventures. Though the game loads with CLOADM, the rather slow nature of some of the responses suggests that the program is actually in BASIC. Not that this spoils your enjoyment too much once the adventure gets started.

Your first problem is that you parachute down into a dark and murky wood. It is possible to get out of the wood in a couple of moves, but until you discover what those are it's possible to wander round lost for ages. You then move into the chateau, where you risk arrest if your knowledge of German is shaky.

At one point a guard asks you for your pass. We tried sneaking past him without betraying the fact that we didn't yet have one. We thought we'd got away with it, but in fact we were only being humoured for a few moves and then the sentries pounced. If you can get upstairs in the chateau a whole new world of private quarters and laboratories opens up to you. We still haven't figured out how you smuggle out the six required objects when you're only allowed to carry five at once. Some thought needed here, obviously.

There's the usual verb-noun input, a SAVE GAME routine, and instant resurrection should you come up against the loaded lugers, as you frequently do. Maybe not the best adventure every seen, but still very enjoyable and with some intriguing puzzles . . . for example, what's a frog doing in the toilet?

PART THREE SOFT RELEASE ROUND-UP

Part three of our round-up of the past year's software releases. They're all here — the brilliant, the OK and the diabolical.

Rule of Thumb!

Each review carries our exclusive "Rule of Thumb" to give you an instant guide to how we rate it. Here's how the system works.

- Brilliant!
- Better than most — probably a good bet.
- Only average, but no major faults.
- Noticeable, though not crippling, defects.
- Contains flaws which significantly affect it.
- Avoid at all costs.

Rainbow Writer

Dragon 32/64 £19.95 tape £21.95 disk — Microdeal, 41 Truro Road, St Austell, Cornwall PL25 5JE

The main purpose of this product is to overcome the Dragon's unattractive screen text display and offer 12 alternative layouts, all of which can be mixed with high resolution graphics. The options are contained in two machine code programs to be loaded in the upper memory. The bad news is that once loaded, the Dragon slows down enormously and entering commands is a clumsy procedure. (Apr '84)

Snooker

BBC Micro B £9.95 — Acornsoft, Vector Marketing, Denington Estate Wellingborough, Northants

This is a skilful transposition of Snooker from 3-D to a 2-D game. The package includes instructions, but further knowledge would be required to understand the play and scoring properly. The graphics are good and sound effects realistic. (Nov '83)

Snowball

BBC Model B (others soon) £9.90 — Level 9 Computing 229 Hughenden Road High Wycombe, Bucks

Snowball is the opening adventure of a series. You are a secret agent, aboard a space ship in trouble. Your task is to right the situation. An interesting game with some unusual extra features, ie the central figure is female and playing demands imagination not mere competiveness. (Feb '84)

Space Shuttle

Dragon 32 1 joystick £8 — Microdeal 41 Truro Road St Austell, Cornwall

A high standard game with excellent graphics. The idea is to launch a space shuttle into orbit in order to retrieve a malfunctioning satellite. A joystick is essential for the game which comes with a 16-page detailed manual. This is a very challenging simulation game. (Nov '83)

Splat

Spectrum 48K £5.50 — Incentive Software Ltd 54 London Street Reading, Berks

In this game you are Zippy, a small cross on the screen, displayed as a walled maze, dotted with grass. The idea is to lead Zippy through the maze and eat the grass. Besides a joystick option, you can program keys to suit yourself. It is fun, but not as good as the author's first, Mined Out. (Nov '83)

Sprite Man

Commodore 64 £7.95 — Interceptor Micros Linden House The Green Tadley, Herts

Well, this game is Pacman in disguise, in which you run around a maze, eating dots and avoiding the 4 monsters trying to eat you. One fault is that the run/stop key isn't disabled, so beware of hitting it! Otherwise, this is a successful reproduction. (Dec '83)

The Spy Strikes Back

Atari 400/600/800 £14.95 — CentreSoft CentreSoft House Unit 16, Tipton Trading Estate Bloomfield Road Tipton, West Middx

Dr X's fortress is divided into sections. Hidden are 9 clues and the first to collect them or crack the code will win £100 worth of software (really). The best feature is the sound but the clue cracking is compulsive. (Feb '84)

Squash a Frog

Commodore 64 £7.95 — Alligata software 178 West Street Sheffield

For something completely different . . . this is a version of 'Frogger' (but featuring non-amphibious frogs). An average reproduction in which the action could be tightened up and improved by the inclusion of a joystick version. (Dec '83)

Starbowl Football

Atari 400/800 £21.95 — Efficient Chips 40 The Market Place Chippenham, Wilts

This is a representation of American Football. The playfield is set out in the standard gridiron pattern and the game plays in the same way as reality. The game is easy to pick up, with clear instructions. There's a variety of options and the graphics, sound and scrolling are smooth and colourful. (Feb '84)

Starclash

Any Spectrum £6.95 — Micromega 230 Lavender Hill, London SW11

A tired version on the Space Invaders theme with aliens akin to bow ties and pointed hats. It is compatible with a Kempston joystick but the action is fairly slow. (Feb '84)

Stellar Triumph

Commodore 64 £6.99 — Romik Software 272 Argyll Avenue Slough SL1 4HE

An original game for two which requires agile fingers, or a joystick. It is basically a spatial battle with both players in charge of very nippy spaceships. Good sound and graphics, the ability to play any of 25 billion variations all combine to make a very good value game. (Dec '83)

Strike Attack

Spectrum 48K £9.95 — Micro-Mart Greenhill Ind. Estate Kidderminster, Worcs

A cross between a flight simulator and a blood and guts shooting gallery game, the instructions require careful study before attempting to play. You are the pilot of a military jet and have to reach your target before the enemy shoots you down. Not that realistic, but it will prove a challenge. (Nov '83)

Super Dogfight

Commodore 64 £9.95 — Terminal Software 28 Church Lane Prestwich Manchester

An attempt to simulate a World War I fighter pilot duel. (It's a two player game requiring two joysticks). The object is just to destroy your opponent 10 times. It's a fairly good implementation of an early arcade game but has no original extra features. (Dec '83)

Tank Atak

Commodore 64 £8 — Supersoft Winchester House Canning Road Harrow, Middx

A joint version of the 'Battle Zone' video game in which you are in command of a tank, equipped with radar. A joystick is essential to avoid displaced digits. There are bonuses and different levels, but the graphics are disappointing. (July '83)

T-Comp

Oric 1 48K £12.95 — Bambey Software Leneburgh, Isle of Harris

This is a compiler, written in Basic for the Oric. Unfortunately it will only process a tiny subset of Oric Basic so it cannot be seriously considered. (Feb '84)

Tele Talk

Atari 400/800 £36 (Disk) — Efficient Chips 40 The Market Place Chippenham, Wilts

With the help of a modem, Tele Talk enables you to communicate with bulletin boards or other Atari owners over the telephone. Its strongest feature is the ability to modify the point configuration of the computer. Although highly priced, Tele Talk is good value. (Feb '84)

Tiger Grand Prix

Dragon 32 £7.95 — Tiger Software, 63 Devonshire Street, Monk Wearmouth, Sunderland

This is an educational program with an original idea based on a race game for 1-2 people. There are 12 data files of about 40 questions on maths, spelling, general knowledge, etc, plus a Fun Quiz at the end. (Jan '84)

The Ultimate Crossword

BBC Mode B £14.95 — Alien, Arundel House, Church Street, Blackburn Lancs.

Unlike many other adaptations of traditional games, Alien has added here an 'extra dimension', transforming the humble crossword into the equivalent of Rubic's cube. A useful feature is the ability to save a solution on cassette. Though the clues are not that difficult, Alien reckons it's such a formidable project that they're offering a prize of £1000 for the first correct solution. (Apr '84)

The Ultra

Oric 1 £5.95 — PSS, 452 Stoney Stanton Road, Coventry

Following the Space Invaders idea, the aim here is purely destructive. However the game has excellent graphics. There are 16 screens, each with a different type of alien. (Dec '83)

Uncle Groucho

Spectrum 48K £10 — Automata, 27 Highland Road, Portsmouth, PO4 9OA

By the same author as Pimania, this game is easier to understand but is more conventional and holds less surprises. A Hollywood holiday is offered so that you can meet the film star whose name you must discover by uncovering the 22 clues hidden in the program. (Feb '84)

Up Periscope

Dragon 32 £6.95 — Beyond Software, Competition House, Farndon Road, Market Harborough, Leics

The first in a batch of EMAP linked software, this game is a good strategic battle, along the lines of Shards Empire. It can be played with keyboard or joystick, and is for 1-2 players. The graphics are simple and as the game is in Basic some of the responses are slow but an enjoyable, tactical struggle. (Feb '84)

Urban Upstart

Spectrum 48K £6.50 — Richard Shepherd Software, 23-25 Elmshott Lane, Chippenham, Slough, Berks

An original game in which you can literally escape from reality! Set in grimy Scarthorpe the aim is to keep out of jail, hospital etc and avoid the hazards of urban deprivation. Though the adventure isn't too difficult to solve — just like life itself — getting out of the place is! (Feb '84)

Utilities Package

BBC £9.95 — Salamander Software, 17 Norfolk Road, Brighton

This cassette-based package provides four different utilities for the BBC user; a sound shaper, a screen dump, a teletext editor, and a disassembler. This all sounds useful but it belies its image and falls short of expectations. The package has its problems and the facilities that do work are not that wonderful or original. (Apr '84)

UXB

Dragon 32 £7.95 — Virgin Games, 61-3 Portobello Rd, London W11

In this game the task is to defuse an old war-time bomb, a rare model for which there is no documentation. It is an interesting idea but the game has several bugs. Also the game involves the same sequence of events, so once successful it loses its point. (Jan '84)

Valhalla

Spectrum 48K £14.95 — Legend, FREEPOST, 1 Milton Road, Cambridge CB4 1UY

This is the most exciting game designed for the Spectrum since The Hobbit. The screen is in 3 parts; picture, information and commands. There are 37 characters which can act independently and there are 6 quests. An absorbing game with excellent graphics. (Feb '84)

View

BBC Micro £59.80 — Acornsoft, 4A Market Hill, Cambridge CB2 3NJ

A word processor is the first software requirement for lots of people and View offers many facilities expected of an advanced system. There is full control of the page format and it is easy to change, delete or insert text. However, it doesn't cope with filing and is fairly complicated to use. (Sept '83)

Viza Write 64

Commodore 64 £69 — Viza Software, 9 Mansion Row, Brompton, Gillingham, Kent ME7 5SE

This is an average word processor business program. It will work with a number of disk drives of which the 1541 is recommended. After loading there are about 20 A4 pages of storage space. There are 5 options on the menu, of which loading the disk directory is the most important. (July '83)

Wheelie

Spectrum 48K £5.95 — Microsphere, 72 Roseberry Road, London N10 2LS

Wheelie puts you in charge of a Zedaxaki 500 bike. It's driven by keyboard or joystick and is excellent not only in terms of addiction potential but also the graphics and sound which are both accurate and realistic... and the game features the dreaded 'bouncing hedgehogs'! (Apr '84)

White Crystal

Dragon £6.99 — Romik Software, 272 Argyll Avenue, Slough, Berks

An interesting sci-fi game in which you are the last of a race of wizards. The object of the game is to free the world and restore the crystal from its present black back to pure white. There's a top three scores table, five skill levels and optional instructions. A machine code version would be an improvement as at present it suffers from restricted graphics and is slow moving. (Mar '84)

White Knight

BBC Model B £11.50 — BBC Soft, 35 Marylebone High Street, London W1M 4AA

An excellent game that looks and plays well. The program is not only difficult to beat but is unpredictable, due to the author deviating from standard openings. The only disappointment is the lack of a SAVE facility; thereby each game has to be played in full. (Nov '83)

Wordwise

BBC Micro £45 — Computer Concepts, 16 Wayside, Chipperfield, Herts.

This comes as an 8K EPROM for the BBC and needs at least a 1.0 operating system to run. Being menu driven, the options, loading, saving etc are quite straightforward. It lacks some features necessary for 'professional word processing' but does offer some nice facilities and is recommended for the hobbyist who needs to edit Basic programs as well as normal text. (Sept '83)

The Worm

Lynx 48K & 96K £4.74 — Quazar Computing, 17 Teg Close, Portslade, Sussex

The object here is to guide a wildfire worm called Wilberforce around the screen. There are four separate screens to progress. The game uses both Basic and machine code but is very fast. The graphics are good, though they do not exploit the full colour range of the Lynx. (Dec '83)

Zappy Zooks

Commodore 64 £6.99 — Romik software, 272 Argyll Avenue, Slough SL1 4HE

This game boils down into another version of Pacman, though this is a fairly good version for the Commodore. It's for use with a joystick only and has a number of menu options at the start enabling you to choose the number of 'Zooks' to chase you around the screen. (Dec '83)

Zeus Assembler

Spectrum 48K £12.95 — Sinclair Research Ltd, Freepost, Camberley, Surrey

This long-awaited assembler from Sinclair is disappointing and inefficient in its use of the available memory.

Zip Zap

Spectrum 48K joystick optional £5.50 — Imagine, Masons Buildings, Exchange Street East, Liverpool L2 3PN

In Zip Zap you are the last surviving member of a robotic, intergalaxian cleaning force. As such your movements lack 'vim' but the game's action is smooth and fast and there are impressive graphics. High-scoring is the name of the game and Imagine has provided an infinite number of screens and changing aliens. (Oct '83)

Zzoom

Spectrum 48K £5.50 — Imagine Software, Masons Building, Exchange Street East, Liverpool L2 3PN

A flashy package that lives up to its image. Here the mission is to rescue innocent refugees from a genocidal enemy. There are a range of attack waves, the first consisting of bomber planes, and guided missiles. The game gets progressively more difficult and the graphics are excellent. (Sept '83)

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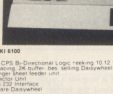

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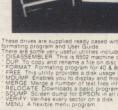

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BUYER'S GUIDE

Sometimes even those who know the home computer market best are amazed by its convoluted approach to marketing. That almost mythical machine, the Acorn Electron is only now, in mid-April starting to appear on the retailers' shelves in reasonable numbers, despite the fact that we received our original review machine in early July last year.

In the intervening period, the gap between the Electron and its rivals has narrowed considerably, and numerous potential buyers have settled for a more readily available machine such as the Commodore 64. Acorn's credibility has been seriously damaged.

That company can take some comfort from the continuing saga of the Sinclair QL — ordering now might get you one by August, then again it might not.

Every effort is made to keep the Buyer's Guide completely up to date, but if you have any comments or suggestions then please send them to Buyer's Guide Editor, Which Micro, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.

Acorn Electron	£199
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Tandy Model 100	£500
TRS-80 Colour	£299
Texas T199A	£90
Texas CC40	£170
ZX81	£45



TA Alphatronic PC

Price: **£347**
Use: **Home/office**
RAM: **64K**
Colour: **Yes**
Interface: **Centronics/RS232**
Supplier: **Triumph Adler 01-250 1717**

For: One of the least expensive units which can still be expanded into a CP/M system.
Against: The documentation is lousy, both in presentation as well as content, and there are some strange omissions in the package as supplied to users — no cassette lead for example. When viewed purely as a home computer, the price is rather high.
Conclusion: Not one of the most tempting packages available to home users, especially since the introduction of the Sinclair QL.

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.

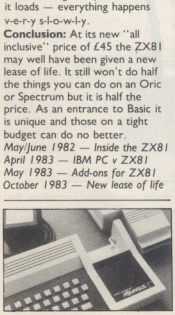
But in recognition of the declining appeal of a black and white computer that costs over £70 — by the time the virtually obligatory 16K of extra memory is purchased — Sinclair has now introduced a £45 starter pack. For this reasonable sum purchasers can acquire a ZX81, a 16K RAM pack and a software cassette.

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

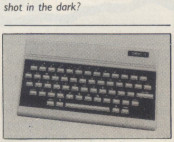
Price: **£70**
Use: **Home**
RAM: **4K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **?**

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 128×64. 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.

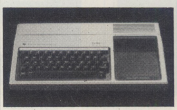
The Basic included is a near-standard Microsoft with many powerful extensions, so when software houses have had time to catch up on the recent surge of new machines, programs for the Oric should appear quickly.

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 1 Review
February 1983 — Comparison: Oric 1 v Spectrum
May 1983 — Oric 1 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**

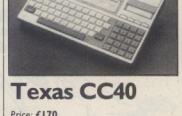
For: Atari's latest runs all the old favourites from the huge reserve of Atari 400/800 software, plus you get a superb new keyboard and much-improved quality of construction.
Against: The standard memory (as with most US home micros) is rather on the mean side, and the necessity of compatibility with 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

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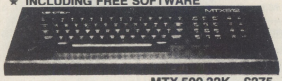

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system will be necessary for some applications — in particular, the "wafertape" floppy tape will be almost essential for permanent data storage. The price is around £150.

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



TRS-80 Colour

Price: **£140-£250**
Use: **Home**
RAM: **16K-32K**
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



Spectravideo SV318

Price: **£186.00 (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 buyng the expansion box.

This makes it essential to budget for a fair amount of extra expenditure if you want a really useful system.

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.

January 1984 — Spectravideo review



Oric Atmos

Price: **£170**
Use: **Home**
RAM: **48K**
Colour: **Yes**
Language: **Basic**
Interface: **Centronics and expansion port**
Supplier: **Oric Products International 0990 27641**

For: The Atmos's keyboard is a definite improvement on the original Oric 1, the design is attractive and the manual is good. Atmos also costs £30 less than its nearest competitor, the Acorn Electron.

Against: Cassette loading, a problem on the original Oric 1, is still not a strong point, and it isn't yet clear if Oric's quality control problems have been eliminated.

Conclusion: Most of the bugs found on the Oric have been cured — maybe Oric's got it right this time.



Dragon 32/64

Price: **£175/£225**
Use: **Home**
RAM: **32K/64K**
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 macerial 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
February 1984 — Dragon 64



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. This is where the revised Oric scores heavily.

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: **Camputers 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.

Camputers 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. Makes the BBC look over-priced.

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

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.

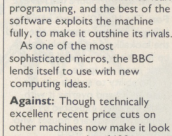
Against: Non on-board RS232 interfaces on the basic model. The error messages in Basic are very unhelpful.

Conclusion: The MTX has features which will appeal to all kinds of home computer buyers, but check on availability.

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.

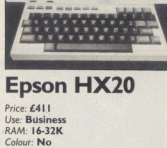
As one of the most sophisticated micros, the BBC lends itself to use with new computing ideas.

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 01-902 8892**

For: Remarkably efficient design gives you a 4×20 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.

March 1983 — Epson HX20 Review

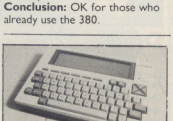
Link 480Z

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.



NEC PC8201A

Price: **£475**
Use: **Business/home**
RAM: **16K expandable to 64K**
Colour: **No**
Language: **Basic**
Interface: **RS232C, Centronics, 2 serial ports**
Supplier: **NEC 01-388 6100**

For: Essentially this is the Tandy Model 100 enhanced with twice as much memory, a better keyboard and more interfaces crammed into the one compact portable unit.

Against: There just isn't enough memory for serious applications.

Conclusion: The NEC 8201A is easy to use, even for beginners. A 16-bit processor could solve the memory problem. However, until CMOS memory prices drop, high expansion costs may deter many buyers.



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.

Conclusion: One of the very few micros which is genuinely easy for even a raw beginner to use profitably for business. The rival NEC machine offers better value, though.

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.

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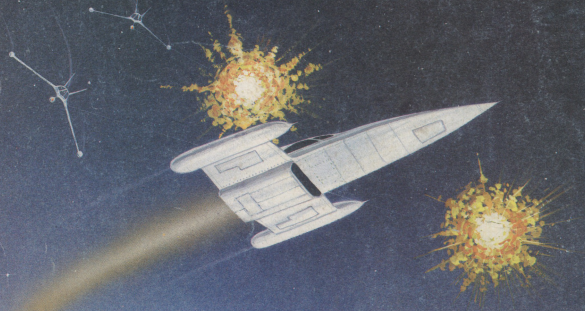

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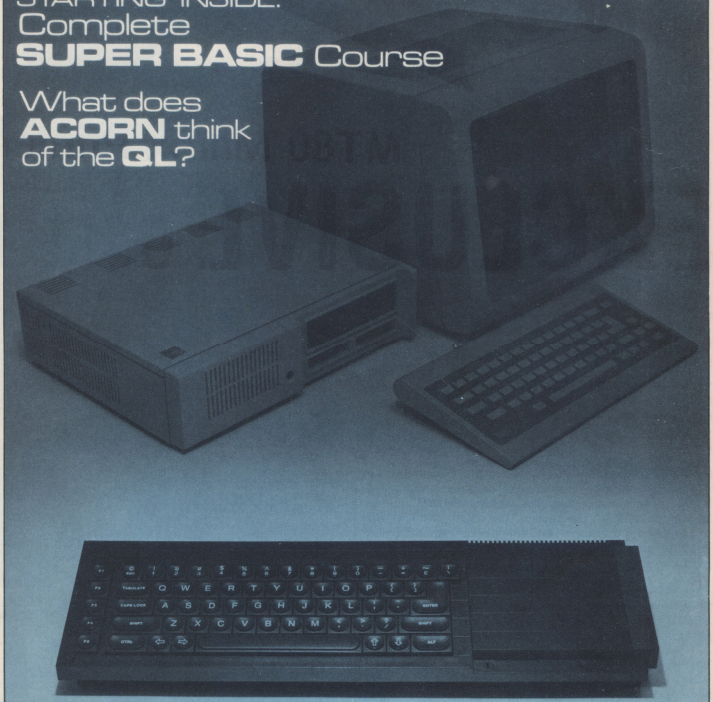

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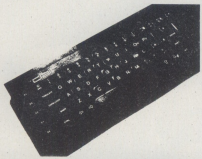

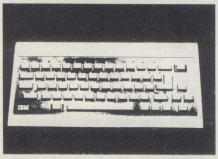







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IN TO

Martin Banks brings

Modems get cheaper

It would appear that the 'umble modem is the latest target for all that 'white heat of technology' stuff.

In the good old days of computing, these devices were big and they were expensive. Not any more, however. Technology has been applied to the beasts and the prices are suffering the consequences. Not that the users will mind very much if the prices start touching rock bottom.

They haven't got that far yet, but they're starting to get close. Only earlier this year, getting the price of a modem under £100 was considered a good trick. Now here's once priced at £84. It comes from a Welsh company, DEL, and is called Telemod 2. This can provide connections to Prestel, Micronet 800 and other viewdata services for a wide range of machines, including the BBC Model B, Commodore 64, Atari, Apple IIe, Tandy Model III and Commodore's business machines.

More info on 0768 66748.



Upgrades for the Beeb

A complete family of upgrade products for the BBC Micro has now been made available from Torch Computers. It gives users the option to take the Beeb machine right through to a Unix-running, 68000-based business machine.

Collectively known as the Unicorn range, the upgrade family has as its star product the 68000 hard disk pack. This effectively turns the Beeb into a keyboard for a high-powered micro. The hard disk unit contains a 68000 processor, a Z80B for running CP/M programs, 256 kbytes of RAM, a 20 Mbyte hard disk and a 400 kbyte floppy. This little lot, together with Unix System III and Torchnet operating systems, costs under £2900.

The existing Torch Z80 disk pack for the Beeb has now been integrated into the Unicorn product family. This offers 800 kbytes of disk storage, a Z80 second processor with 64 kbytes of RAM and a complete set of business software.

The final member of the family is the extension processor, which allows BBC owners already equipped with disk drives from other sources to get into the act. This has a Z80 processor with 64 kbytes of RAM coupled to a full range of business software. It costs £375.

More info on the Unicorn family from 0223 841000.

Serious software

As the number of domestically-oriented professional computer users increases, so the number of packages being introduced to support them also grows. Among the latest to appear are some from an engineering company, Bel-Tech, which has decided that home computers need a little more than games software to play with.

The company has launched two professionally-oriented packages in among a number of releases for the hobby and educational markets. These are Bel Graph and Bel Base, respectively a graphics package and a database system. They are available to run on the BBC Model B, the 48k Spectrum and the Commodore 64, with versions for other machines to follow shortly.



Bel Graph, seen here in action, has been designed to produce line graphs, bar charts and pie charts. Data is entered in four records, each having up to 52 numeric fields, and entry can be either from the keyboard or from an existing data file. It's also possible to enter an equation in either standard or parametric form, so long as legal Basic expressions are used.

Further details on 07462 5420.

DUCH

rings you the news.

Plenty of ROM inside

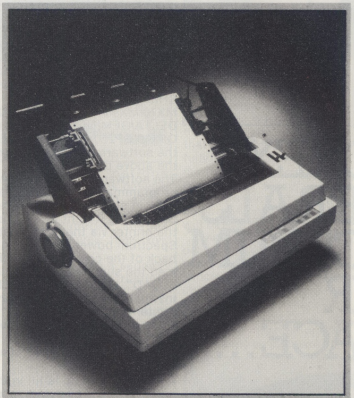
Most of the faithful who sit awaiting the first coming of the QL will know that it comes — when it comes — with some interesting applications packages bundled into the selling price. These programs — a spreadsheet, a database system, a word processor and a business graphics package — all come on Microdrive cartridges — for now, that is.

It seems that the company responsible for the packages — Psion — is considering the possibility of putting the four packages onto a ROM cartridge designed to plug into the left-hand side expansion port on the QL. Though it has one current major disadvantage, the move could offer one or two interesting advantages to the user.

The big disadvantage is likely to be only temporary — cost. There is currently a cost penalty in trying to engineer ROMs containing the packages. For one thing there just isn't the volume demand for such an effort to be made at present. Once the installed base of QLs increases, however, there will be a large enough market to make a plug-in cartridge a viable product.

But why should a user pay twice as much for the same program, seeing as they come 'free' with the QL in the first place?

The main reason is that by using a ROM cartridge instead of a Microdrive tape, the user gains immediate access to the best part of 60 kbytes of additional memory. This occurs because the Microdrive versions will be loaded into the user RAM of the QL so that the program can be run. With a ROM cartridge, there is no need to load into RAM so the space taken up by the program will be free for the user. Keen types could find this facility very useful.



Printing the word

What do you do once you have used your splendid word processing package to produce startlingly erudite prose? Do you switch off the computer and go down to the pub or do you print it out for the benefit of future generations?

If the answer in any way corresponds to the latter then the new Letterpro 20 printer from Qume might prove interesting. Costing £695, it is a daisywheel machine aimed specifically at those who indulge in the art of word processing. It is claimed to be plug-compatible with most makes of personal computer and is supplied with a range of interfaces, including Centronics parallel, RS232 and Qume parallel. Various optional accessories are available for this 20-characters-per-second newcomer.

Details on 0734 884666.

Adding to the QL

Well, yes, we understand about the little difficulty in actually getting any QLs into the hands of users, let alone into the hands of third party software and add-on companies. But that hasn't stopped some of the latter making all sorts of grand announcements.

Indeed, many of these companies are quite open in their attempts to locate a spare QL machine, even for just a few hours, so that they can find out how it works and how to interface add-on hardware to it.

Though they haven't got any machines to play with, it has not stopped some of them introducing new products specifically for the QL market. This can be seen as quite an interesting example of faith in action.

One of the first companies to announce a new product, or to be more exact, a modification of an existing product, is Microvitec, which makes monitor displays. The company has announced a new version of its Cub colour monitor that is said to be compatible with the QL. It features a 14-inch screen with a resolution of 653 × 585 pixels, which the company claims makes it well suited to the graphics capabilities of the QL.

For all those who want to upgrade the unupgradeable (in other words, transport existing Spectrum software into the QL environment) there is a theoretical solution to the problem on the horizon. It is theoretical at the moment because the product does not yet exist (though it might by the time you read this). The product in question is a Spectrum Emulator which will — or should be — available on a QL Microdrive cartridge. Load this into the QL and the machine will then be able to run existing Spectrum programs held on cassette.

The product, being developed by a company calling itself Joe-the-Lion (yes, really), does face one or two problems, however. At the time of writing, it is still seeking programmers with experience of Z80 and 68000 machine code so the programs can be written. It will also require the development of a special interface connector to allow a cassette machine to be plugged into the QL, which lacks such an interface as standard.

Several other companies are rumoured to be working on floppy and hard disk add-ons to overcome the potential deficiencies of the right-hand end of the QL.



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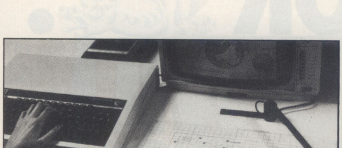
IN TOUCH



Tracing the BBC

Owners of BBC micros will now be able to directly enter graphic images into their systems with the new Digital Tracer from RD Laboratories. This is the latest addition to a family of tracers which already covers the Spectrum.

The tracer consists of two pivotted tracing arms whose rotational movements are monitored by high-quality potentiometers. These are interfaced for direct connection to the BBC Model B.

Accurate reproduction of an image over an area the size of an A3 page is claimed for the arm, which comes complete with a software package that allows a wide range of graphic displays to be used. The basic drawing routines are: thin and emphasised lines, with dotted options; straight line joins between two points; and a fast colour fill for both irregular and geometric shapes, which ensures their vivid display.

There is also a series of geometric constructions available, all of which can be sampled and moved on screen before entry. This facility is also available for text and the combination of these features means that such business applications as bar graphs and pie charts can be created and edited very quickly. The software is available in either cassette or disk format (the latter actually produced on cassette) and the whole lot costs — no, not an arm and a leg — just £65.95 including VAT.

RD Laboratories can be found in Cwmbran, Wales, on 06333 74333.

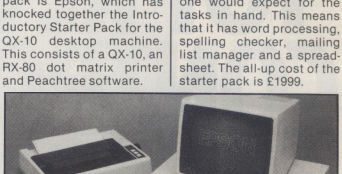
Epson starts packing

What many business people need when they are contemplating getting involved with all this computer-type stuff is a helping hand, especially when it comes to buying all the necessary bits and pieces that are needed to make a fully working system. That is why many companies are now offering 'starter packs', accumulations of all the basic equipment that a user will need to get going.

One of the latest companies to launch a starter pack is Epson, which has knocked together the Introductory Starter Pack for the QX-10 desktop machine. This consists of a QX-10, an RX-80 dot matrix printer and Peachtree software.

The QX-10 is getting to be a well-known workhorse of the 'use a Z80 and run CP/M programs' variety. It comes with 192 kbytes of memory as standard and this can be upgraded to 256k. The printer has a print speed of 100 characters per second, dot-addressable graphics, condensed and double-width printing and a Centronics 8-bit parallel interface as standard. It comes with a tractor feed and has 128 character styles and 11 character sets.

The Peachtree business software includes all that one would expect for the tasks in hand. This means that it has word processing, spelling checker, mailing list manager and a spreadsheet. The all-up cost of the starter pack is £1999.



Lynx grows a Laureate

Having played the bridesmaid to Sinclair and Commodore in the home computer/games-playing market with its Lynx 48 and 96 models, Camputers is making an early and concerted pitch to be the bride in the emerging small professional computer marketplace.

It has recently launched a 128 variant of the Lynx and re-packaged it as a pukka small business/professional machine to be sold under the name Laureate.

The main feature of this machine is the incorporation of the CP/M operating system. Now this may not be called a feature by some people, especially as it is the ordinary 2.2 version of the system which is included. But dear old CP/M is an important tool in getting into the small business market quickly. Innovative it is not (well, not now) but it instantly brings with it a wealth of available applications software and that is what the small business user requires.

The Laureate has 128 kbytes of RAM, although only half of this is directly available to the user. The rest is taken up by the video memory. This can provide display resolutions of 512 by 248 pixels, each of which is individually addressable in up to eight different colours. For text work, it provides 40, 64 and 80-column displays, plus compatibility with the 48 and 96 Lynxes.

It comes with an on-board 24k of ROM which holds the Lynx extended Basic. This incorporates high-resolution graphics including circles and shading.

A professional system is no good without secondary storage of some sort and the Laureate is not exception to this rule. Disk drivers are available for the machine, with the user specifying whether CP/M 2.2 is to be the operating system used or whether it is to be Camputers' own DOS. Camputers itself will be making one or two applications programs available, all from US software house Perfect Software (a modest bunch). These include Perfect Writer, Perfect Filer and Perfect Speller. The basic box from Camputers will cost £399.95 including VAT — coincidence, huh?



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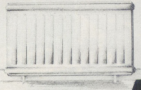



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IN TOUCH

The non-invasion

Over the past four or five years there have been many predictions that the Japanese were coming to take over the world's personal computer business. The industrious orientals had managed to pull it off in motorcycles, cameras, hi-fi and televisions, so there seemed no reason why they shouldn't in the consumer computer marketplace.

Notwithstanding their successes in other industries and market sectors, the Japanese promptly ignored all these predictions of their success and failed to take the market by storm. In fact they all but failed to show at all, except in a few areas. Even in the world of the desk-top small business system, the Japanese manufacturers corporately missed the boat. And as IBM showed so graphically with its PC, there was a very big boat waiting to be caught.

The basis of the Japanese failure was software, or more specifically, the lack of it. Because both systems and applications software has proved to be at least as important as hardware in the personal computer market, and because the Japanese have taken no real position in either area, their hardware has not been well received, generally speaking.

To make an impression on a maturing marketplace, they needed what was demonstrated years before by the CP/M operating system and the S-100 bus: a degree of standardisation.

This the Japanese manufacturers now have — as does any other company wishing to adopt the standard. Microsoft, the US systems software house, launched the MSX software and software package specification last year with the Japanese specifically in mind. Here was a package around which they could all build a standardised range of machines. With the right parts standardised, software companies would be able to produce programs just once and have the whole MSX-oriented marketplace to aim at. That, at least, is the theory.

The potential advantages of MSX are many, not the least of which is the fact that software producers can target the whole range of machines in one go. Another is the fact that there is a degree of compatibility on the software side between MSX and its bigger brother in the 16-bit micro field, MS-DOS. This compatibility allows for a degree of file transfer, meaning that an MSX machine can start life as a simple, stand-aline games player like so many other home computers currently available, and then grow into a tolerable professional computer capable of doing some real work with real files and tasks.

This aspect is attracting a modicum of attention for the MSX family, for the machine could become among the front-runners in the just-emerging professional computing market. But to develop this area, commonality and compatibility are crucial, and there are hints that the Japanese are, in practice, about to 'blow it' once again in the computer business.

The early MSX machines are now starting to appear. Not in Europe yet, but soon to arrive, no doubt. Not surprisingly, there are differences between them, which shouldn't normally matter — but it appears they might.

True to form, each Japanese manufacturer has tended towards trying to build a better 'mousetrap' than its competitors, adding more gizmos and things to the basic standard package. The end result, according to word emanating from the orient, is that some of the 'additions' and 'enhancements' to individual MSX machines are creating situations in which software written to accommodate these differences won't always run on other machines...

If this proves to be largely the case with the Japanese machines then it is likely that most of them will die in the Western marketplace.

Computer in hand is worth two in post

By the time you read this there is a chance that someone, somewhere will have gotten their hands on a real live for sale type of QL. This is to differentiate it from the just-made-a-few-and-given-them- to- journalists- for-review type of QL.

As was wearily predicted by ageing journalists sitting at the back of the room at the QL launch, delivery schedules were geared to the old maxim of '28 days but don't say *which* 28 days'. This of course meant that the many people who fired off cheques and credit card numbers to the company and sat back expectantly have continued to do so, some with a little tear in the corner of their eyes.

Not surprisingly the company is not commenting on the many rumours now circulating as to why there has been the delay, except to say that there have been some 'development problems'.

In this area there have been rumours about problems getting the multi-tasking operating system to work and with getting the new version of Basic into the ROM.

There are those cynics who have suggested that the QL would only ever appear 28 days after the computer press started making totally unjustifiable accusations of a debacle in the management of the project, though such views are not given much credence.

What has proved more worrying from the point of view of many of those people who have placed orders is the fact that their money has already been taken. This is not to imply that Sinclair has just pocketed the loot and not delivered but the fact is that those who have paid for their QL by cheque have had them cashed. The money has been placed in a trust fund.

This posed the question, 'what happens to the interest from the fund?' Some cheque payers have talked about getting their share of the accruing interest the fund is generating, but Sinclair managing director Nigel Searle has claimed that it would be too difficult, administratively, to carry out this task. This is indeed an interesting observation for a company selling high technology equipment aimed at information processing.

What the punters will get is a 'free' gift from Sinclair in lieu of the interest earned. Some cynics have suggested that this might be a Black Watch but it will probably be some additional software. Given that some people will have waited four months by the time their QL arrives, they will have four months' accrued interest to account for. Look for software worth at least £15 *to Sinclair* — a retail value of £40-£50.

THE JUNIOR

Peter Rodwell gets his hands on IBM's latest, the PCjr, ar

The latest market to come under the attack of the micro makers is the boundary between home and office. The theory is that many businessmen want a computer which is cheap enough for the home but can be used for more serious things, too.

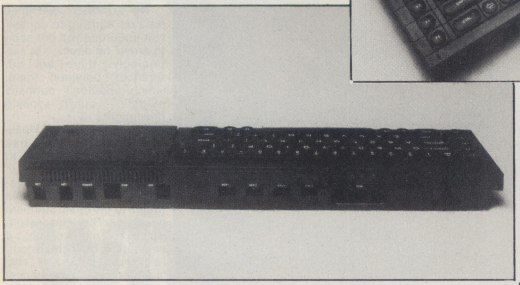
Trying to sell traditional business machines to home users has, of course, never been successful because the hardware is just too expensive. And although the idea of trying to use a low-cost home machine for work has been pushed by the home computer manufacturers for years, it has never been a very convincing sales tactic: most home machines are patently unsuited to business use, although this might not often be apparent to somebody looking for a small business system — dominated the big mainframe and mini market and has achieved similar status in the USA micro scene with its PC. Now it has gone 'down-market' with its PCjr, a 'sawn-off' PC with the right features to appeal to the home/games buyers but with many of the business capabilities of its big brother.

Sinclair has captured the major slice of the European home market with its low-cost machines and has now gone 'up-market' with a business micro capable of performing some neat tricks yet still cheap enough — just — to cream off the top of the home buyers, specifically (one suspects) people thinking of buying a BBC machine.

Although we can compare the two machines on paper, one big unknown is still throwing a spanner in the works: we don't yet know how much the PCjr will cost in the UK. It's pretty obvious that it will be much more expensive than the QL, possibly around the price of an Apple IIe. The PCjr's European success will depend heavily on its price. If it's significantly more than the QL, then it could probably take over the slot about to be left vacant by the dying Apple II. It will, however, find the going very tough — at least in Europe — as this niche will become the arena for some very tough competition over the next year or so.

Alternately the home/business boundary could be wide enough for the PCjr and the QL to fill opposite ends of the spectrum (sorry). All this preoccupation with 'market positions' is, by the way, just one sign that the micro market is maturing: increasingly, computer manufacturers are thinking in terms of model ranges to fit different pockets, just as car manufacturers have been doing for decades.





QL has bigger, nicer keyboard (top) and tidier back panel (above).

The Sinclair QL

As *QL User* is all about the QL, I won't waste space here by going into its full specification again. Instead, let's concentrate on the features which will appeal most to its buyers, both home and business.

First the businessman. There's no point at all in buying any business computer unless software is available to turn it into a useful business tool: writing your own stock control package is so time consuming — even if you're a professional programmer — that it simply doesn't make commercial sense. The exception is if your requirements are so arcane that there simply isn't any software available off the shelf. Then you'll have to write your own or employ a programmer to write it for you. Generally, though, a major criterion for the success of a business computer is the availability of useful business software to run on it.

The QL comes with four business packages included in the price. We until they tried using the machine.

Now we have two major companies competing for the home/business boundary, IBM and Sinclair. The two have taken different approaches, reflecting their backgrounds: IBM has long

R V THE QL

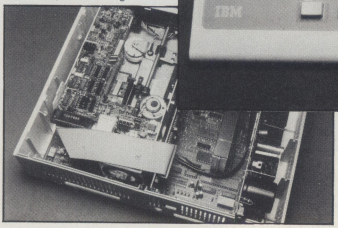
jr, and assesses its chances against the QL.

have yet to evaluate these fully, so we cannot yet comment on how likely or otherwise they are to meet the needs of QL buyers. However, on paper at least, they cover the major applications areas in business computing: word processing, database management and spreadsheet work. A fourth package allows graphics to be created (pie and bar charts and graphs, etc); this may not strike many businessmen as essential but it's a fast-growing applications area as it offers a more efficient way of presenting information.

By opting for its own operating system, QDOS, rather than an industry standard one, Sinclair has isolated the QL from a vast pool of ready-to-run software. At launch time, no software was available for the QL other than the above-mentioned freebies. On the face of it, this is a big disadvantage, but you can be sure that software houses are already hard at work producing QL versions of existing packages and writing new products. The forthcoming C compiler for the QL will make this task much easier — there is already a large amount of software written in C which could be ported onto the QL.

At the moment, then, the QL buyer could be rather frustrated if the QL's own software doesn't meet his needs. Within a very short time, though, there will be plenty of software to choose from, even though you might not be able to run your favourite CP/M package on the Sinclair.

For the home/hobbyist QL buyer, the situation is not quite so critical. For a start, many people will be content to write their own software, but in any case there'll be no shortage of games — initially straight Spectrum translations — for the machine. With the extra memory and better screen resolution (especially when used with a colour monitor rather than a TV), we can look forward to seeing some really good games on the QL.



You can't touch-type on the PCjr (above).

The IBM PCjr

The PCjr is IBM's first-ever venture into the home market, just as the PC itself was Big Blue's first — and highly successful — attempt to join the micro league.

With the PC, IBM very clearly got it right at the first attempt. After all, it knew very well what the business computer market was all about and it took the trouble to research the micro scene very carefully, and to fit into it rather than to try and make the micro industry conform to the IBM way of thinking. (Of course, in a subtle way, it *did* force the market round to the IBM Way by making its machine so successful.)

But whether IBM will have the same success with the PCjr is very debatable. The domestic market is something entirely new to IBM and there are signs that it has not researched this area as thoroughly as it did the business micro market.

Firstly, the PCjr is expensive by home standards. This might not have been too much of a mistake in itself, but there are two problems:

The PCjr is not fully compatible with its bigger brother. There is now a massive pool of software for the PC and some of it just won't run on the PCjr, including MicroSoft's smash hit Flight Simulator. Thus IBM has in one stroke destroyed a gigantic potential market: those people who have a PC at the office and want to carry home a few disks to work on in the evening with their PCjr. Sure, the machines are disk-compatible, but there's no guarantee that the software you use at work is going to run on your PCjr at home.

IBM's second problem is the new Apple Macintosh. This has been received with huge acclaim in the States and is already *the* machine of the moment. It costs more than the PCjr but it has those sexy little icons which, in the States, are compulsory if you don't want your neighbours to

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WHICH MICRO? & SOFTWARE REVIEW

THE JUNIOR V THE QL

think you're slipping off the leading edge.

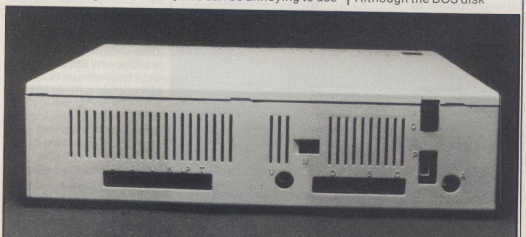
In Britain, the PCjr's future is even more unsure. To date, IBM will not even say whether or not the machine will be sold here. Already badly hit by the successes of the Sirius and Apricot, IBM will be looking long and hard at how its PCjr will fare, not only against the QL but against low-cost business alternatives. Signs are that

optional Cartridge Basic ROM pack before you can get down to really interesting things.

The keyboard has far fewer keys than that of the PC, but the use of control, Alt and Func keys, allows you to carry out all the PC keyboard's functions, albeit less conveniently. The keyboard is linked to the main unit by an infra-red link, although in practice this can be annoying to use

up to two joysticks (which are excellently constructed), a thermal printer and a single 320k 5¼ inch disk drive with DOS 2.1 to operate it. The machine then becomes disk-compatible with the PC but, as noted above, not wholly software-compatible.

Incidentally, if you buy a disk-based PCjr, don't think you can get away without buying Cartridge Basic too. Although the DOS disk



Plenty of (non-standard) connectors on the PCjr.

PC sales in the UK have mainly been to large corporations with DP departments which know of no other computer manufacturer; stacked up against many 16-bit machines, the PC offers poor value for money (even after a recent, desperate 20 percent price cut) and those magic three initials don't carry as much weight here as they do State-side.

Marketing apart, though, what has the PCjr to offer? Well, it does come as a neat package, about half the size of the PC, but with a nasty keyboard and 64k of RAM. The machine has a simple Basic in ROM, which allows you to use some — but by no means all — of the machine's capabilities; there are two cartridge slots at the front, into one of which you must insert the

as it only really functions well when the keyboard is pointing straight at the box; there's a cable to join them together available as an optional extra.

There are outputs for a domestic TV set and for an RGB monitor. Using the IBM PC colour monitor, this latter gives a sparklingly crisp display — but you need to buy an adaptor to plug in the display. In fact all the I/O sockets on the PCjr are non-standard. Graphics and colour capabilities are as for the PC, ie good but not outstanding. The machine has an 80-column display mode but you need a monitor (monochrome or colour) to use it.

You can upgrade your PCjr by adding a 64k RAM expansion to get better graphics and you can add

contains two Basics (standard MicroSoft and Advanced Basic) neither will work without the cartridge — you just get a message saying 'Cartridge Required' an the machine crashes!

One thing the PCjr has got going for it is quality, which, frankly, has never been a strong point of Sinclair machines. When IBM builds a computer, it does it well, with strong, nicely detailed plastic mouldings and a really solid feel. In the case of the keyboard, the feel is too solid — those awkwardly-shaped keys are made more difficult to operate by requiring a heavy push down, making touch-typing very difficult indeed. Doubtless at some stage soon, IBM will offer a full-sized PC-style keyboard for

the PCjr as an option; if not, some enterprising manufacturer will.

Conclusions

How, then, do the two machines compare after this brief overview? On paper at least, the QL wins hands down. Although no UK price has been announced for the PCjr, it will almost certainly cost at least almost twice the price of a QL for the basic, 64k, diskless model. Add the extra memory and the disks and the price will be heading towards the bottom of Apricot territory but providing you with a lot less computer.

Of course, if you have a PC at work and you want a similar but cheaper machine to use at home, the PCjr would obviously be very much in the running, apart from the nagging doubts about software compatibility which have yet to be fully resolved. It's certain, though, that many software houses — especially in the US — will start to produce PCjr versions of existing PC packages where necessary . . . once they can tear themselves away from their Macintoshes that is. At worst, you might have to buy PCjr versions of some of the packages you use at work, but you'll be able to use the same data disks.

Meanwhile, even without being compared to the PCjr, the QL has a lot going for it, despite the inevitable Sinclair non-availability situation which has delayed deliveries. While there may not be vast pools of software available for the QL, if a degree of IBM compatibility is unimportant to you, then the QL is the one to choose. After all, even if you have to wait for Sinclair to deliver the goods, the wait should be shorter than for the PCjr.

BUDDING RIVALRY

by Sid Smith, News Editor, Micronet 800

If you're wondering what links the QL and Acorn, look at these remarks, all made at the QL launch either by Clive Sinclair or Nigel Searle:

'The BBC Micro was designed a long time ago, so it's pretty much behind the times.'

'Unlike the BBC machine, the QL will not be made overseas.'

'We're certainly still interested in talking to the BBC about the QL or a derivative becoming the BBC Model C.'

'We would very much like to redress the balance of what we have long considered a most unfair arrangement whereby a respected competitor gets massive free publicity from the BBC.'

'Look at Acorn's shares over the next few days to see what impact the QL will have.'

Such gleeful aggression, plus a remarkable price 'coincidence' should convince you that the BBC Micro is seen by Sinclair as the QL's chief rival.

The QL's success may well spell death to the BBC machine.

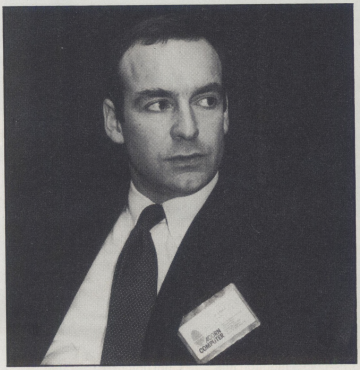
Schools bid

Sinclair has already made moves to invade two prestige areas where the BBC Micro has always been dominant. The first of these is the education market.

Sinclair is well aware of how exposure at school can extend into the home. And the company is determined that the QL will be included in any future list of machines qualifying for the Government's educational subsidy.

David Parks, Sinclair's education chief, told me that the Government's 50 percent subsidy on computers for schools induced what he called 'the Rolls-Royce syndrome' whereby teachers consider that they might as well get £200 off a BBC machine rather than £60 off a Spectrum.

In future that syndrome, combined with the QL's intrinsic merit (just consider how useful the machine's ability to network with Spectrums will prove for a school full of Sinclair machines), is bound to operate to the detriment of the BBC Micro.



Acorn's Chris Curry: 'What about Unix?'

Beeb battle

The Acorn machine's second great area of strength lies in its association with the BBC.

The remarks from Clive Sinclair quoted above indicate how seriously his company takes Acorn's exclusive link with the Corporation. Even before the QL launch, meetings took place between Sinclair and the BBC to discuss the adoption of the forthcoming machine as a BBC Micro.

Nigel Searle has said that he is not asking the BBC for an arrangement which excludes the Acorn machine: 'Anything which favours the emergence of a single machine is premature. It's conceivable that we could be talking about letting our machine be one of two. I don't think it's good for children's education if the market is not open to new products and I wouldn't be happy about an exclusive arrangement.

'The BBC Micro has an aura of official backing. It's that exclusivity that bothers us.'

It should be pointed out, however, that Nigel Searle's claim to be content with sharing the BBC's endorsement with the Acorn machine was made before the QL was launched. Since the machine appeared, the idea of any market sector being peaceably divided between the computers has become untenable: they both have exactly the same price; the QL has a higher specification.

These two facts mean that the old situation in which Sinclair and Acorn machines were sufficiently separated in price not to compete seriously with each other is now over. Any sale won by the QL is a sale lost by the BBC Micro — and vice versa.

But having said all that, there are still powerful reasons why the BBC might want to continue its association with Acorn.

The reason given in public is that the Corporation feels that any new BBC Micro must offer compatibility with the existing machine. Indeed, one BBC executive told me that he considered the BBC would be breaking its Charter obligation to educate the public if it compromised its Computer Literacy Project by not maintaining this compatibility.

The second — and more private — reason is money.

Put simply, the BBC has sunk an enormous amount of time and money into the Acorn machine and it continues to reap handsome returns on its investment.

The Corporation's association with Acorn dates back to the design stage of the BBC Micro. Many of the machine's principal characteristics, including the existence of Mode 7 and the specifications for BBC Basic (on which the Corporation still holds copyright) were laid down in the early stages of that association.

And if the re-naming of the Acorn Proton to the Acorn BBC Micro has transformed Acorn, its

effect on the Corporation's balance books has also been beneficial. The BBC's royalty earnings on the Acorn micro have been placed at anything between £3½ million (which is too low) and £15 million (which is probably too high).

Either way, it's a handy sum. As an Acorn man once muttered, 'Just take it from me, we're definitely helping to keep your licence fee down.'

In contrast, the BBC would earn nothing at all from promoting the QL and though the Corporation might eventually feel obliged to embrace the technical sophistication offered by Sinclair's machine, it has no incentive to do so soon — or to the exclusion of the Acorn device.

But what has Acorn to say about the QL?

I brought first news of the QL to Acorn, delivering a press pack into the hands of Chris Curry on my way back from the QL launch. His first words were, 'Unix! It doesn't say anything about Unix.' That, in effect, has been the Acorn reaction ever since.

The QL, says Acorn, is a business machine which has been launched without compatibility with any of the established business operating systems such as Unix. For that reason it will fail, says Acorn.

'The QL is very good,' conceded Herman Hauser, the other co-founder of Acorn. 'But it's a cul-de-sac. Nowadays computers must fit in with other computers. We can be very ambitious — and Sinclair has always been ambitious — and think that we can create our own standards but in fact computers nowadays must always give compatibility.'

Acorn, of course, has hit a sensitive spot with this accusation; the lack of compatibility with any standard operating system — coupled with the Microdrives — is probably the feature of the QL most likely to upset the business buyer.

Acorn's stress on this aspect of the QL probably springs from its own preoccupation with standard operating systems for its developments for the BBC Micro and for the forthcoming Acorn Business Machine.

For the BBC's 16032 second processor, Acorn has engaged Logica to produce a version of Microsoft's Xenix, an adaptation of the Unix operating system which Sinclair chose to ignore. And Dr Martin Richards of Cambridge is known to be working for Acorn on a version of the Tripos operating system, again for the 16032.

Business ambitions

Xenix and Tripos will also have relevance to the Acorn Business Machine (ABM) which Acorn intends to launch sometime in the latter half of this year. It is believed that one variant of the ABM, intended for computer-aided design work, will contain the 16032.

Acorn has said nothing officially about the specifications of the ABM but a recent report of remarks made by Chris Curry would seem to confirm industry speculation that the machine will comprise the established BBC board, with a Z80 second processor, disk drives and a VDU, all at around £1000.

The presence of the ageing Z80 chip is explicable by the access it gives to business software running under the CP/M operating system. But many observers would agree with Nigel Searle, who said at the QL launch, 'I think that the Z80 giving access to business software through the CP/M operating system is very rapidly going to be outdated. I don't think that the business software available through CP/M is going to meet the needs of the huge new markets for professional computers.'

Indeed, if the speculation about the ABM is correct, and if Acorn takes no steps to upgrade the machine as a result of the QL, the whole project looks shaky, especially bearing in mind that the ABM is not expected to appear for at least another six months, by which time the circa-£1000 16-bit business micro scene will be ultra-competitive.

And although there are compelling reasons why a computer costing around £1000 should offer a standard operating system like CP/M, the same is not true of the £399 QL.

Acorn's entire point about the lack of Unix, or any other software standard, provides an incomplete defence. It ignores the question: If Acorn can describe the £399 QL as a failed business micro, how would it defend the £399 BBC Micro from the same charge?

It confuses another: Why should a QL need compatibility with 100,000 other micros when it can have compatibility with 100,000 QLs? Or to put it another way, doesn't a business machine sold in sufficient numbers automatically become an industry standard?

It begs a third: How many word processors or spreadsheets or databases or graphics toolkits do most people need anyway? If the Psion software is of reasonable quality, what more will the average businessman want?

In short, the QL seems not only to threaten the BBC Micro in its present form but it also attacks Acorn's long-cherished but long-delayed ambition to move the BBC Micro upwards into the business sector. So what is Acorn going to do about the QL?

Well, the delivery delays which have afflicted Sinclair, and the inevitable shortages which will continue until QL production is ramped up, have given Acorn a brief breathing space.

Eventually, though, the company will have to decide between dropping the price of the BBC Micro and upgrading its specification. Of the two, the least likely would seem to be a price reduction.

In the years since the launch of the BBC Micro, Acorn has been almost unique in the micro world in resisting price cuts. A reduction now would surely seem too great an admission of defeat.

I also suspect that the Acorn management would have a temperamental aversion to conceding that its machine was worth less than the QL.

So perhaps Acorn will take advantage of that extraordinary facility of the BBC Micro to accept plug-in software and sell the machine — as in the States — with a couple of 'sideways' ROM chips already fitted.

Whatever Acorn does, it had better be good.



Herman Hauser: 'It's a cul-de-sac.'

SEARLE'S S

Adam Denning speaks to Sinclair MD Nigel Searle

Shortly after the launch of the QL, I went to Cambridge to talk to Sinclair's managing director, Nigel Searle. The full transcript of this interview appeared on Micronet 800 shortly after the interview but hindsight makes his words rather interesting to us now.

At the time we — and, to all intents and purposes, he — were under the misapprehension that the QL would be shipped on time at the end of February. With this now proven untrue, Searle's ebullience and overt willingness to talk seem perhaps a little unfounded.

Our initial questions revolved around what Sinclair saw as its market, for the QL specifically. At that time, Searle was unable to expand upon his expostulations at the launch, when he said that they really had no idea what the market was going to be and they had no particular bias towards any one particular sector. To put it a little more simply, anyone who buys a QL or wishes to buy one is Sinclair's market.

The software bundled with the basic machine, I said, hints at a leaning towards a 'home executive' or small businessman. 'Yes,' said Nigel, 'but that doesn't mean that we are devoting our intentions wholly or solely to him.'

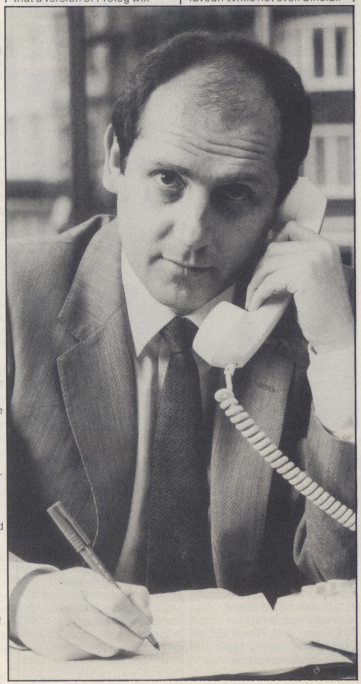
Searle then went on to surprise me by expanding on what he personally says is the biggest initial QL market — but he made it clear that this was not necessarily a corporate view.

Education — particularly higher education — is what Sinclair seems to be aiming for. The degree of annoyance in the Sinclair camp over the BBC's long-discussed decision to give arch-rival Acorn the computer literacy contract became really apparent since the QL launch and Sinclair hopes that the one relatively untapped area of education — degree courses — can be the QL's forte.

And perhaps it can. With unofficial but highly influential sources indicating that Imperial College, for one, would very much like to adopt a standard machine for all computing courses, with all students having to make this obligatory purchase, it seems that educational establishments are taking Sinclair's latest baby with rather more than just a pinch of salt.

These rumours are further strengthened by the news that the Open University also wishes to adopt a standard machine *and* that it was given the specifications of the QL by Sinclair much in advance of the launch date. The OU prefers not to comment . . .

If education is the big market, what moves is Sinclair taking to see this one through? Already known to be in development are compilers for Pascal — long the language of the scholars — and rather more interestingly, C. From this C compiler it is almost certain that a version of Prolog will appear, as the company dealing with Prolog in this country — Logic Programming Associates — not only has a version of its interpreter written in C already but is in very close contact with Sinclair. Prolog is said to be the language of the future and Sinclair certainly seems to agree. Having beaten Acorn to the mark with a version of the language for its earlier Spectrum, it is stacking the cards very much in its favour. While not even Sinclair would claim that the QL is a fifth-generation machine, Prolog is plugged as being a fifth-generation language, hence the enormous degree of importance attached to it by the more adventurous of educationalists.



Logo, too, which Acorn seems to be using as its chief educational lynch-pin, is almost certain to be made available sooner rather than later, but this is really aimed at the altogether younger end of the spectrum, primary schools and early comprehensive years.

Of more interest to universities will be the IEEE interface, ideal for laboratory control applications, and the 68000 assembler, with which students can learn one of the most advanced of assembler languages in a situation where they can actually use the fruits of their labours, unlike many establishments now which tend to teach the machine codes of outdated processors on systems for which any practical applications are hard to find. No one gets satisfaction from causing LEDs to flash on and off these days — computers have caught on in too large a way for that.

One thing very much in Sinclair's favour is that the QL is the same price as the BBC Micro — yet even Acorn is forced to admit that the two machines' specifications are poles apart. The QL design is, of course, at least two years younger, a point made by Acorn more than once, but such is the advance over the older machine that the stage is finally reached where there is no choice: to buy the BBC Micro would almost certainly prove to be a folly *unless* an institution is already stocked up with BBCs.

An education market is also almost certain to be happy with the QL's storage medium — Microdrives — while the other prospective market, business, is not. As a seasoned user of these devices, I would agree with Searle that such fears are unfounded, but although businessmen are relatively computer-naive, they know what they like. What they like is a large system that does everything they want with speed, efficiency and convenience. Money doesn't really have much bearing on their level of choice. If it does the job, buy it. Nigel Searle had a lot to say about this.

QL User: 'How reliable do you consider the Microdrives to be, in serious business use?'

Searle: 'The Microdrives are, I believe, at least as reliable as

SOTHINGS

floppy disks.'

QL User: 'The review copies we had when they first came out were not reliable. It was only when the production models were released that they proved to be better.'

Searle: 'Yeah. Any mechanical product like that, particularly one which is operating on the microscopic scale and speed of the Microdrive, is very difficult to make perfectly. We've got a continuing program for improvement to the Microdrive. We've been carrying out surveys of people who have bought Microdrives and in particular of people who will have been using them very heavily. We recently wrote to all the software houses to which we have supplied Microdrives to ask them in detail for their experience in using the Microdrives. Recognising that they are not the sort of people who would be able to give us accurate descriptions of any problems they had. And I'm pleased to say that they were remarkably favourable — and the Microdrives in the QL will be improved over the Spectrum.'

QL User: 'But I've heard that the Microdrive ROM in the Spectrum is about to be changed. One of those very software companies told me that.'

Searle: 'I can't confirm that — I simply don't know.'

QL User: 'Would you expect it?'

Searle: 'I see no reason why it wouldn't be if we're able to improve it. But the gate array that controls the interface between the machine and the Microdrive in the QL is quite different from that in the Spectrum and I think that there will be substantially improved performance. But the Microdrive is really very encouraging — the return rate both for defective units and units with no fault where the user has had a problem with it is actually lower than on the Spectrum and we've by now got the Spectrum's return rate down very, very low. Now that reflects the fact that people buying the Microdrive are still pretty experienced users who therefore aren't going to return a product that hasn't got anything wrong with it and are fairly understanding about the fact that if you're going to run it for eight hours a day you don't go on using the same cartridge for six weeks, that you make back-up copies, and so on. But it's pretty good, and the QL will be even better.'

QL User: 'Do you accept that the cartridges are too expensive?'

Searle: 'Umm.'

QL User: 'A reduction of 50 percent would be a much better idea to compare with floppy disks, surely?'

Searle: 'Yes . . .' (Long pause) 'I think that eventually cartridges will be less expensive. We have invested an enormous amount of money not only in designing it but also in getting it into production. We've had to design all the equipment that splices and winds the tape automatically, for example, and we didn't feel that putting a premium price on the cartridges initially would seriously deter people who wanted to buy Microdrives.

'In any case I'm sure you're aware that until recently we had limited production on Microdrives and therefore there weren't that many people buying Microdrives and wanting cartridges anyway. Also, we in all honesty didn't want to create a situation where the cartridges were so cheap that everybody buying a Microdrive said, "I'll have 20 please". We would then fall into the trap that we suddenly couldn't supply cartridges and if you're trying to sell a Microdrive or a QL and anybody has any serious fear about the supply of cartridges then you seriously affect the product. We are confident that we can supply all the cartridges that people reasonably want at the price at which we offer them.

'Obviously we can't supply them *all* full stop because if they were 10p each we wouldn't make as many as people wanted. Our objective is to make certain that we never have to say to anyone, "Sorry, you can't have a cartridge". To a certain extent we've got to price the cartridges to make that happen.'

QL User: 'So at some time there's got to be a policy like cassette duplication with Microdrive duplication — especially with the QL.'

Searle: 'Yes, you can duplicate cartridges in real time where you simply have operators with a bank of Microdrives and they plug them in and take them out.'

QL User: 'Isn't that a little unwise with the scope of QL software that could exist?'

Searle: 'Well, if you figure it out, you can do an awful lot. If you've got the whole thing perfectly set up, the only time it takes for an operator to record one cartridge is the time it takes to put it in and the time it takes to remove it, because while everything else is happening to that cartridge the operator is putting in and taking out other cartridges. So how long is that going to take? Say 10 seconds per cartridge, 360 an hour, 2000 a day, 10,000 a week *per operator*. So 50 operators means half a million cartridges a week, two million a month, pre-recorded. It's not impossible. However, having said that, and even recognising the unemployment problems, our instinct is to try to automate the process wherever possible.'

Well enough on the Microdrives. Only time and experience can really tell if these devices are going to cause problems to QL owners, but perhaps the really sceptical can gain comfort from the fact that Sinclair itself is shortly to bring out a hard disk interface for the QL and at least one company has plans for a floppy disk interface to allow normal drives to be used with the QL. Perhaps this is a retrograde step and we should really be showing rather more confidence in our technologists than we do at present. One thing stops us from doing this, however: the continuing lack of shippable QLs. With all the people who ordered QLs getting a letter from Sinclair in mid- or late February warning them of possible delays on the QL up to the end of May, and a similar letter to the press warning that review copies and first commercial shipments will not now be made until the end of March, there aren't that many people left who don't feel at least somewhat jaded over the QL debacle.

Some of us still remember the Spectrum fiasco, followed by the Microdrive fiasco, and Sinclair, despite many assurances, has not been seen to have done much to offset these most dangerous of fears. Whatever the outcome of Microdrive reliability, business users will certainly not put up with a 'when — if ever' delivery schedule for their computer.

On this tack, which was not mentioned too much at the interview as everyone seemed to believe Sinclair on this point, Searle merely commented 'very possible' to my claim that someone working on the QL production line at Thorn-EMI told me they had ordered every 68008 processor in existence. Searle went on to say that although they didn't have an exclusive arrangement with Motorola, the manufacturer of the 68008, he thought it very unlikely that any other manufacturer or individual would find it all that easy to lay his hands on one.

On the software side, Searle said that four software houses had been given QLs to develop software, but he could only be drawn into naming two of them: Psion, which wrote the software packaged with the QL and which has long been closely associated with Sinclair; and GST, which wrote the QDOS operating system and SuperBasic. I was led to believe that the other two were very much education based but that was as far as I got.

The QL's operating system, QDOS, is new to everyone — a move which is wholly typical of Sinclair philosophy — and called 'arrogance' by Acorn. As the QL is based around a 68008, there is no hardware reason why the QL should not be made to support some other operating system such as the (horrible) minicomputer operating system Unix, or the rather better but under-marketed Tripos or CP/M-68K. Searle thought it highly unlikely that any other operating system would be required and he also said that he doubted if, at present at least, QDOS would be transferred to other 68000-based machines.

He'll talked briefly about other machines, the only one of any interest to him being Apple's Macintosh. He had never seen the machine himself but reports had left him with the impression that it was a wonder machine, not something with which everyone would agree!

Finally, the future. While I was there he was on the phone to ICL, which is known to be working on a desktop machine using QL and possible flat-screen technology, so we asked him about Sinclair's designs in this field. As the proposed Sinclair electric car is sure to have some very advanced battery technology, and as Sinclair already has extensive flat screen technology, the two together plus a QL look-alike would seem the ideal combination. But Searle wouldn't be drawn.

Adam Denning is Software and Technical Editor of Micronet 800, *and the extracts from his interview with Nigel Searle can be found on page 800 11698a onwards on* Micronet 800.

THE SUPER BA

Starting here, a complete course in progra

In the first issue of *QL User* we described SuperBasic in fairly close detail. SuperBasic is what Sinclair calls the Basic resident in the QL and, as we saw, the Super tag is quite a fair one.

We went on (and on) about how SuperBasic was derived in part form those great *block structured* languages BCPL, Pascal and C, without really describing what we meant or what the advantages are of a structured language. As a lot of QL owners will be fairly new to computing — and almost certainly new to SuperBasic — we're running this series on getting to grips with programming and with SuperBasic in particular.

Absolutely no knowledge of programming will be assumed but you should be conversant with setting up your QL and switching it on. You should also have the User Guide to hand.

A computer is a 'blank' machine — it is not designed to perform any one task but it can be made to carry out a wide range of activities. However, it can do nothing at all unless it is given a list of instructions — called a program — which tell it what to do and how to do it, all in great detail.

The 'language' which computers 'understand' can be represented by a long series of 1s and 0s but, while these are crammed with meaning for the computer, they are completely incomprehensible to humans. Therefore a number of computer languages have been developed which allow you to write your program in an abbreviated form of English which you can easily understand and follow. Of course, the computer can't understand such a program, so additional programs have been developed which interpret the human-level instructions into computer-understandable code.

A wide range of these programming languages has been developed, each of which has been designed for a specific applications area — writing accounts programs, for instance, or controlling industrial processes. The QL comes equipped with a built-in interpreter for the Basic language (Basic stands for 'Beginner's All-purpose Symbolic Instruction Code' if you must know) which was designed for ease of learning but still allows you to carry out some sophisticated computing tasks.

Let's begin. Switch on your QL and type,

Listing 1

and then press the ENTER key. Hey presto! 'A message to the world' appears on the screen. If it doesn't, then you must have typed in something incorrect, in which case switch the machine off and then on and try again, taking care to type in the line *exactly* as it appears above. Later we'll discover a better way of correcting mistakes.

What we have done so far may or may not seem spectacular, depending on your level of experience; in any case, it's not really programming. All we did was to tell the QL to do something that it already knew how to do. Further, if we want the QL to do it again, we'll have to type in the same command; later, you'll see how we can get our QL to perform a task repeatedly without our needing to prompt it each time.

To start programming, then, we have to give the QL a whole series of commands, each of which it knows how to do but which do something that one command alone could not have done. This group of commands is called a program.

Listing 1

```
PRINT "A message to the world"
```

Listing 2

```
LET QL = 4
```

Listing 3

```
LET QL = QL + 4
```

Listing 4

```
LET FRED = 5
PRINT FRED
LET FRED = FRED + 2
PRINT FRED
```

Listing 5

```
FRED = 6
ERIC = 4
JOHN = FRED + ERIC
PRINT JOHN
```

Listing 6

```
QL = 2 * QL + LN(SQR(93.21))
```

Let's write a program which will ask you to type in your name and age and then print a message saying 'Hello' to you with an appropriate comment on your age.

In Basic, each line of a program is given a *line number*. This isn't done purely for the sake of it — the line numbers allow us to refer conveniently to different parts of a program. We can, for example, write an instruction which says, 'If the result of the action just taken is such-and-such a value, then go to line number 500 and carry on there'. It is this ability to make decisions and carry out different courses of action depending on the outcome of those decisions which give computers their power and flexibility.

As we saw earlier, you can type a command without a line number; however, the computer recognises that no line number has been typed in and assumes you want it to carry out the command immediately, as it did with the example above. In SuperBasic, then, as with most Basics, you must number the lines in your program.

The next concept to get to grips with is that of *variables*. A variable is nothing more than a box in which the QL puts numbers or letters which it uses during the execution of a program. Each of these boxes has a name, which you, the programmer, decide on. Usually, the name is chosen to convey an idea of what the variable is being used for: TOTAL, for instance, or DATE. When you first turn on the computer, these variables don't exist — you have to *declare* them first, as there's not a lot of use for having thousands of empty, nameless boxes hanging about.

To declare a variable, we

BASIC COURSE

Programming in SuperBasic, by Adam Denning

use the LET statement in SuperBasic. We can say:

Listing 2

for instance, which will declare a variable called QL and at the same time assign a value of 4 to it. In other words, the computer will reserve an area of its memory, give it the name QL, and insert the value 4. Now, each time you use 'QL' in your program, the computer will look in the 'box' called QL and find the value 4.

The word *variable* is used because we can alter the contents of the box to anything we like, simply by assigning a new value to it:

Listing 3

for instance. This is nonsense mathematically but perfectly logical to the computer. What it says is, 'find the box called QL and add 4 to whatever value is already there'. In this case, we've already set the value of QL to 4 so this instruction would then change that value to 8. If you want, you can experiment by assigning values to variable names in this way without using line numbers. Don't be afraid to experiment in this way — nothing you type at the keyboard can damage the machine and if you get weird results or the machine seems to 'lock up', don't panic but switch the machine off and on again to restore it to a usable state. Try this sequence (but remember to press the ENTER key at the end of each line — this tells the computer that you have finished typing in a command and allows it to execute that command):

Listing 4

You should get the answer 5 when you first PRINT FRED and 7 the next time. Incidentally, the word LET is optional — so to save effort we won't be using it again; it's there simply for the sake of convenience and for compatibility with some other Basics which insist on its use — such as Spectrum Basic.

As you may have gathered by now, we don't have to use only specific numbers when we assign values to variables — we can use the values of other variables:

Listing 5

or even:

Listing 6

which confuses us considerably but makes perfect sense to the QL.

Variables do not have to contain numbers; they can, if you want them to, hold words and phrases or just single characters. The type of variable which does this is slightly different to the variable which holds numbers — its name has a $ sign at the end. The dollar sign means *string*, because a sequence of characters (any sort of characters and any number of them, even zero) is called a string. Thus, variables ending in a $ are called *string variables*, while other types are called *numeric variables*.

So, as a person's name is a string of characters, we need a string variable to hold it. Let's call it NAME$. Then we need a numeric variable to hold the person's age — we'll call this one AGE. You can see these at work by typing the following, but putting your own name in place of the phrase 'Your name' (and don't forget to hit ENTER at the end of each line):

Listing 7

Remember that the computer differentiates between string and numeric variables and won't allow you to assign a string to a numerical variable. Try:

Listing 8

and you'll get an error message. However, you *can* assign a string of numbers to a string variable, as long as you enclose them in quotes:

Listing 9

will produce the reply 12345. But

Listing 10

will produce an error message. The reason is that, in order to carry out operations such as addition, subtraction, etc, on numbers, the computer stores them in its memory in a different way to that used when it stores strings. So if you store a number as a string, you won't be able to perform any arithmetical operations on it. Try:

Listing 11

but don't expect to get the answer 4!

We are now in a position to write a simple program which prints out somebody's name and age — substitute the name and age for your own:

Listing 12

Once you have typed in the program, check that it's correct by typing LIST and hitting ENTER. The computer will display the program on its screen for you to check. If it's OK, type RUN and hit ENTER and the computer will execute the program.

There are three important things to notice about this program. Firstly, the line numbers are in increments of 10. In fact you can use increments of 1 but using 10 makes it easier to insert lines later if you realise you omitted something from a program. Secondly, we have inserted the variable names within a single PRINT statement, with some text, enclosed in quotes, to make the answer intelligible. The QL will automatically print the *value* of each variable as it encounters the variable names. What happens if you enclose the entire line in quotes and leave out the quotes within the line?

Listing 7

```
NAME$ = "Your name"
AGE = 55
PRINT NAME$
PRINT AGE
```

Listing 8

```
AGE = "Too old"
```

Listing 9

```
NAME$ = "12345"
PRINT NAME$
```

Listing 10

```
NAME$ = 12345
```

Listing 11

```
FIRST$ = 2
SECOND$ = 2
PRINT FIRST$ + SECOND$
```

Listing 12

```
10 NAME$ = "Fred"
20 AGE = 97
30 PRINT "The age of ";NAME$;" is ";AGE
```

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Notice too the use of semi-colons, which ensure that there's no gap between the text and the values of the variables. Try re-typing line 30 but use commas instead of semi-colons; RUN the program and notice how the commas cause gaps to appear in the line when it's PRINTed. Now re-type line 30, substituting apostrophes (') for the commas and see what happens.

Incidentally, to alter line 30 you don't need to re-type the entire program — just type in line 30 and the computer will automatically substitute the new line for the old one. Once you've RUN the program, type 30 and hit ENTER, then LIST the program again — you'll find that line 30 has disappeared. This is a handy way of getting rid of unwanted lines.

The above program has a considerable disadvantage: the string assigned to NAME$ and the value assigned to AGE are both 'fixed' within the program; if another person wants to use the program he has to alter it to include his own name and age, just as you did. It would be more convenient to be able to type in these values when the program is RUN. Such a convenience is provided by the INPUT statement.

At its simplest, we use INPUT in the following format:

Listing 13

```
INPUT NAME$
```

This will accept anything typed in by the user, until he hits ENTER, and place it in the variable called NAME$. However, it's a little unfriendly as, when this is included in a program, all that appears on the screen when the INPUT statement is reached is a question mark. We need a way of presenting a *prompt* to the user, reminding him what to type in. INPUT can in fact be used rather like PRINT to do just this:

Listing 14

```
INPUT "What is your name";NAME$
```

Everything within the quotes will be printed out, followed by a question mark. The user's reply will then be placed in the 'box' called NAME$. Try this. Type NEW followed by ENTER to clear out the computer's memory and then type in the following:

Listing 15

```
10 INPUT "What is your name ";NAME$
20 INPUT "How old are you ";AGE
```

This is of course only a fragment of a program and it doesn't do anything particularly useful — yet.

Next, we want a way of getting the computer to print a friendly message such as 'Hello, *person*, how are you?', where *person* is the name typed in response to the 'What is your name' prompt. This is held in NAME$ so we can use the PRINT statement just as we did earlier:

Listing 16

```
10 INPUT "What is your name ";NAME$
20 INPUT "How old are you ";AGE
30 PRINT "Hello, ";NAME$;", how are you?"
```

Make sure you get the quotes and semi-colons correct — LIST the program to check.

The last thing we need is a way of printing a different comment for each age group. There are lots of ways to do this, but Super-Basic has some very neat and structured facilities which we'll take advantage of.

The SELECT statement will do what we want. This makes the QL do different things depending on the value of a specified variable. We can make it do things for a range of values or just one particular value and we can also make it do something else if the value of the variable is not within one of the values or ranges we specified. So, let's say that if we use AGE as the SELECTing variable, then if AGE is between 0 and 18 the computer prints 'You're a bit young for this, aren't you?'; if it is between 19 and 20 it prints 'You should have better things to do at your age!'; if it is exactly 21 it prints 'What, today? I don't believe you!'; and for any other age the QL prints 'I won't mention your age again!'. Yes, of course it's frivolous, but it serves to illustrate the power of the SELECT statement very well. Type in the following extra lines:

Listing 17

```
40 SELECT ON AGE
50   ON AGE = 0 TO 18
60   PRINT "You're a bit young for this, aren't you?"
70   ON AGE = 19 TO 20
80   PRINT "You should have better things to do at your age!"
90   ON AGE = 21
100  PRINT "What, today?  I don't believe you!"
110  ON AGE = REMAINDER
120  PRINT "I won't mention your age again!"
130 END SELECT
```

Run this program by typing RUN and hitting ENTER. Try it a few times and experiment with changing the age ranges and messages.

Although simple, this program also treats us to a little tuition on *algorithms*. An algorithm is simply a long name for the method by which we mean to solve a task or problem. Note that in this sort of programming, the algorithm must be precise or else unpredicted results (ie, *wrong* results!) can occur.

For instance, RUN the program again and type in an age of 18.5. Why does it print out 'I won't mention your age again!'? Surely this isn't what we intended?

Well, no, it isn't, but our algorithm was written in such a way that the computer is given no choice but to interpret it that way. The problem lies in the differentiation of ages in the SELECT statement. You'll notice, if you examine the program carefully, that there is no provision for ages which are greater than 18 but less than 19. The best way of dealing with this is to change line 50 to extend from 0 to — well, to where? If we make it 19, then both lines 60 and 80 will be executed if the age is 19, which is clearly wrong. So we have to extend it to a number which is as near to 19 as possible but isn't actually 19. Problems are caused here by the phenomenal accuracy of the QL when it comes to calculations — it knows that even 18.999999999999 is less than 19, so if we changed line 50 to

Listing 18

```
50 ON AGE = 0 TO 18.9
```

and you type in an age of 18.95, neither lines 60 or 80 would be executed — it would jump to the REMAINDER line again.

Next month we'll show you a way around this — and then we'll start to do some more exciting things.

THAT SOFTWARE

The background

Software 'bundling' — the inclusion of software in the purchase price of a computer — is no new phenomenon, even at the home computing end of the market. Nor is it surprising that Sinclair, having decided to offer software with the QL, should take the packages from Psion.

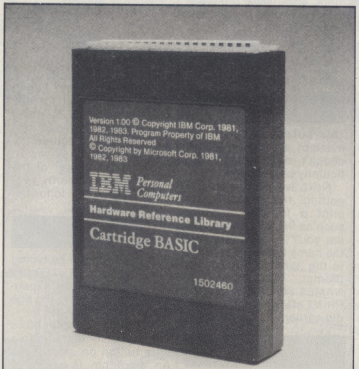
Psion has, after all, long enjoyed a relationship with Sinclair so close as to resemble in-house concerns like Acorn's Acornsoft. Indeed, much of Psion's prosperity has been built on an early determination to exploit the new market for high volume games software opened up by the successes of the Sinclair range of machines. Psion has been so successful, in fact, in emulating the Sinclair ability to move product in high volume that the company recently notched up its three millionth software sale.

Many of the most remarkable programs available for earlier Sinclair machines — Flight Simulation, Scrabble and Chequered Flag, for example, have come from Psion, but like all the company's products, they were sold to Sinclair for worldwide marketing — Psion retained only the intellectual rights to the programs.

What is remarkable about the material bundled with the QL is its exclusively business orientation. In the past, home computer manufacturers have always been able to rely on one-man software houses to generate the material needed to support new machines. Such material has perforce been simple and heavily biased towards the games player.

But the QL is intended to be the first machine to bridge the gap between the previously separate worlds of home and business computing. For this machine, therefore, Sinclair has wisely decided that it could not rely on such a haphazard approach for the business software it requires.

So that the QL should be immediately attractive to the business user, the company has chosen to supply it with three of the most widely used business packages — word processing, database and spreadsheet, along with an example of an increasingly fashionable *genre*, business graphics.



IBM packs its PCjr software in ROM.

A certain degree of family resemblance between the programs demonstrates their common parenthood. For instance, the screen is split into three sections: in all four packages, the screen displays an upper zone reserved as a prompts box, a central area where the main function of the program is displayed, and a lower portion giving miscellaneous details of the package's current status.

The prompts box monitors the user's commands, giving a record of actions in progress and acting as a memory-jogger for functions available via the QL's programmable keys.

The second, central zone is the data area. This is the largest section and displays the meat of the four packages — the spreadsheet, database, text or graphics in use.

The third and lowest zone contains information such as current command, current mode, memory remaining, etc.

Another common feature is the availability of a Help function at all times, allowing the user to exit from any part of the operation — even in the middle of inputting — and returning him to the exact point of departure after the consultation.

But although the four packages do have these family resemblances, the Psion material as a whole is only partly integrated into the unique operating environment of the QL, adding weight to industry rumours that Psion was until recently offering the programs to other manufacturers. Names mentioned include Apple and IBM . . .

Whatever the explanation — and it may be simply that the QDOS operating system had not been available to Psion long enough — the four packages cannot be held simultaneously in the QL's memory, and only a limited amount of data-swapping between them is possible. So the QL's much-mentioned multi-tasking capabilities cannot be exercised on the bundled Psion material.

'Import' and 'export' commands do exist, though, enabling some raw data to be transferred between the programs via a common file format. Only time and frequent usage will clarify the precise scope and usefulness of this facility.

But one feature of Sinclair's software back-up for the QL does already seem like an exceedingly good idea: the QL Users' Bureau (QLUB) which will provide members with an advice service — run by Psion — as well as regular software upgrades for the four packages.

There's something refreshing about the admission here that software is constantly improvable and for £35 a year the service looks like a great investment for any QL owner. And thrown in with QLUB membership is a bi-monthly newsletter containing latest QL developments.

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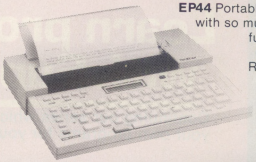

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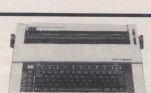

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Psion profile

We take you behind the scenes at Psion, the software house which rose to fame and fortune with its Sinclair products.

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The QL turns its back on the rest of the micro industry by using its very own operating system. We put it under the microscope.

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