

AUGUST 1984 35p

WHICH MICRO

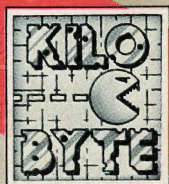
& SOFTWARE REVIEW

AN EMAP PUBLICATION

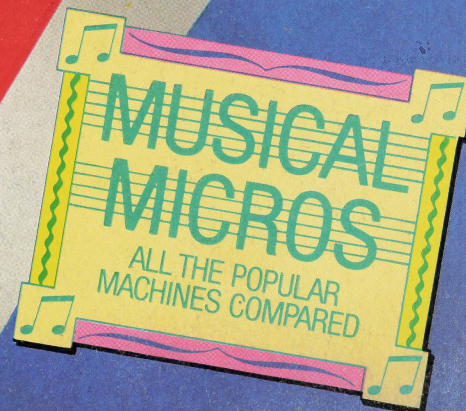
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With the number of different micros on the market increasing almost daily, it's surprising to see the revival of an old campaigner — the TI-99/4A from Texas Instruments. However, it is not the aforementioned semiconductor giant that has initiated this relaunch, but a rather enterprising company called Parco Electrics. They've bought up all the machines and software from TI and are primed to meet potential demand. We wish them the best of luck, since the return of a personal favourite is to be welcomed.

And from the old back to the new, with this month's review of Toshiba's MSX micro — the first of several MSX machines to be launched over the next few months. We at *Which Micro* feel — unlike a few noted 'oracles' in the business — that these Japanese invaders are destined to make significant inroads into the UK market, if only due to their having the support of such notaries as Canon, Sony, Sanyo, Hitachi, JVC *et al.* Indeed, the combined predicted market share of 150,000 units may be a little conservative; though even with a release date of late September for Toshiba's MSX micro, the real impact probably won't be felt until the run up to Christmas... and a lot could happen before then.

Paul N Coster — EDITOR

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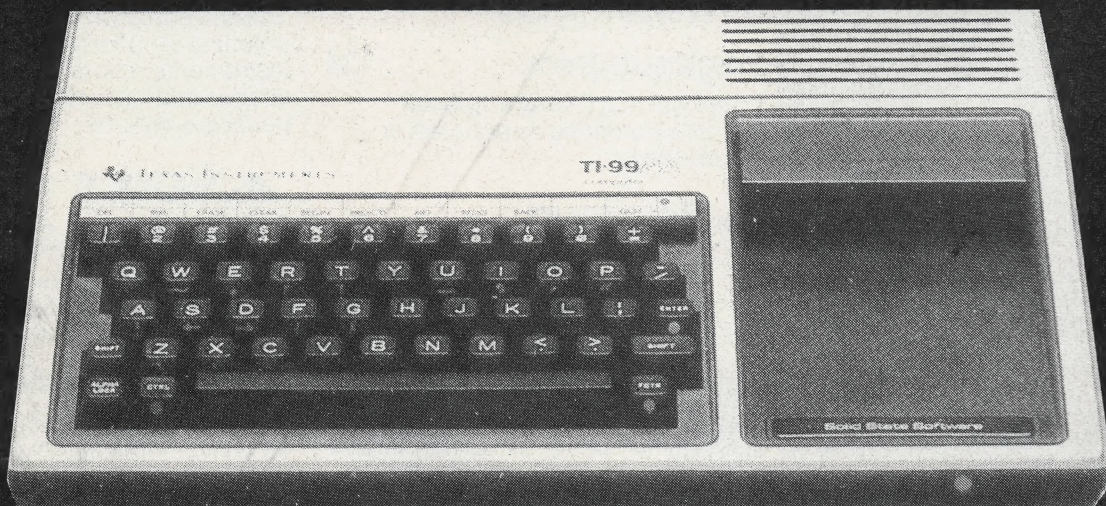
Reviews of software this month include programs for the Vic 20, Dragon, CBM 64, Spectrum and BBC.

ALSO INSIDE THIS ISSUE

8 Page Printers & Monitors Special

Featuring a host of display and print peripherals for home micros.

HERE TO STAY



TEXAS INSTRUMENTS HOME COMPUTER TI-99/4A £89.00

Console: 9900 Family, 16-bit microprocessor, plus 256-byte scratchpad RAM.

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➤ SIGFILE

On those halcyon days of yesteryear when every computer exhibition from Lands End to John O'Groats had the enthusiasts chomping at the bit, desperate to get inside the doors. And oh how quickly things can change in this volatile business. The figures speak for themselves. Take the recent Earls Court Computer Show — supposedly one of the sure fire winners. Last year's attendance numbered some 47,687 keyboard-crazed junkies. This year, a rather embarrassed spokesperson admitted the bodies numbered only 27,384 over the duration.

There could be any number of reasons for this turn of events; the most likely is quite simply why pay £3 (an average figure) to have the opportunity to see software that's tumbling off the shelves just down the road, or to play with hardware you've already got in the backroom and are, by now, quite familiar with, if you're ever going to be.

The mystique surrounding home computers has gone now that there is a ready availability. It's human nature to want what you can't have... and when you can have it you don't necessarily want it.

If home computer shows are to continue to thrive they must offer something more. As a rather cynical Tim Best of Imagine commented: "We weren't at the show deliberately. What's the

point of tying up people on the stand to sell tapes that could be sold elsewhere, and that the kids are just going to go away and copy for their mates anyway?"

Bug Byte on the other hand, whilst remarking on the drastic drop in attendance, were "pleasantly surprised considering" although the company's John Phillips felt they wouldn't be taking part in more than one or two shows next year — one trade and one consumer.

And what of the avid micro enthusiast. Disappointed with the lack of new products and developments and very little razzamatazz at the show to get the adrenalin going, who can blame them for ceasing to part with their three quid.

If this apparent decline in interest is to be halted it's time for the marketing whizz-kids to enter stage left, and instead of hyping titles along the route taken to date, or relying on them to sell themselves, adopt a few professional techniques such as have been known to excite housewives into buying particular brands of air freshener when they really didn't want any at all.

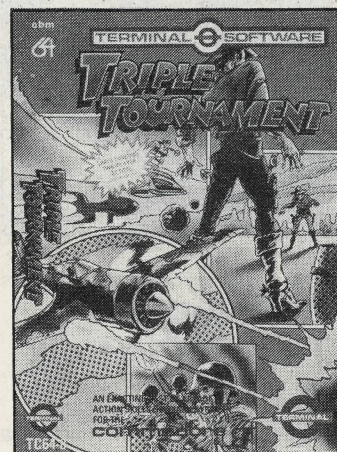
And if it's done properly, those of you reading this column, albeit unwittingly, and mourning the lack of excitement will suddenly and painlessly find the adrenalin running through your veins again and happily pay £3 at exhibitions (hopefully), buy more software and breathe new life into home

computer exhibitions.

- By the time you read this Dragon Data will either be in new hands, or it will have ceased to exist completely. At the time of going to press a spokesman for the receivers said there were prospective buyers some of them "fairly substantial people" (whatever that means) and that a deal was expected to be struck within one or two weeks. If a deal was not struck, then it would be the end of the story he went on, for they could not maintain the business any longer than that.

- Also at the time of going to press there were numerous — well half a dozen — unconfirmed rumours surrounding the possible viability of some software houses, and threats of market withdrawal by big names, some of them who entered the home computer business from other markets.

To save my editor any embarrassment emanating from legal writs (*such devotion — Ed*) the identities are probably best kept secret. All it goes to show is that the home computer business likes nothing better than a good gossip and since a morbid sense of doom has decreed there will be many collapses before the year is out, and this is now widely accepted, it's turning into a game of pass the parcel as everyone tries to blame everyone else of being the one caught out first...



Up From Down Under

Your starter for ten... from which country do Ozisoft titles originate? All those who said Australia take a gold star. But there's no need to go down under to play them, and there's nothing particularly Antipodean about the game play. Triple Tournament is the first of series from them to be distributed by Terminal Software and is three games on one cassette that are billed as "exacting tests of arcade action skills" — in other words you've seen it all before — but then we taught our Australian cousins all they know anyway, didn't we?

Terminal Software. Tel: 061-832 4209.

Business On a Budget

And now, from the company that brought you budget priced games, there's budget prices business and educational software. Mastertronic have joined forces with Galactic Software to form a new joint venture AI Products Ltd. Their dramatic commercial success as they term it, with two titles for the CMB 64 currently Britain's best sellers (BMX Racers and Space Walk) is thanks to an advanced program design system devised by themselves — nothing like modesty (and this is nothing like modesty...).

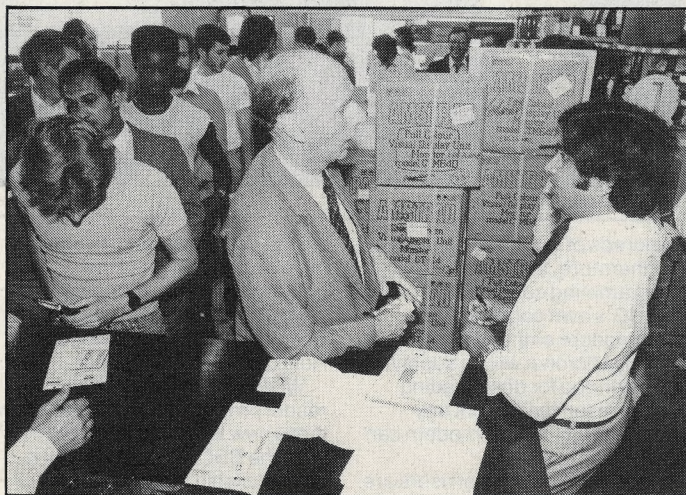
Budget ranges of business and educational titles should be ready for the market in the autumn. In the meantime they are looking for programmers — it smacks of putting the cart before the horse but if you fancy it, make contact at 48 George Street, London W1H 5RF.

Promises, Promises...

Rather a sad state of affairs when it's a game of one-upmanship as to who can deliver the goods on schedule. The very fact that Amstrad held a special celebration to mark the fact that they kept their promise indicates that even they were a little surprised by it!

And as we go to press, sure enough the first machines are on sale. The Rumbelow's chain, one of the nominated stockists, has received its first consignment and further supplies are going to Rumbelows and the other retailers — Dixons, Boots, Comet and the major mail order houses. We've also heard that certain local stockists are getting machines — just keep an eye out for them.

Amstrad's initial run of 200,000



units for 1984 is already underwritten by nominated stockists and they are urgently

reassessing budgets for 1985, when they anticipate bringing in 600,000 units.



Pig in a POKE?

An Everyday Tale Of Pig Folk

This just has to be the pic of the month... pigs might fly? Pigs might use micros? New machine a pig in a poke?

Nothing of the sort — any computer literate worth his salt can see this jubilant sow is helping to celebrate the export orders flooding into Alpha Micro's offices in exchange for what's believed to be the world's largest pig production database — the quaintly named Pigtales. It's all part of the wonder of technology... sowing the seeds for future generations, but here's betting it's a swine of a system!

Alpha Micro Systems (GB) Ltd, Berkshire House, 56 Herschel House, Slough, Berks SL1 1PY.

Expanding Prestel...

Available this month — so they say — is Micronet's communication cartridge for the Commodore 64, the latest machine to be catered for by the 30,000 page magazine service on Prestel. What's Prestel? Well may you ask, and the answer is that it's the British Telecom electronic communications system that is sadly under-utilised thanks to BT's apparent inability to get their marketing act together.

Be that as it may, as a member of Micronet, the Commodore 64 user will now be able to download software 24 hours a day (that's going some for even the most dedicated computer junkies) some of which will be free. In addition, titles from top software houses will be on sale for up to 20 per cent off normal retail prices. In addition, for the £1 a week sub, users can take advantage of the Micronet electronic Mailbox, tune in to daily micro news, swap hardware and software, enjoy a 24 hour technical advice service, suffer home education, armchair shopping and join in Starnet — an interactive strategy game for

For Anybodies Everywhere

More basic than BASIC (which really isn't very basic at all) is Trojan developed by Scifax Micro Software — programs written in good old fashioned plan English, with an interactive editor that prompts users to confirm and define their instructions every step of the way.

A bit revolutionary isn't it, I mean who uses English these days? Can't see it catching on but Scifax obviously think so and because the programs are written in 'true

English' they say, they can be easily understood by anybody. Part of the fun of being computer literate though is surely that you are elevated beyond being just plain old anybody. For anybodies everywhere however, Trojan has been designed as a totally machine independent system, and programs are transportable at the compiled level between any machines that support it. Scifax Micro Systems, 12 Cross Street, Basingstoke, Hants. Tel: 0256 69871.

Ooh là là!

Believe it or not there is micro life outside of the UK, and from across the Channel comes a range of 26 titles covering arcade, adventure and action games, educational, home, business and utilities software not surprisingly for the Oric 1 and Atmos since this is the best selling machine in France, where the producers, Innelec S.A. hail from.

Their products are claimed to be fully translated into English and for some inexplicable reason are being branded No Man's Land, or perhaps it is as good a name for a software house as any. A brief scout through their catalogue does not reveal any titles remotely related to Inspector Clouseau, as feared last month, so Oric users are recommended to give them a try.

Innelec SA RCS
Paris 327 948 626.

Oric Club Launch

Other user-group news meanwhile is that the first official Oric Club has been launched nationally by software suppliers Tansoft, with the blessing of the machine's makers. Annual sub is £10 in exchange for which there is an eight page monthly newsletter, discounts, special offers, and Oric Club clothing — Members need never be lonely so long as they are sporting their gear.

Future plans also include providing a service on Prestel and the setting up of residential schools so members sporting their clothing can learn how to wash them, and also how to get the most out of their machines.

Anyone desperate for a new sweat shirt should contact Oric Club, Units 1 and 2, Techno Park, Newmarket Road, Cambridge.

Keeping Up With The Jones's

Rather unfortunate for R B Jones of Kenton Lane, Harrow, that notification of a proposed Lynx User Group plopped into the in-tray the same day news broke that the Lynx may well cease to exist.

Suppliers of the machine, Computers have certainly ceased to exist whilst what happens to the machine remains to be seen.

Well, R. B. Jones of Kenton Lane, Harrow, rather than give you the gaff of the month award, we will wish you well in your intentions to 'minimise the feeling that any Lynx owner is out in the cold', as you put it. Computers have blamed a lack of software for their downfall, and since, miracles excepted, this situation is now likely to be worse instead of better it should be a pretty cosy user group: Mr Jones, Mrs Jones, the young Jones's and anyone who wants to keep up with Jones's perhaps...

Lynx owners who want to com in from the cold can contact the Jones's at 209 Kenton Lane, Harrow, Middlesex HA3 8TL.

£10 Must Be Won!

Yet another opportunity for bright young programmers to become... disillusioned? Newtech Publishing are looking for 'home-made' (their words) computer games and puzzles for publication in two books later in the year entitled The Times Book of Computer Puzzles and Games for the Commodore 64 and The Times Book of Computer Puzzles and Games for the Sinclair Spectrum. Entries for evaluation and possible publication are requested to be sent as soon as possible to a judging panel headed by Robin Bradbeer, 'the well known authority on microcomputer matters,' and Harold Gale chief executive of Mensa Administration Ltd, that organisation for those wot 'ave high IQs. For every game published the authors — oh lucky ones — will receive a princely £10 gift voucher each and have their names published alongside — such generosity which is taken even further, for the copyright for what it's worth, remains the property of the author.

All those who consider their work worth a gift voucher send their ideas written in BASIC if possible on cassette, together with a brief synopsis of the aims of the program and its level of difficulty to: The Times book of (etc.), c/o Newtech Publishing, 8 Forge Court, Reading Road, Yately, Camberley, Surrey. Alternatively you could send it to *Which Micro*, where our page rate of up to £60 seems a mite more generous.



Micronet executives on display.

hundreds of like-minded junkies. Furthermore, there are programming courses and ICPUG's own pages for Commodore enthusiasts.

Only Micronet will be supplying the cartridge for downloading software (price £43) but any standard V21 or V23 modem can be used.

Incidentally Micronet users are astoundingly generous creatures it seems, for during Capital Radio's Help a London Child fund raising venture they contributed

via the system around 16 times the average pledge of the individual Capital listener.

Micronet 800, Telemat Ltd, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.

Whilst on the Prestel trail readers may be interested to know that a new viewdata interface that links the BBC Micro to Prestel is now available from Acorn for £113.85. And Oric users too can switch into the service this month (July) when their £100 modem is launched.

From Megapop To Megagames

Carol Wilson is a name you won't know but one that carries with it an implication that you should, since according to the press release the good lady has launched many of the UK's pop megastars on their route to fame and fortune.

Now she has turned her attention to megagames by launching Interdisc, financed by Island Records. Hercules is the first title to be released and is for the CBM 64. It claims 50 frames and 'for the first time ever' the random access principle through which, on losing a life, she is plunged into a new frame totally at random. For the first time ever? Does anyone remember Asteroids or was it so long ago?

Software houses will come up with anything to justify that they are different from the rest and excuses are rapidly being used up. Interdisc have a novel one though. Their games are aimed at the connoisseur — does such a beast exist? — and this apparently justifies the fact that they will only be releasing two more titles between now and October though both will allegedly be "complex and satisfying", sounds more like an advert for Hamlet or St Bruno.

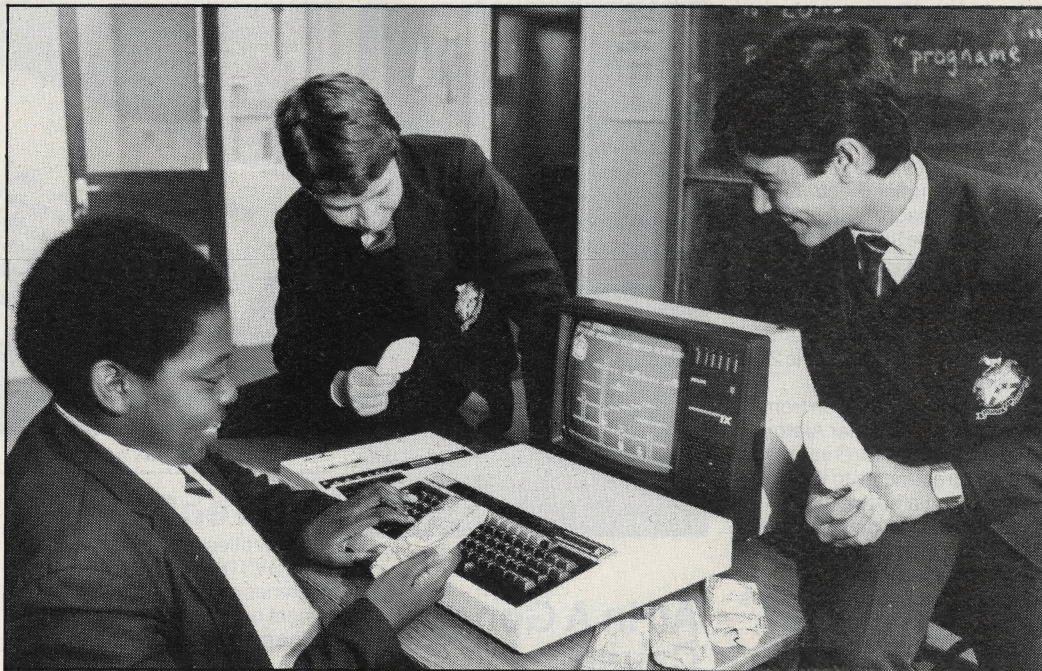
Just in case your megapop affiliations have any bearing on your megasoft purchasing habits, music names Ms Wilson has been associated with are Sting of the Police, The Human League and Orchestral Manoeuvres in the Dark. Interdisc is at Kensaltown Works, 249/251 Kensal Road, London W10 5DB.

Services For The Sick

If you live in the London area and your micro is sick, fret no more, immediate help is at hand. Micro Systems at Lion House in Tottenham Court Road are now providing an over the counter maintenance and repair service for a wide range of machines and peripherals suffering from the more common ailments that occasionally strike. Should the illness be serious, the likely time and cost to repair will be estimated. Should the case be terminal presumably they can flog you a new machine and perform the last rites on your faithful friend. All repairs are fully guaranteed.

Lion House, 227 Tottenham Court Road, London W1P 0HX.

Meanwhile sick joysticks have their own GP to call on, a 24 hour turn-around for repairs at Computer Supplies, 146 Church Road, Boston, Lincs. PE21 0JX. This company are also offering stronger replacement handle inserts for Commodore model 1311 joysticks priced at £2.75 a pair, post free.



Feeding the Beeb — three experts look for the ice lolly input.

Getting It Licked

If you're quick off the mark at writing games programs and can eat 15 ice lollies in less than two weeks (or get 14 mates to help you out, then it's one each) — you might still be in with a chance of winning a BBC Micro for your school...

The catch is that your game

program must feature ice lollies — just about the only subject a game has not yet been devised for!

Rectifying this appalling state of affairs is the joint Acorn/Walls Ice Cream competition in honour of the latter company's latest mega offering — Mega Bytes. As well as devising the program you must take up the scintillating challenge of listing as many words as

possible coming from the phrase 'Wall's and Acorn'.

If you want you can eat more than 15 ice lollies, since there's no limit to the number of entries per school. The only condition is that each entry must be accompanied by 15 mega wrappers from Mega Bytes, and must arrive by 28th July at MegaBytes, PO Box 4XZ, London W1A 4XZ.

Pirate Beating

So you're all dying to hear the latest on the piracy issue — Good. Then you shall not be deprived... This month's offering concerning software protection comes from business software suppliers Tamsys Ltd, and concerns Prolok, an anti-pirate goodie that comes from the Vault Corp, California, USA. It is based on a specially manufactured 5.25 inch floppy diskette which has a unique 'fingerprint' it's said, a custom modification the disk's program must find before it will run.

For use with a wide range of operating systems Prolok is said to be totally transparent to the legitimate user and does allow the making of back-up copies. The price of Prolok disks is no higher than that of standard diskettes according to Tamsys.

One person who will surely be pleased at the sudden outcrop of anti-thingsy devices must be Gary Mays of PSS, the Coventry based software house that recently suffered a burglary with a difference. Not just your common or garden vandal it seems that broke into their warehouse, but that breed of villain 'who knows what he's looking for' a term which always sounds so sinister, don't you think? The villains took only master copies of games just released or soon to be released titles, and a computer to play them on — that was smart thinking. PSS

reckon the night's ransacking could set them back by as much as £10,000 when development time and so on is taken account of.

What we may never know is whether the games in development that are now on the loose, were likely to be any good or not. C'est la vie...

PSS, 452 Stoney Stanton Road, Coventry CV6 5DG.

Tamsys Ltd, Pilgrim House, 2-6 William Street, Windsor, Berks SL4 1BA.

Daylight At Last

Finally for those who enjoyed the dawning of Aquarius, but have been wondering what happened to the full light of day, it's here at last — the second issue of Aquarius User Magazine, the official journal of that machine's user club, is now out, and issue three is also said to be in production. There's clearly no stopping them at 66 Wymering Road, London W9.

Splitting Hairs?

It's hardly surprising that Sinclair themselves took the trouble to inform us that Sinclair have continued to dominate the UK personal computer market during the first quarter of this year, achieving an independently surveyed 43 per cent of unit sales.

Now that's all very well, sales perhaps yes, but deliveries, well that's another matter, but then we all know that you don't have to be a graduate statistician to make figures mean what you want them to mean. In the normal run of things sales and deliveries are pretty well the same thing unless you want to split hairs, but in Sinclair's case, well, it's worth splitting a few hairs. Is anyone still waiting for a QL they "bought" in the first quarter?

Total Sinclair sales for the

quarter amounted to 215,000, up from 129,000 for the corresponding period last year according to AGB Research. Second and third places in the sales poll, and their deliveries are probably slightly better, went to Commodore and Acorn with 28 and ten per cent respectively. Is there much hope for the rest we wonder?

Should you doubt these facts they are apparently backed up by more independent findings from Gallup marketing Direction, who sampled over 10,000 people over 16, coming up with the same 43 per cent for Sinclair. In addition, Gallup reckon there are now some 2.35 million units in total, floating around British homes, a 10.7 per cent household penetration.

Sinclair Research Ltd, 23 Motcombe Street, London SW1X 8LB.

Home Sweet Home

Practical applications for home computers were by common consent, reckoned to be the most interesting developments at the recent Consumer Electronics Show in Chicago, USA, so it can't be long before there are lots more of these goodies in the UK.

In the meantime an Englishman can ensure his home remains his castle with the Sentinel Home Security System for the Vic 20 or Commodore 64, the first Commodore application from Micro Security Burglar Alarm Systems. It uses a I/O interface unit which connects to the user port and contains two input channels and six output channels. The first input is attached to a closed circuit consisting of magnetic reed contact switches on major doors and windows. Open circuit devices such as pressure mats, infra-red and vibration detectors can be attached to the second.

The six output channels are connected through micro relays to a power supply in the interface. Attached to two of them are an external alarm bell and an internal buzzer. The remaining four can be used to control a variety of other devices such as telephone diallers and domestic appliances connected via the mains. A control program on tape or disk is available which is menu driven and offers a number of options. The complete kit sells for £99 including VAT.

Micro Security Burglar Alarm Systems, PO Box 18, Havant, Hants PO9 3LB.

Modem Magic

Coming soon, possibly sometime in August, is the modem to beat all modems from Protek. Four times as fast and half the cost (£59.95) of any other so the theory goes and it is specially designed to establish a two way computer link up via the telephone. The Protek 1200 has two operating speeds, a flexible design for "perfect acoustic connections" is battery powered and has an LED indicator. Prices of the necessary interface cables and software for respective machines are yet to be announced.

Protek Computing Ltd, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian.

All In A Good Cause

Want to see your old game cassettes put to a good cause? Then here's just the opportunity to help thousands of men, women and children in dozens of countries, ward off the immediate perils of hunger, disease and homelessness. Gosh, can game cassettes really do all that? Indirectly yes, Oxfam Shops have hit on the fact that computer games are hot-stuff and by re-selling your cast-offs they can make a bob or two for the underprivileged around the world. Games of any type for any machine are welcomed, particularly in London.

Oxfam, 172 Archway Road, London N6.



The almost-MSX Spectravideo.

Top Ten?

Ten new titles from Spectravideo for its SV318 and SV328 machines means you lucky owners now have a total of 38 programs and utilities to choose

from. Seven of them are games: Old Mac Farmer, Tetra Horror, Tele Bunny, Turboat, Sasa, Ninja and Kung Fu Master — all exciting stuff, eh?

Spectravideo Ltd, 165 Garth Road, Morden, Surrey SM4 4LH.

More Orics In More Shops

Prism Technology Holdings Ltd, have become the official UK distributors for the Oric Atmos and its peripherals (is this on account of a singular lack of Sinclair products to distribute we wonder?)

The official line from Prism's Bob Denton is that they recently signed a long term agreement with Sinclair firming up their relationship as prime distributor for that company's hardware and software, an agreement which also permits them to supply other hardware for the first time. "The UK market will continue to be

under-supplied because of the world shortages in components," he said. There's *under-supplied* and *Sinclair-under-supplied* however, which are two quite different things it seems.

For Oric the agreement will mean products will be available at far more retail outlets than has been the case to date.

Prism Technology Holdings, Prism House, 18/29 Mora Street, City Road, London EC1V 8BT.

Go Faster Tapes

Thorn EMI, not content with launching their Crative Sparks label not so long ago, have announced a £1 million deal securing exclusive distribution rights for Human Engineered Software products from the USA. Under the brandname Hesware, titles cover the following fields: educational, home productivity; utilities and entertainment for the Commodore, Apple, Spectrum and IBM machines. The company is the largest third party software developer for the Commodore in its home country, and is ranked 10th largest overall.

And they're not just any old tapes, they are Turbo Tapes that load in more than double quick time, something which Thorn say will "shake the very foundations of the computer software industry" — a slight exaggeration on their part? Anyway the 'very foundations' of the software industry seem to be constantly shaken for one reason or another. Nevertheless and notwithstanding, Turbo Tapes are capable of loading programs three to eight times faster than normal cassettes, hence a 16K program will load in less than a minute.

Thorn EMI Computer Software, Thomson House, 296 Farnborough House, Farnborough, Hants.



Another 'two is better than one' demo.

Stereo Disks

Dedicated BBC owners do it in stereo. Dual disk drives for the BBC Micro are now available from Cumana Ltd, in two types 'side by

side' or 'switchable' which allows either drive to be switched independently between 40 and 80 track modes.

The icing on the cake by the way, is that each has a steel

cabinet in this season's fashionable colour, BBC Beige.

For further details contact Cumana Ltd, Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH.

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Citoh 1550, 8510	3.60	3.15	
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Commodore 4022	3.60	3.00	
Commodore 8023	3.15	2.90	
Commodore 8024	3.57	3.30	
Commodore 8026 Correctable	2.65	2.25	
Daisy M50 MultiStrike	4.75	4.65	
Decwriter LA34	3.30	3.00	
Decwriter LA120	12.00	11.00	
Decision Data 6703	3.72	3.50	
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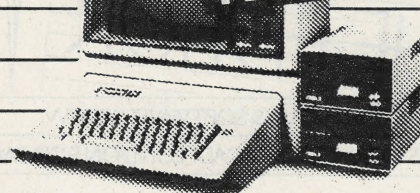
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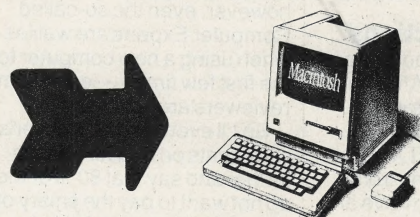
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Letters TO THE EDITOR

THE EDITOR, WHICH MICRO & SOFTWARE REVIEW

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

Memotech Query

I have just purchased a Memotech MTX512 and would be obliged if you could supply me with some answers to the following questions: Where can I obtain software for it? Are there any books on programs or programming for it? Is there a MTX owners club or magazine? Or is it possible to convert BBC, Spectrum or Commodore programs for it.

John A Pope
Greenock, Scotland

A cursory glance through our collection of books and software revealed two books: *Memotech Computing* (Sinclair — Granada) and *The Memotech Games Book* (Bishop & Bishop — Granada); and three games: 'Alice in Wonderland', 'Kilopede' and 'Chess', available from Continental software (0993 76261).

However, it's worth a trip to your local WH Smith to check out the complete range.

The Right Connections

Thank you for a very readable and informative magazine. After about a year of reading reports on various micros, I have finally ordered a Memotech MTX 512. I would appreciate hearing from any of your readers who have any tips to pass on about using this machine.

I am no expert on computing and I wonder if you could let me

know the chances of being able to use other makes of peripherals with the Memotech. For example is it possible to use the Sinclair Microdrive system, the Oric Microdisc or the Dragon OS9?
David Wemyss
Fife, Scotland

You have put your finger on the micro industry's biggest problem — standardisation. Virtually nothing works with anything else unless it has been specifically designed to do so. About the only kind of peripheral which can be expected to work with a reasonable number of different systems is a printer which comes from a printer manufacturer, rather than a computer manufacturer. Anything else is likely to cause problems.

Wallies Epitaph

I read with interest Mr Wickens letter, 'Wallies Unite' (July 84). In most respects I agree with him, however, even the so-called Computer Experts are wallies when using a new computer for the first few times — even some reviewers are wallies!!

So I'll even take Mr Wickens comments on retailers a step further and say that 80% of them do not want to pay the salary of employing a knowledgeable computer salesman; even on a part-time basis — they just want to take the sales and run.

The point he made regarding the computer press however, is a little out of line, as most magazines, this one is a good example (with your series for beginners), do try to cater for the not-so-clever computer enthusiast.

Mr Wickens spoils a good letter by becoming a wally himself, with his comments regarding Memotech. To say he would not be willing to buy one on the grounds that Mr Hudson has one, is extremely wally-like. I have a Memotech MTX and would, and do answer all sorts of elementary questions by phone and letter every day. This is not to say that the Memotech Manual is to blame, quite the reverse, 50% of the questions are answered quite adequately in the manual but, most people want to use their new computer today, not when they've absorbed the instructions, and this is OK — we all do it. We forget, sophisticated machines need sophisticated instructions.

Finally dealers of the UK in the original letter, should have a Government Health warning displayed outside their premises — if I were Memotech, I'd be breathing a sigh of relief that he can no longer do them any harm.
Kit Hook
Burnley, Lancs.

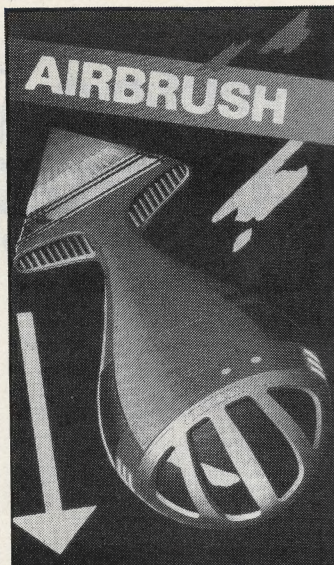
Timely Update

I am writing to correct you on the fact that there is a joystick interface for commercial sale for the Acorn Electron. First Byte make it, a 9 pin Atari type programmable interface. It is on sale in Aberdeen, I am an owner of one. Also there is a working ROM made by Sir Computers.
Nicky Harle
Inverurie, Aberdeenshire

Channel Blocked

I hope I am not a computer wally. Yet, like Mr Johnson ('Flexi-disc blues' — May 1984) I could not get anything out of the Airbrush program provided for the Spectrum on the free flexidisc.

After careful adjustment of the arm balance and lateral tracking bias, I did manage to get the stylus to follow the groove. Yet the faint crackling coming through the loudspeaker was nothing like the sharply contrasted noises usually heard when loading a program, and predictably the computer did not respond to the loading operation. Marked improvement in the sound was obtained by cleaning the record in the usual ways. Using one of those creams which can be peeled off the record when dry I even managed to get the name of the game onto the screen! But in spite of my patient efforts, tape loading error messages prevented me from getting any further. These appear at the precise moment when the sound becomes briefly duller, as if the 'music' missed a beat (a 'bit'



would be more appropriate here). Further cleaning of the record succeeded in suppressing some of these blank spaces (dust specks?) but so many remain along the groove that the task seems hopeless. Is it? (PS I did put a cassette in the tape-recorder and the micro was plugged in. Nor has the flexidisc been used as a door-mat before being put on the turntable).

Jean-Pierre Chartier
Chartres, France

In answer to your question, I am afraid your case is hopeless. Your disc has obviously contracted some form of 'groove-and-track' disease on its journey across the Channel and will most likely have to be put down (in the garbage bin). Do not despair, however, we will be sending you a couple of replacement flexidisks in the hope that at least one arrives uncontaminated.

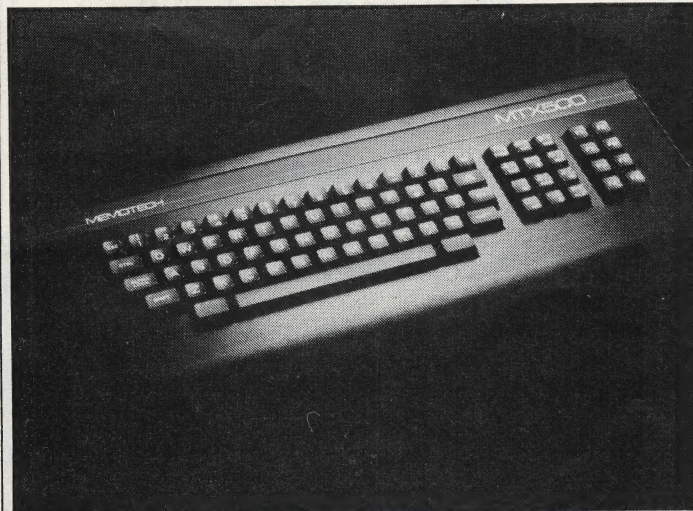


Sorry State

I am writing to plead to you to enter a program for the Sord M5. I know it may be hard to get one, but I'm sure you can. I am a regular reader of your magazine and think it's excellent.

Laurence Burke (aged 13)
Wicklow, Ireland

Sorry to disappoint you, but out of the hundreds of readers' programs submitted not one relates to the Sord. Also, we find that we cannot even recommend an alternative source as literature on the machine seems to be extremely scarce. (In fact, there ain't nun at all — Ed).



In The Sticks

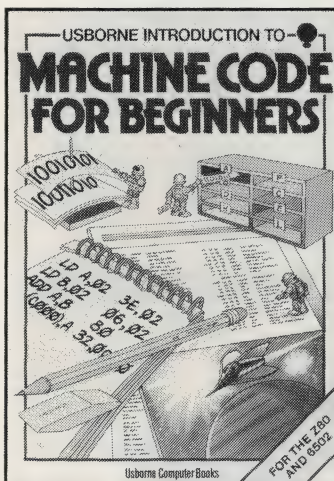
I am writing to enquire whether the 'Fox Programmable Joystick Interface' and a 'Quickshot Joystick MkII' will work with most of the games on the market? Also, which is the best version of 'Manic Miner', the 'Bug-Byte', or the 'Software Projects' version?

I would also like to know if you intend to review 'Jet Set Willy'. Thank you for such an informative magazine.

G C Pravda (aged 10)
Farnham, Surrey

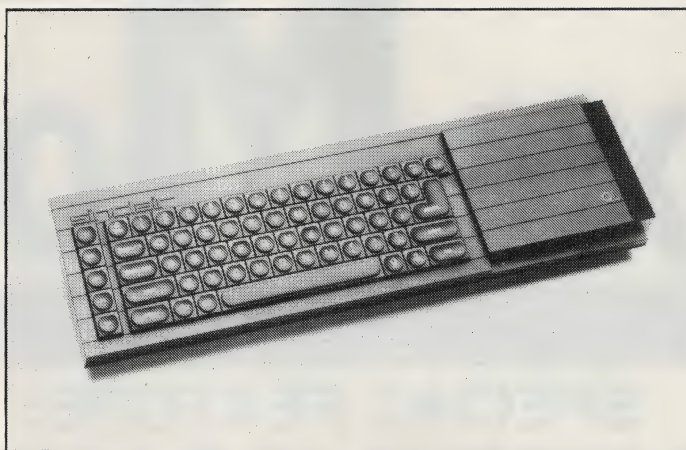
We're not familiar with the Fox interface, but the AGF Programmable is easy to use and very versatile. Of the 'fixed' type interfaces, the Kempston and Sinclair interface II both work with a lot of games. The actual joystick is not important as long as it is wired up to the Atari/Commodore specification. The Quickshot II is one of these. Just try out a few until you find one which seems to be strongly made and which is comfortable to use.

The two versions of Manic Miner are identical.



A Word From Afar

I am interested to know if you could please supply me with an address that would enable me to purchase the manual 'Machine Code for Beginners' by Lisa Watts and Mike Wharton, which was featured under 'Manual Override'.



in your April 1984 edition of Which Micro.

I would also like to state that many South Africans and I enjoy reading your 'fantastic' monthly magazine namely *Which Micro*.

Lance Tantum
Natal, South Africa

The book you want is published by Usborne Publishing Ltd, 20 Garrick St, London WC2. We suggest that you contact a local bookstore and have them order the book on your behalf.

For some time we have been aware that *Which Micro* has a strong following in such countries as Australia, New Zealand and the Gulf States. It seems we must now add South Africa to the list.

Elusive QL (User)

On page 83 of the June issue you state "FREE WITH THE JULY ISSUE: QL USER" etc. Please can you confirm if the magazine was not ready on time as my copy of *Which Micro* did not contain the QL User which I was very much looking forward to. Disappointed though I was I would imagine there is a simple answer. Will QL User be in the newsagents monthly from September?

A B McNulty
Bridlington

Sorry to keep you in the dark, but QL User is undergoing a stunning transformation. Due

to popular demand, this new magazine will be appearing in newsagents across the country very soon — just keep a watchful eye on the bookstands.

And one more point regarding the Next Month page. Whilst we always try to ensure that articles mentioned *do* appear in the next issue, sometimes circumstances prevent this happening. That's why we add the line 'Contents subject to late revision' — OK?

Where And Whys

I own a BBC Micro and I would like some advice on which disk drive and printer to buy. I have 10,000 shillings (£400). I have my eye on the TEAC SLIMLINE Disc Drives and on the SHINWA CP80 FT printer. I would like to know if this is a good buy. The printer I want to buy should be a friction feed printer because in Kenya we can't buy printer paper. I intend to use the disk drives and printer for home use and for small business.

I would like to know if there is any other alternative to buy a cheaper disk drive and a cheaper printer.
Sanjeev Vidyarthi
Nairobi, Kenya

As regards your choice in printers, we feel that our current feature on printers and monitors will provide you with a satisfactory answer. As for disk

drives, you have provided insufficient information for us to make a particular recommendation. Are you looking at a dual or single drive? What capacity are you considering? Do you wish to use single or double sided disks? These questions should be answered before you consider buying.

Having satisfied yourself as to the nature and type of disk you desire the following addresses may prove useful as regards obtaining price lists: AMS, Woodside Technology Centre, Green Lane, Appleton, Cheshire; Carson Developments, 84 Highfield Rd, Romford, Essex; Cumana, Pines Trading Estate, Broad Street, Guildford, Surrey; Midwich, Rickingham House, Hinderclay Rd, Rickingham, Suffolk; Opus Supplies, 158 Camberwell Rd, London SE5; Microware, Stanhope House, Fairbridge Rd, London N19.

Electron vs Atmos

I am considering buying a personal computer and I am willing to spend about £200. I would like to use the computer to play games, but mainly to program it myself.

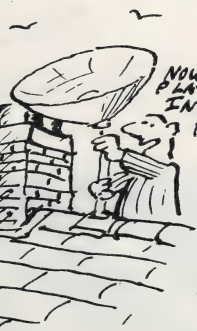
I have considered the Commodore 64, but I have been put off by warnings that it is not suitable for anyone wanting to do their own programming. I am now considering buying either the Acorn Electron or the new Oric Atmos and I wonder if you could tell me which (if either) of these computers would be most suitable.
Karen Lee
Wigan

Hope our comparative review of the two machines in last month's issue helped! If you want to use BASIC and/or assembly language, the Electron is hard to beat in the £200 market — but also consider the 48K Spectrum if you want to try some of the many unusual languages which are available for this machine.

SILICON TIPS

Handy Hints for Micro Users
By Richard Howell

To complete your computer requirements a satellite dish might prove an interesting acquisition



But it may hatch some problems for you

THIS THING'S GONE CLUCKOO



STOP GROUNDING

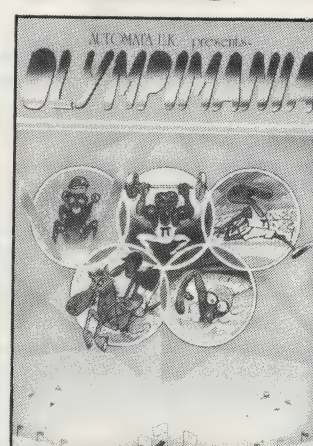
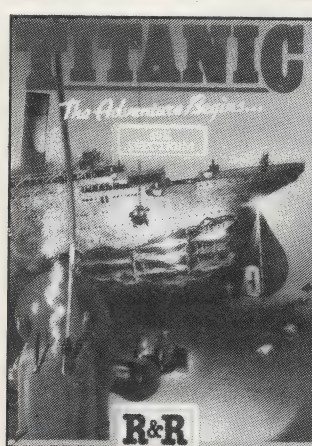
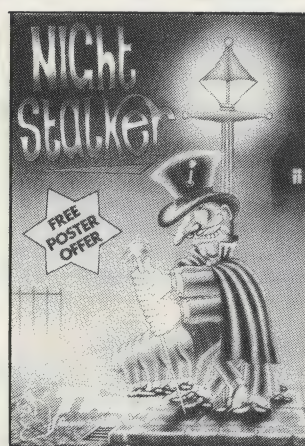
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NEXT MONTH

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A guide to software that excels *vocally* as well as graphically.
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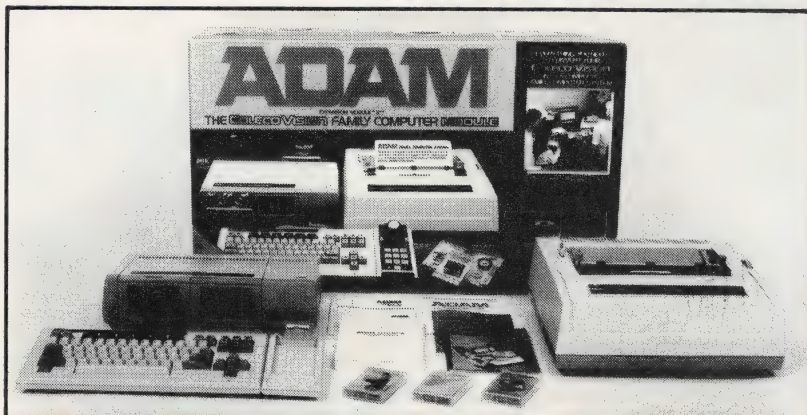
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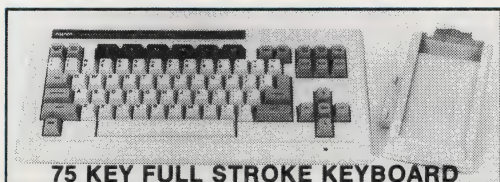
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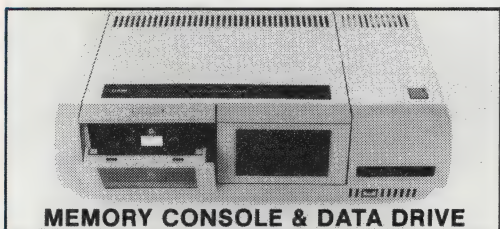


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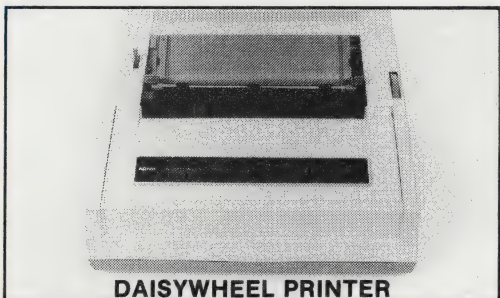
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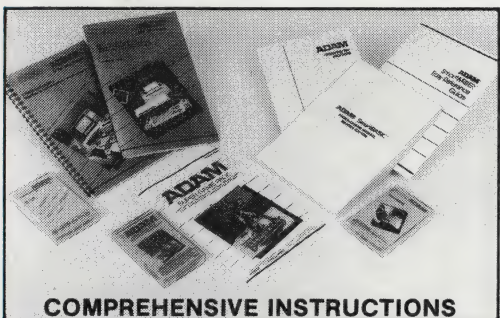
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If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console* with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.

MEMORY CONSOLE/DATA DRIVE: "The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accommodate a second optional digital data drive.

FULL STROKE KEYBOARD: The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

LETTER QUALITY PRINTER: The SmartWriter letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typesets are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's SmartWriter word processing program or as a stand alone electronic typewriter.

BUILT-IN WORD PROCESSOR: Adam comes with SmartWriter word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

COMPATIBILITY WITH COLECOVISION: By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

WHAT IS COLECOVISION: Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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LITERATURE REQUEST:

- ☐ Please send me your FREE 12 page colour brochure on Colecovision/Adam
☐ I own a Videogame ☐ I own a Computer

Mr/Mrs/Ms: Initials: Surname:

Address:

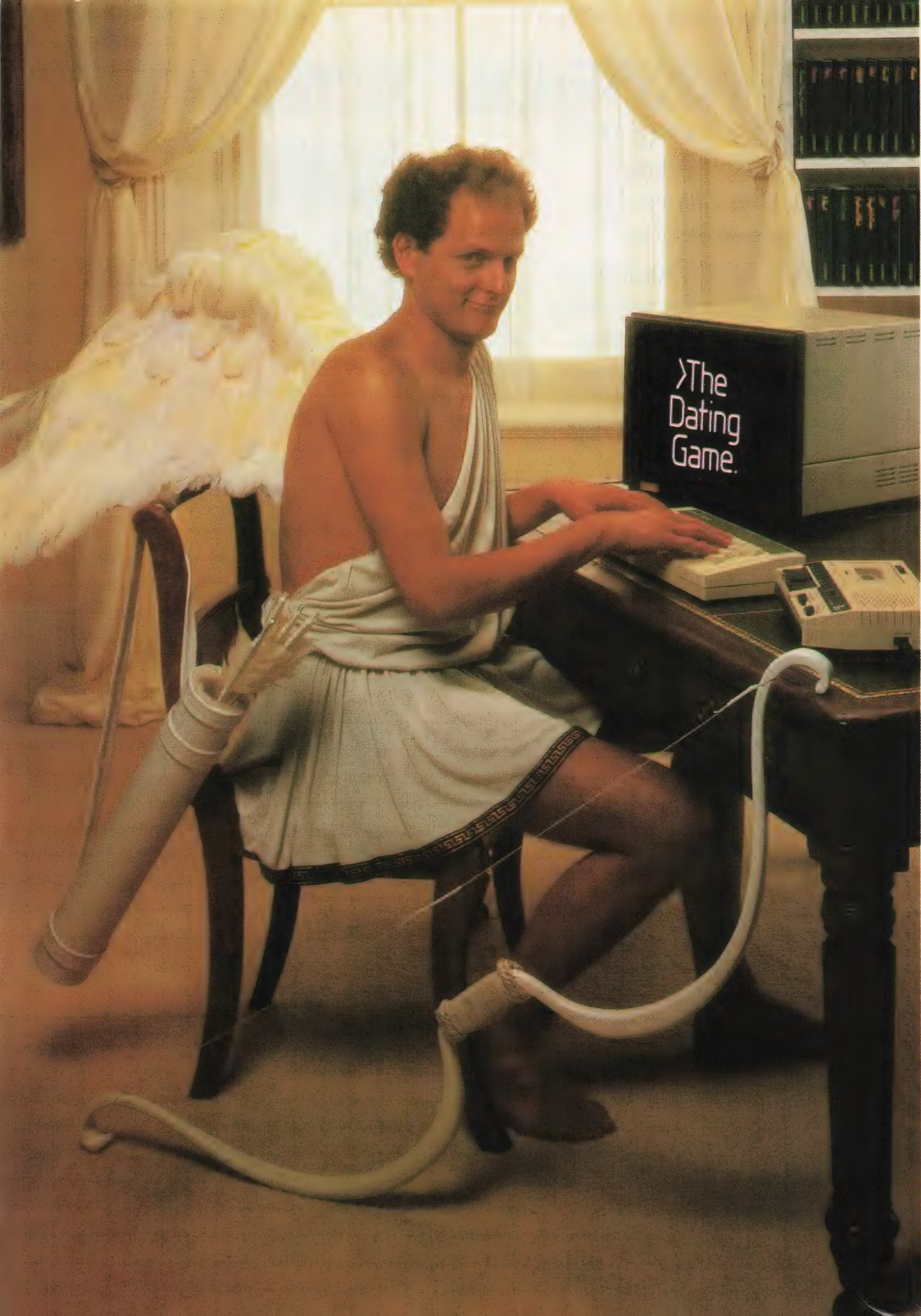
Postcode:

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- Please send me: ☐ Adam (add-on package only) £499 inc VAT
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MSX



Being first appears to be the all-important factor behind Toshiba's approach to the MSX race. Gary Evans checks whether they've sacrificed quality in the rush.

IN THE UK

Today's buyer of a home micro is faced with a daunting choice of machines, each featuring its own particular hardware and software specifications. The *ad hoc* way in which the British micro market has grown over the past few years has made no provision for any form of microcomputer standard. Not only do we have micros that feature an assortment of CPUs, among them the Z80, the 6502 and Commodore variant and the 6809, but even machines with the same CPU often have incompatible versions of BASIC. In the case of the 6502, these include the Commodore, BBC and Microsoft incarnations of the language.

Micro users in the UK have grown up with this disorderly market and know no better, so the fact that any software package is only capable of use with one specific micro is not seen as anything out of the ordinary. Little wonder that it's only now that a change of emphasis is about to occur; though it has taken a concerted effort from Japan to achieve it. And this autumn sees the launch of the first machines conforming to the MSX specification, with Toshiba's HX10 set to lead the onslaught with a September launch date.

Of all the machines so far announced, the Toshiba HX 10 seems fairly typical of the UK implementation of the MSX format. The HX 10 demonstrates the usual Japanese flair for production design that has to date been evidenced in items ranging from TV sets to micro-wave ovens. First impressions are of a machine that's built to last, with a solid feel — it appears sturdier and indeed heavier than the likes of the Spectrum and Oric. The main reason for this is the inclusion of a built-in power

supply. This is in contrast to the separate power supplies provided for most UK micros. When left switched on, though, the HX 10 did get rather warm in the area above the computer's power supply. Having said that, the temperature stabilised and after an overnight soak test (*no, we didn't leave it in the bath — Ed*), the HX 10 was still functioning perfectly.

The HX 10 is a 64K computer, but the bytes free message at power up indicates 28815 bytes available for user programs. It's worth noting, however, that the HX 10-specific manual was not available at the time of writing, so some aspects such as user-RAM may change. We did have access to the MSX technical specification, which revealed that bank-switching of memory could be achieved by poking values into a slot select register (port A of an 8255 PIA).

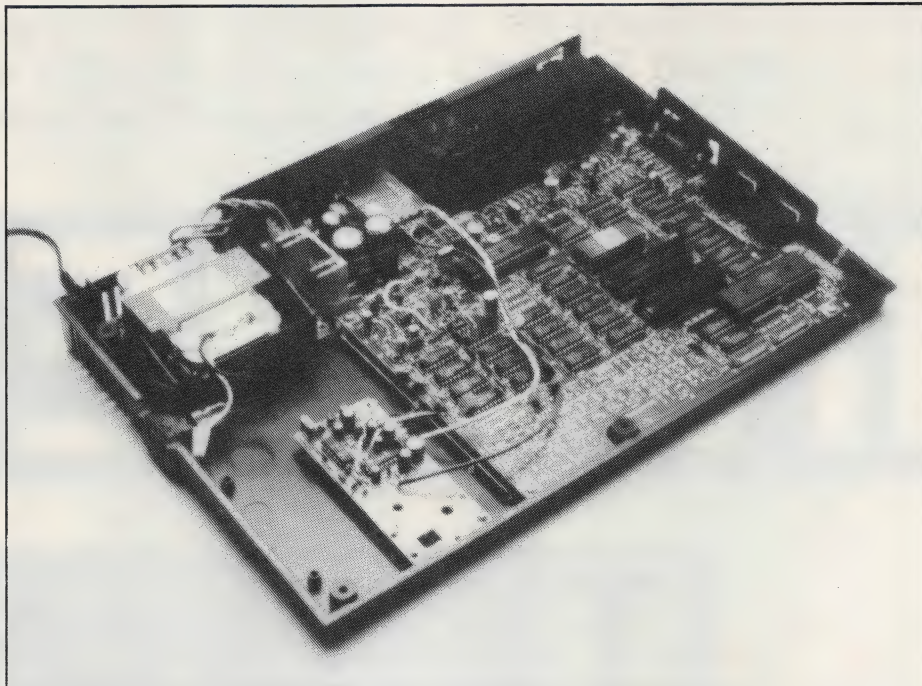
The computer's keyboard is a full travel 'typewriter' style design with a good, positive feel to it. It features three LEDs, one to indicate power on, another to show the caps lock function is engaged; with the purpose of the third LED remaining a mystery — it wouldn't light no matter what modes the HX 10 was in.

The keyboard layout is quite compact, so compact in fact that it's easy to hit the function keys by accident when inputting numeric data.

The default screen mode on power up is white text on a pale blue background. In addition to the aforementioned 'bytes free' message, the lowest line of the screen area displays the words colour (actually 'color' belying the fact that everything is still not 100% UK) auto, goto, list and run. These commands are associated with the five function keys f1-f5 at the top of the keyboard. In addition, pressing shift will ►

SPECIFICATIONS

Microprocessor: Z80A
Clock speed: 3.58MHz
Main memory: 64K RAM
System memory: 32K ROM
Video memory: 16K RAM
Programming language: Microsoft extended BASIC
Display output: RF/ Composite video terminals
VDP: TMS 9929A
Screen mode: 3 modes
Text mode: 40 characters × 24 lines/32 characters × 24 lines
High resolution mode: 256 × 192 dot matrix
Multi-colour mode: 64 × 48 blocks (4 × 4 dot matrix per block)
Sprites: 32 definable shapes
Colour: 16 colours
Keyboard: 73 keys. Alphanumeric and graphic symbols
Sound output: Audio terminal
PSG: AY-3-8910, 8 octaves, triple chord
Audio cassette interface: FSK 1200/2400 baud
Printer interface: CENTRONICS parallel
System bus: Cartridge bus, expansion bus
Joystick connections: Twin joystick ports
Power consumption: AC 240V, 50Hz, 20W
Dimensions (W × H × D): 370 × 60 × 245 mm
Weight: 2.8 Kg



display an alternate set of keywords.

Before leaving the HX 10's keyboard, mention should be made of the separate cursor cluster — a boon in many text or data editing sessions and indeed when playing games which do not make provision for the use of joysticks.

Close study of the HX 10 reveals a mystery key at the lower right of the keyboard. This is another indication that the computer is still not in its final form (the key in fact will produce the £ sign).

The command structure of MSX BASIC (Table 1) is quite comprehensive. The inclusion of the ON ERROR GOTO

command is welcome, as are the comprehensive print position control commands. The designers of the MSX version of BASIC have paid particular attention to both the sound and graphics facilities and a wide variety of control commands are available via straightforward BASIC statements. The TI processor responsible for the graphics is well known for its sprite-based system of graphics and this allows quite complex displays to be readily produced. In addition the sprite system makes the animation of patterns an easy task and when the MSX facility for detecting sprite collisions is taken into account it is possible for even inexperienced programmers to produce some quite impressive games software.

The HX 10 supports quite a number of expansion ports. The main expansion route is via the cartridge slot at the top of the

computer. This makes available all the CPU's control, address and data signals plus a number of signals unique to MSX machines. Into this port any cartridge software is loaded and expansion devices such as disk controllers and possibly RS232 drivers would be placed. One minor criticism here is that opening the flap does not power down the computer. It is up to the user therefore to ensure that power to the computer is switched off before inserting a cartridge in order to avoid damaging either computer or ROM based software.

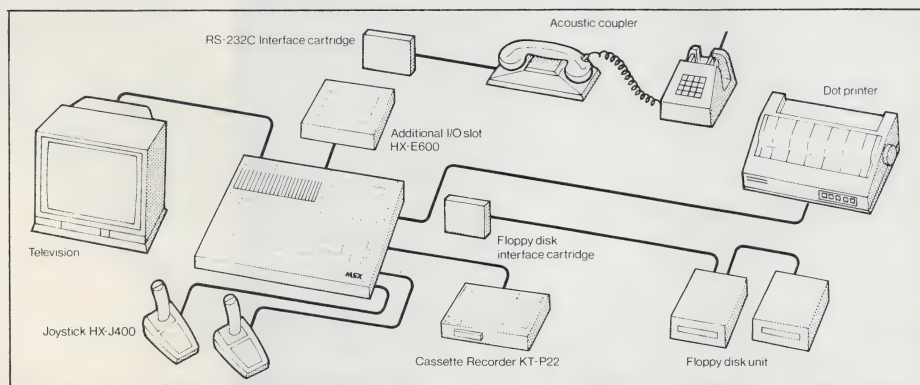
A parallel printer port is also provided (Centronics compatible) as are 2 Atari style joystick sockets. Both RF and composite video outputs are supported, although sadly there is no RGB output.

The major attraction of this computer (as with the rest of the MSX range) is that its MSX BASIC will be fully compatible with a number of other computers — this fact alone is bound to attract a large number of software houses. And if the examples of Japanese software we've seen are anything to go by, then the software should be very popular.

The HX 10 just scrapes in under the £250 price tag and as such is a fairly expensive home micro. It will be in competition with the likes of the new Commodore Plus 4 as well as many other machines that may offer better value for money (the Amstrad CPC464 for instance).

As always with reviews of this nature, changes have been made during its writing which affect certain of our points. The following addenda is thus made without apology.

The keyboard layout now loses that mysterious third LED (it was to indicate the Japanese character set). The enter key will be enlarged, a '£' sign key provided and the code key moves next to the space bar.



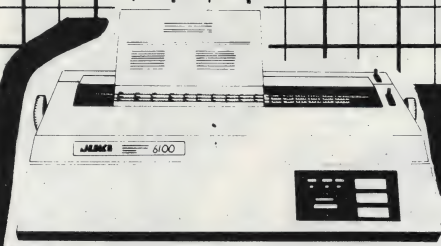
MSX BASIC COMMANDS

AUTO	DATA	ERROR	MIDS	RESUME
CONT	DIM	FOR TO	ON ERROR GOTO	RESUME 0
DELETE	DEFINT	GOSUB	ON GOTO	RESUME NEXT
LIST	DEFSNG	GOTO	ON GOSUB	RESUME
LLIST	DEFDBL	IF GOTO	POKE	(line number)
NEW	DEFSTR	INPUT	PRINT	STOP
RENUM	DEF FN	LINE INPUT	PRINT USING	SWAP
RUN	DEFUSR	LET	READ	NEXT
TRON/TROFF	ERASE	LPRINT	REM	RETURN
CLEAR	END	LPRINT USING	RESTORE	IF THEN

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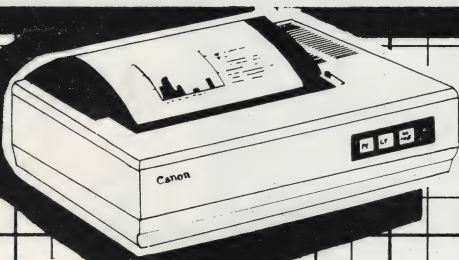


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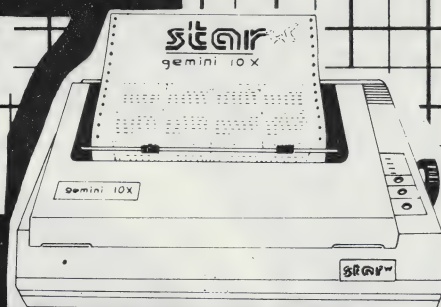
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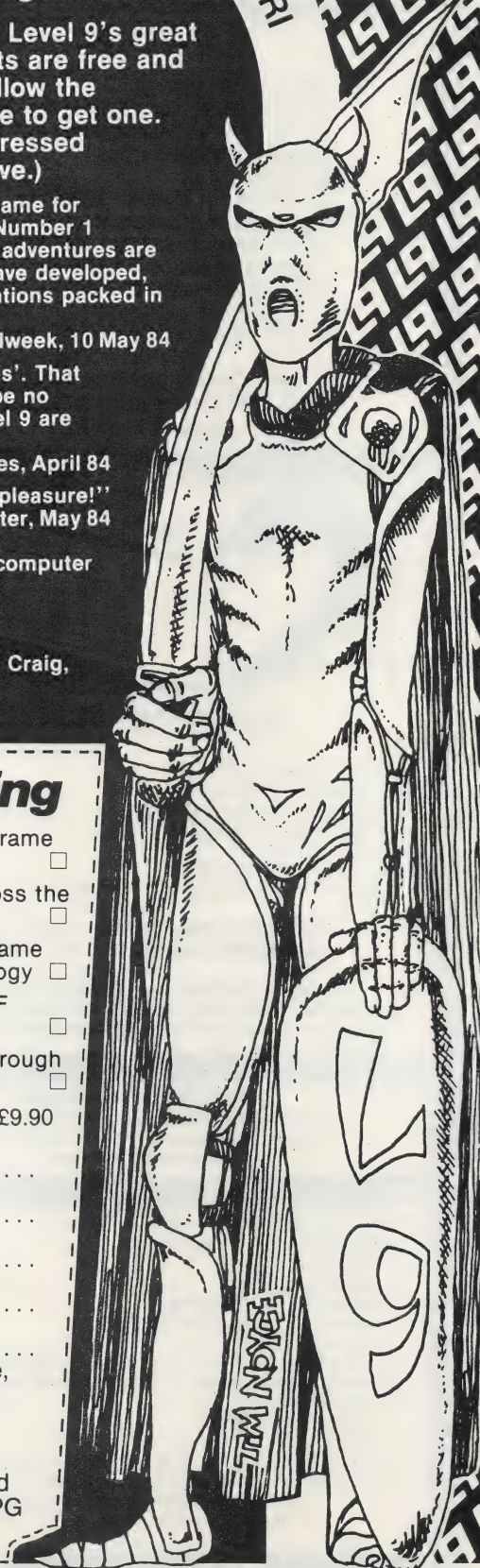
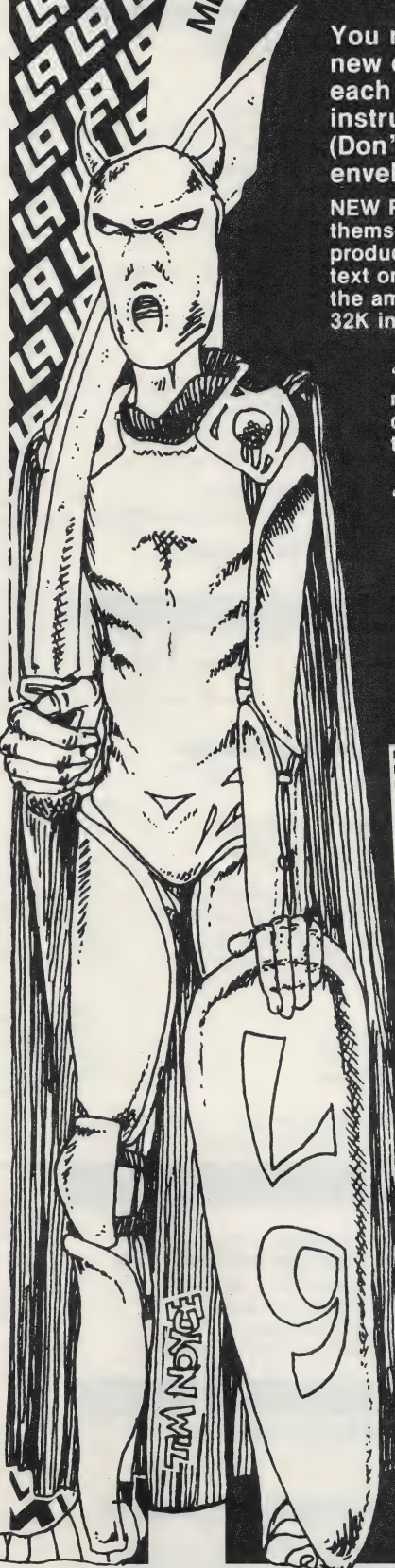
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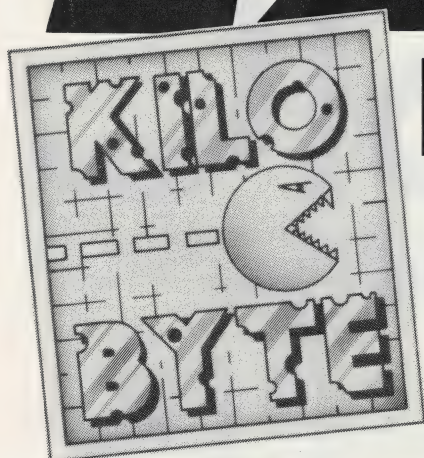
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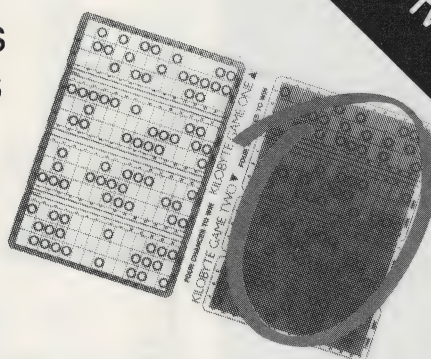


MUST BE WON

You have four chances to win on Game 2.

You should be sinking islands in four oceans as indicated.

NOTE: Final claims for Game 2 accepted 10.00 am, 15 August, 1984.



FINAL
NUMBERS
GAME TWO

C14

A5

C9

A11

A12

A7

A6

A8

C5

C6

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 - a. What does RAM mean?

b. Which company makes the Electron computer?

c. Name a programming language.

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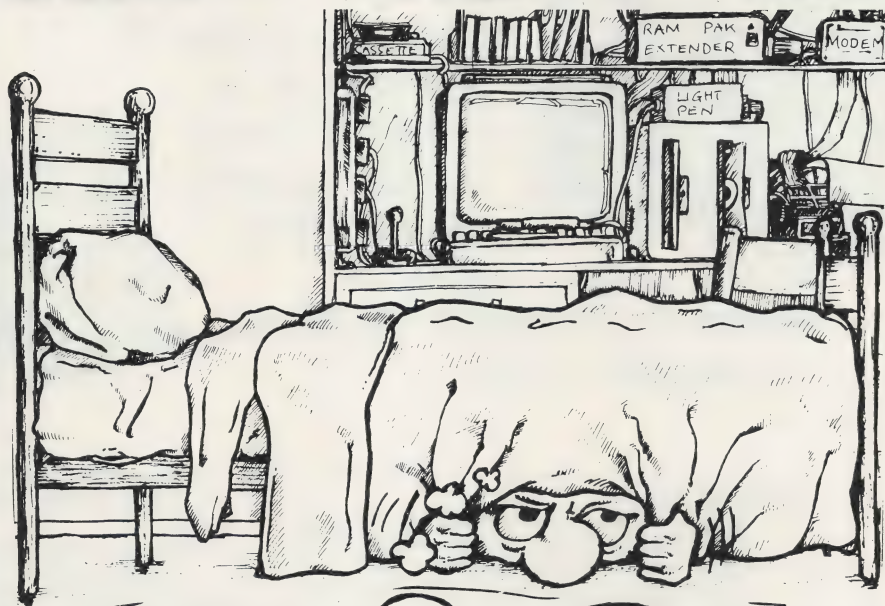
KILOBYTE LUCKY DRAW

When both games are completed, you could win a special prize! Hang on to your card and watch August issue of WHICH MICRO and SOFTWARE REVIEW for details.

If you want a copy of the first grid references for Game 2 printed in the July issue or additional copies of Kilobyte Game Cards, please send a self-addressed, stamped envelope to EMAP Marketing Department, 8 Herbal Hill, Durrant House, London EC1R 5EJ.

The first step towards writing 'fool-proof' software is to plan everything carefully. This month, John Webb and Rob Horne introduce the idea of flowcharting as a means of producing well-structured programs.

EXPLORING BASIC



WOT NO USER GUIDE?

Last month we looked at some fundamental concepts within programming. In this article we'll consider program design. Having introduced the idea of organising a solution into a series of logical steps, the process might be rationalised into two descriptive series of statements. The result is called pseudocode or PDL (Programming Design Language). However, a much clearer way of expressing structure is to use a flowchart. This is like pseudocode, but in the form of a picture.

Flowcharts and structure charts are used to reflect the flow of logic through a program. When you analyse a problem, it is very difficult to see the solution in an overall sense or even to know where to begin. In part one of this series we described how the problem of making a cup of tea could be broken down into five sections or modules. These could be further sub-divided into a collection of sub-modules, or steps. Resolving the problem into this series of steps is the first goal towards the solution. In effect, the problem can be diagrammatically represented as shown in Fig 1. This type of structure chart is known as a tree diagram (for obvious reasons). Each module (boxes 1.1 to 1.5) divides into further sub-modules (Fig 2).

Putting some thought into the problem at this stage makes the whole task a lot easier. With a detailed picture of how to piece all the components together, you will find it an altogether smoother way to write your program. Each sub-module can be individually designed and coded.

If you write a program in this manner, then it is worth the effort to test each module as much as possible before adding it into the main program. If you compare the process to that of building a model, then testing the code is like painting delicate and complicated bits — it makes sense to do the small details first, before they are all put together. When the whole model has been stuck together, further painting of the outer shell must be done and similarly overall program testing should be carried out.

Representing Constituents

Tree diagrams are very useful tools to describe the basic modules within a program, but they don't reflect what the code should be doing. Other symbols are required to cope with the logic constructs found in a program. And a prerequisite of

using these symbols is to know what you hope to represent.

Variables and constants — introduced last month — are not much good by themselves. For instance, in the statement `LET I = I + 1` (which increases the value of variable `I` by the constant 1), there are two operators, `=` and `+`, along with the BASIC command `LET`. Programs can use two types of operators — arithmetic and relational. The first of these consist of `+`, `-`, `*`, `/` and `**`, indicating addition, subtraction, multiplication, division and exponentiation. Don't worry about the last if you've never come across it before, it means raising a number to a power; for instance, to write A^3 in BASIC we write `A**3` (which equals $A \times A \times A$). In some versions of BASIC $\uparrow$ is used to denote this, so we would have `A  $\uparrow$  3`.

Operators have an order of precedence, which determines when their particular operation will be performed. You'll find some micros have different orders, so check your manual. Certain operators may not follow together, for example `A * (-B)` is allowed but `A * -B` is not, so it is a good idea to use brackets freely to keep the meaning clear.

Relational operators include `<`, `>` and `=`. Unlike the arithmetic operators these can be combined to give six actions: `<` (less than), `>` (greater than), `=` (equal to), `<>` (not equal to), `<=` (less than or equal to) and `>=` (greater than or equal to). These relational operators are chiefly used with `IF` statements, and along with a small set of BASIC commands allow a surprising amount of scope and flexibility when programming.

BASIC In Command

To assign a value to some named variable, either as the result of combining other

variables, or by using constants, or a combination of both, we use the command `LET`:

```
20 LET Y = A + 3 * B
```

means evaluate $3 \times B$, add that to `A` and put the answer into `Y`.

In some versions of BASIC, `LET` can actually be left out, so we would have:

```
20 Y = A + 3 * B
```

Often you'll want to assign a value after some condition has been met. `IF` is used to test such a condition, and in conjunction with `THEN`, to move to another part of the program if the condition is true:

```
100 IF A = B THEN 155
```

means if `A` and `B` contain the same value then transfer control to line 155

Transferring control to other lines can also be achieved using `GOTO`, but unlike the `IF...THEN` command, it does this regardless of any conditions which apply. For instance:

```
300 GOTO 450
```

transfers control to line 450

All these control structures, however, are pointless unless you can see what's going on — some output. This is where `PRINT` comes in:

```
10 PRINT A
```

outputs the value of the variable `A`

A list of items can be put into one `PRINT` statement, so that variables, constants, expressions and text can all be printed on the same line. Each item may be followed by a comma or a semi-colon to determine the spacing. Numbers are printed with a trailing space, but text — anything enclosed in quotes ("...") — has no trailing space. Try this example showing the different ways the `PRINT` statement can be used:

```
10 PRINT "NUMBERS
```

```
PROGRAM 2"
```

```
20 LET M = 0: LET N = 0
```

```
30 LET M = M + 1
```

```
40 LET N = N + 2
```

```
50 IF M > 10 THEN 80
```

```
60 PRINT "M IS ";M,"N IS ";N,"M + N IS ";M + N
```

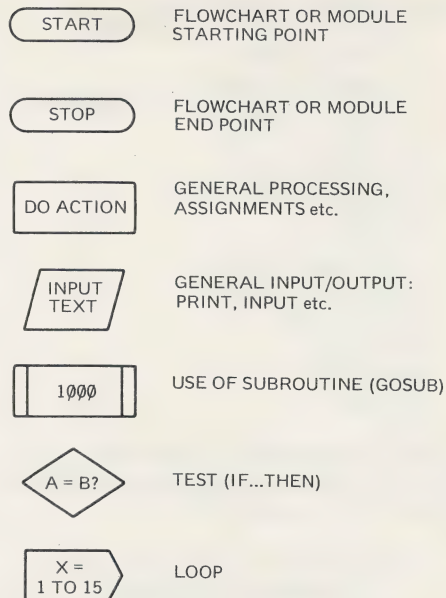


Fig 3. Some typical flowcharting symbols.

```
70 GOTO 30
```

```
80 END
```

```
RUN
```

Using `LET` to assign values to variables is very restricting, since we have to code in the value required and change the program if we want the variable to start with a different value — a tedious exercise. There is a very simple way, however, in which we can give the variables the values we want and change the values each time we run the program. The `INPUT` command allows you to input data *interactively*. `INPUT A` requests a number to be entered, and `INPUT A,B,C` requests three numbers. If only two are entered your computer will print `??` requesting more data.

Play It Again

Often it is necessary to repeat a group of instructions several times. This is done by using `FOR` and `NEXT` statements:

```
50 FOR X = L TO M
```

```
60 NEXT X
```

The effect here is to repeat the execution of the statements between 50 and 60 (inclusive), incrementing the value of `X` (from `L` to `M`) by one each time. This group of statements is called a *loop*.

Where we want to allocate memory to a set of items of data, a dimension statement, `DIM`, is used. Items may then be referred by using a numbered index. For example, `B(3)` refers to the third number in the array `B` and `X(K,J)` refers to the element in row `K` and column `J` of the array `X`. An array can be thought of as lots of boxes (as many as in the `DIM` statement) arranged as a row, column or grid, for instance:

```
30 DIM W (17), X(2,3)
```

declares two arrays, where `W` is a single row of length 17 and `X` is a 2 by 3 grid. If no `DIM` statement is used, `W` will be assumed to have a length of 10 and `X` will be 10 by 10. Remember that space is reserved for `DIM` statements, so don't be over-generous with sizes.

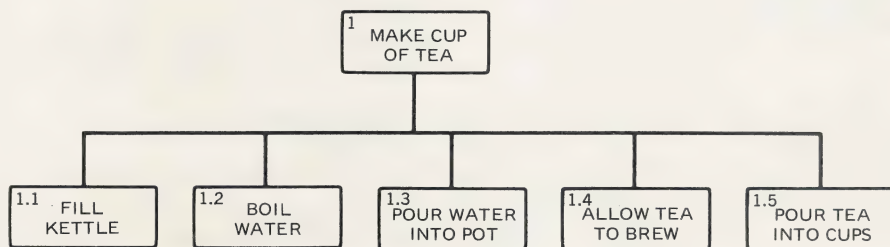


Fig 1. Tree diagram for 'tea making' modules.

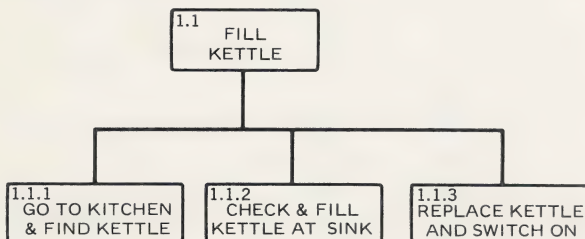


Fig 2. Modules can be split into sub-modules.

Try the following piece of code:

```
110 PRINT "LOOP AND MATRIX
PROGRAM 1"
120 DIM A(3,4): REM
ALLOCATE SPACE IN 3 x 4 ARRAY
130 FOR K = 1 TO 3
140 FOR J = 1 TO 4
150 INPUT A(K,J)
160 NEXT J
170 NEXT K
180 FOR K = 1 TO 3
190 FOR J = 1 TO 4
200 PRINT A(K,J)
210 NEXT J
220 NEXT K
230 END
RUN
```

Note the REM statement in line 120 — anything which follows the keyword REM is ignored (it's short for REMark).

Charting The Flow

A flowchart is like a road map — there's one start location and one stop point. Most programs have only one *start* and only one *stop*; any more and the flow could become very confused. The symbols in Fig 3 represent places where you can 'stop for fuel' (general processing), 'ask the way' (input), 'report on your action' (output) or 'have lunch' (GOSUB).

EXIT FLOWCHART:



ENTER NEXT FLOWCHART:



Fig 4. Exit and entry continuation points.

Sometimes a flowchart may stretch over several pages of paper, or may need breaking down into further modules. Fig 4

shows how the chart is continued to other sheets. A unique label is specified within the symbol (FRED) so as to avoid confusion with any other modules that may be required.

The flow of logic between points is represented by lines with arrows to indicate direction. It is generally a good idea to organise a flowchart so that the overall flow goes from top to bottom and from left to right. There are no definitive rules to determine how a line is drawn from

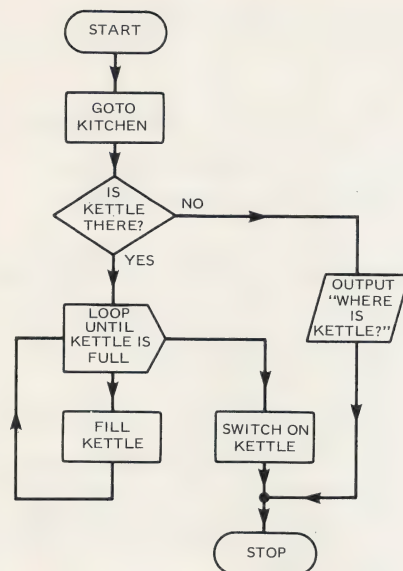


Fig 6. Simplified 'tea making' flowchart.

symbol to symbol, but Fig 5 shows some common examples.

Certain flowchart templates contain several other types of symbols. These generally represent specialised forms of action and are not necessary to the average home computer user.

A Source Of Knowledge

To conclude part two we've put together a program which converts integers into binary code. If the number is out of range or not an integer, then an error message will be generated. The binary code is displayed as eight bits, where the left-most digit has the greatest binary weighting (2 to the power of 7, most significant bit, MSB) and the right-most digit, the smallest binary weighting (2 to the power of 0, least significant bit, LSB).

```
10 REM *****
20 REM : Converts inputted int-
30 REM :eger (0< I <256) into eight bit
40 REM : binary code
50 REM : Written by R L Horne
60 REM : *****
50 CLEAR
60 PRINT "Enter integer";
70 INPUT A
80 LET G=A
90 DIM C$(8),D$(8)
100 IF A<>INT(A) THEN 400
110 IF A<1 OR A>255 THEN 370
120 LET E=0
130 REM : Main conversion loop
140 LET E=E+1
150 LET A=A/2
160 IF A=INT(A) THEN 200
170 LET A=A-.5
180 LET C$(E)="1"
190 GOTO 210
200 LET C$(E)="0"
210 IF A>0 THEN 140
220 REM : Reverse string, stan-
230 REM :dard convention (MSB-LSB, right
240 REM :to left)
230 LET D$="00000000"
240 FOR B=1 TO E
250 LET D$(8-E+B)=C$(E+1-B)
260 NEXT B
270 PRINT "Decimal value =";G
280 PRINT "Binary value = "&D$
290 PRINT
300 PRINT "Again: yes or no";
310 INPUT C$
320 IF C$="YES" THEN 50
330 IF C$="NO" THEN 430
340 CLEAR
350 PRINT "Wrong: do it again"
360 GOTO 300
370 CLEAR
380 PRINT A;" is out of range"
390 GOTO 300
400 CLEAR
410 PRINT A;" has decimal part"
420 GOTO 300
430 CLEAR
440 PRINT "End of run"
450 STOP
```

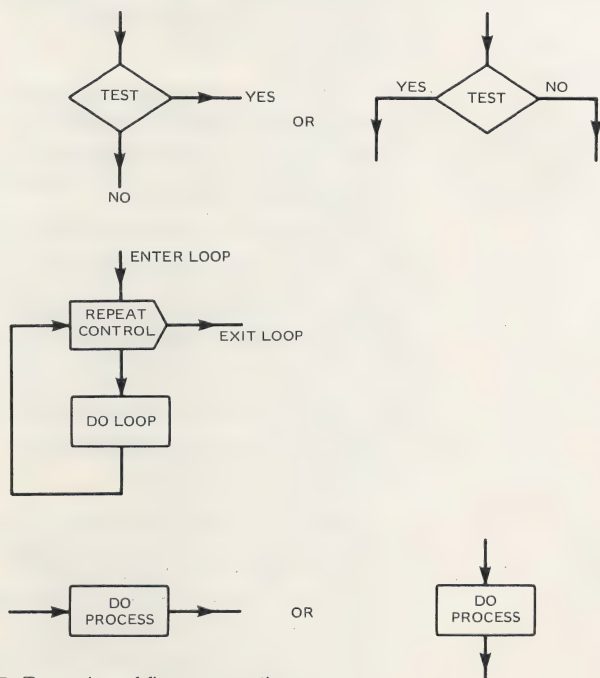


Fig 5. Examples of flow conventions.

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And now a few reasons for adults why

NOW YOU'VE MASTERED MONSTERS,
WE COULD MOVE ON TO MONEY
MANAGEMENT.



the Electron is such an exceptional machine at the price.

The Electron is neat and compact. Yet it is fast and powerful. (Full details, for the technically minded, are in the box opposite.)

It produces high quality sound using its own internal speaker.

And it offers a range of facilities many larger more expensive machines just cannot match.

For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result, the Electron delivers twice as many characters across the screen as its closest competitor.

Built to last and to grow.

The Electron has been designed and built to be a permanent part of the family, year in year out.

Particular care has been paid to the keyboard. It is electric typewriter style; robustly constructed with a good, solid 'feel'. It has a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style keyboards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.

A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be



ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.

A free taste of its versatility.

You will also receive an "Introductory" cassette which will put the Electron through its paces showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM).

The cassette will give you a taste of those exceptional colour graphics we mentioned earlier; of its ability to play and notate music, and show you how it might help in home accounting. It will challenge you to a few games and will, if you ask it, do your whole family's biorhythms in a matter of seconds.

You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal

Money Management" through "Starship Command" to "Creative Graphics" (which, incidentally, includes some spectacular three-dimensional rotating shapes). Naturally, with its strong educational links, educational software will be extremely

EXPERTS LIKE 'WHAT MICRO?'
AND ME RATE THE ELECTRON
HIGHER THAN ANY OF THE
COMPETITION.



important for the Electron and even now O and A Level revision papers are being processed for Electron users.

How to get your Electron.

The Acorn Electron can be found at local Acorn dealers and major high street stores. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200.



Technical Specifications

Hardware.

2MHz 6502.
32K ROM 32K RAM (64K total).
High resolution graphics 640 x 256 max.
Seven display modes.
8 colours and 8 flashing colours.
1200 baud CUTS tape interface with motor control.
Expansion bus for add-on interface modules.
Internal loudspeaker.
PAL UHF output to colour or black and white domestic TV.
RGB output for colour monitor.
56 key full travel QWERTY keyboard with spacebar.

Software.

BBC BASIC.
Extensions include interger, floating point and string variables, multi dimensional arrays: IF...THEN...ELSE, REPEAT...UNTIL, procedures with local variables.
Operating system allows plot, draw and fill commands.
Event timing.
Built-in assembler.
6502 assembly language can be mixed with BASIC.

The Acorn  Electron.

Mention Viewdata, and most people think of Oracle, Ceefax, and lately Prestel. Mention networking and most people will look blank — not surprising really when you consider the problems of computer communications. But are these problems so numerous? Having networked for just over six months on a humble Sinclair Spectrum, I don't think so.

For years people used to think of computers as Gods attended by boffins in white coats (don't laugh; they really did!) In time, people realised that computers weren't such mysteries after all — they were fun. The same is happening for modems, which allow computers to talk to each other (see our June '84 issue). And this is where we'll begin — for the novice computer-owner who, having just purchased his modem and 'plugging in' says, "I've paid all this money for you — do something!"

Buzby's Best

Prestel is definitely friendly — all the terminal has to do is to sit there and listen for incoming signals to display. At the beginning of each page, a clear screen and home cursor command is sent to the home terminal and *voila!* a page is displayed. This is Viewdata and, because of its easy use, is rapidly gaining ground.

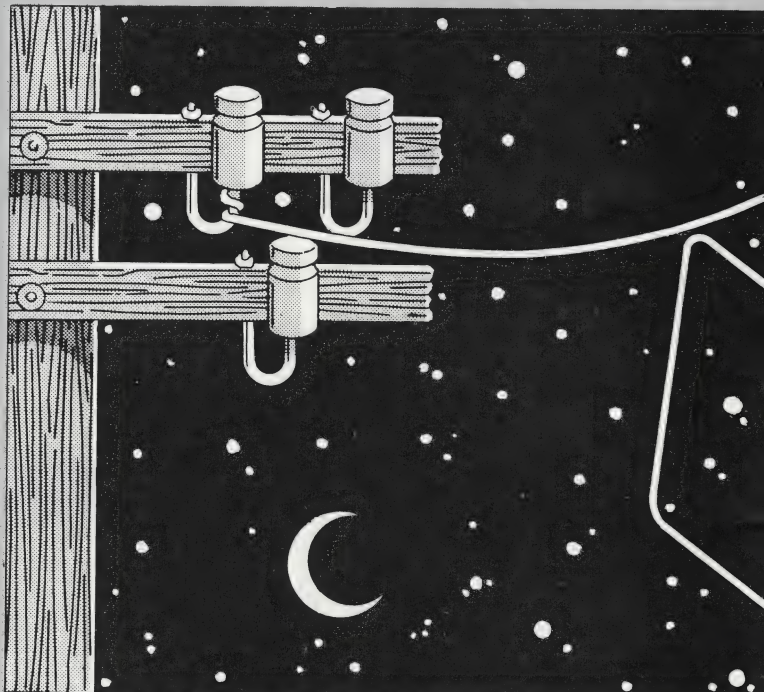
In Britain there are Prestel and several other private Viewdata systems. Data is sent from the host computer to the user's terminal at 1200 baud (about 120 characters a second). Return data plods back at 75 baud — slow, but unless vast quantities of return data are sent, adequate.

Within the UK there are also a multitude of Bulletin Boards, which, because they are truly interactive, operate at 300 baud send and receive. Such boards are for the dedicated computer hacker — the kind who sits hunched over the terminal way into the small hours. Information on these boards is usually computer-oriented and more often than not, has a message taking and sending facility (hence the term "Bulletin Board").

Further And Further

Moving on to the international networks (if your phone bill can stand it) is fairly easy. However, there is a service called Packet Switch Stream (PSS), which is designed to interlink computers for data exchange. PSS is around

NETW THE FINAL



Link up with some national and international 'sys

10% of the cost of dialling direct internationally. For instance, when contacting computers in the USA, call costs are around 12p a minute, cheap rate.

The PSS system works by encoding computer data into packets which are zipped via special BT lines to distant computers both within and outside the UK. Since data is packeted, several packets can be transmitted on one line (time sharing), hence the low costs.

Brought into service in 1981, PSS has around 14 access points in Britain, usually only a local call away (PSS hope to extend the number of access points to 20+ by late summer of this year). Users simply dial up their local "node" and log on (à la Prestel), type in the Network User Address and in a matter of seconds are hooked up. There is an installation charge of £25 (plus VAT), then a quarterly rental of £6.25 (plus

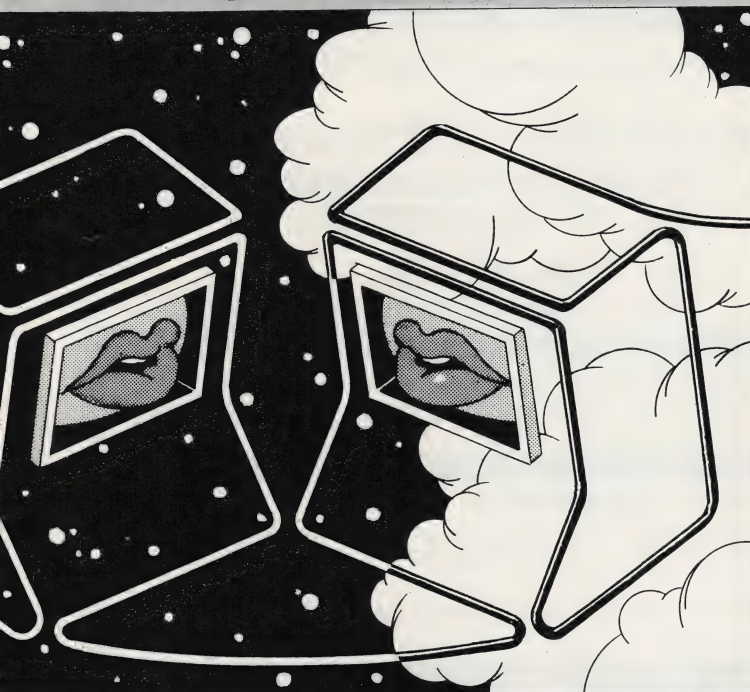
VAT). Once you've got a PSS account, there are two well established text services in the USA aimed at Home Computer Users — The Source and Compuserve.

May The Source Be ...

Described as "America's First Information Utility", the Source has information on everything. In the broadest sense it is similar to Prestel except that, of course, information has an American bias. The nearest analogy one can draw is that of an electronic library — a labyrinthine database with immense potential.

Electronic Mail (Sourcemail) is catered for, as is the US equivalent of telemessages — ECom, which guarantees next business day delivery of hard copy letters anywhere in the US. The cost of ECom is about 80 pence per A4 sheet of text (which is very reasonable). The Source also has

ORKS FRONTIER...



ems'—Steve Gold identifies the key connections.

a service called CHAT, which as the name implies enables users to chat to each other. At peak times, however, it can take several minutes for each chat message to reach the other subscriber.

The Source costs around £70 to sign up (with 5 free hours connect time) and £5.50 per hour connected (cheap rate). Interestingly, the Source allows cheap rate times in line with GMT, so you can go on at 7pm in London when it is 2pm in New York.

Serves You Right

Compuserve is newer than the Source and cheaper (and better *subjectively*). Offering the same facilities as the Source, CIS (Compuserve Information Service) is more accessible than its rival. This is probably because CIS was born out of a late night hackers bulleting board.

Gradually (and perhaps unfortunately for customers' bank

balances), someone realised that here was an opportunity to make money. So, casting a glance at the Source (which by then was evolving slowly but surely), Compuserve was born. Now with some 110,000 subscribers, CIS is rapidly outdistancing the Source because of its lately innovative services: Citizens Band Simulation — a twinset of 40 real-time interactive message boards, where users can chat CB style with each other. This service, ahead of all others, is proving to be the most popular and many, many friendships have been forged on the CB simulator. In fact, last year a couple got married on the CB simulation, following it some ten months later with a "live" birth rite there on CB.

As with CB in this country, different channels are designated for different groups. Most notable of these is the "Adult" channel which, as the name implies, is the

CB equivalent of the infamous New York "Singles" bars where consenting adults go for fun!

Compuserve is amazingly cheap when one compares it to the Source — about £29 sign up (including 5 free hours) and £4.30 per hour access charges (cheap rate).

And The Rest

Other notable services available by PSS include: Dialog Services (US Based), Dow Jones News (US Based), IRS Dialtech (Italian), Beltel (South African Viewdata), Bildshirmtext (West German Viewdata). Both Beltel and Bildshirmtext are colour clones of the UK's Prestel and, at the time of writing, in the process of linking into PSS. All of the services mentioned in this article allow direct dial-up as well as PSS access, although at International phone charges which can get quite pricey.

Packet Switch Stream,
Room G07, Lutyens House,
1-6 Finsbury Circus,
London EC2M 7LY
01 920 0661

IRS Dialtech (Italian Service),
c/o Department of Trade and
Industry, Room 392, Ashdown
House, 123 Victoria Street,
London SW1E 6RB
01 212 5638

Compuserve Information Services,
5000 Arlington Ctr Boulevard,
Post Office Box 20212,
Columbus, Ohio, 432220, USA
01 01 614 457 8600

Source Information Utility,
1616 Andeerson Road,
McLean, Virginia, VA 22102, USA
01 01 703 734 7500

List of 300 Baud (UK) Bulletin Boards

Database	Number
Southern BBS	0243 511077
Efficient Chips	0249 657744
Forum 80 (Hull)	0482 859169
Mailbox 80	051 428 8924
CBBS	01 399 2136
Distel	01 679 1888
Forum 80 (London)	01 747 3191
TBBS	01 348 6518
ACC	0908 44262
Forum 80 (Milton)	0908 613004
Mailbox 80	0384 635336
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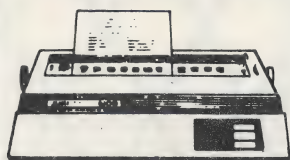
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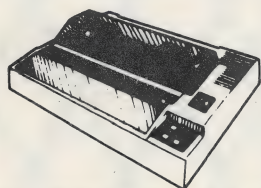


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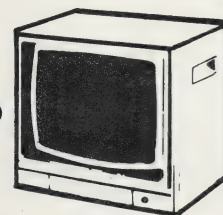


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ORIC ON DISK

The long-awaited Oric Microdisc drive comes under Trevor Barry's scrutiny.

At long last Oric have released their second computer peripheral — the Microdisc system. The drive offers a storage capacity of 160K per side, which seems quite small when compared to the rival Byte Drive's 220K per side, and uses three inch disks.

The system arrives in two boxes. The first, about the same size as an Atmos box, contains the disk drive together with a system disk, manual and plastic stand to rest the drive at an angle on a desk. The second box contains a chunky power supply, which will power two disk drives as well as the computer they are connected to. There is also a mysterious fourth socket next to the disk leads that could be intended for the Oric modem (though we're not going to guarantee it).

The drive itself is surprisingly long for a 3" system. In fact, taking it apart reveals that the drive assembly only takes up the first two thirds of the casing. The remaining third is empty apart from various cables connecting the components and sockets, on the back of the unit, to the controller PCB on top of the drive mechanism.

Putting The Boot In

The same gremlins that had a field day on the Oric-1 manual seem to have been at work on the disk manual. It has quite a few errors, some of which are corrected on an errata sheet. Apart from these errors the manual is quite straightforward and describes all of the DOS commands adequately.

When everything is connected and switched on a message requesting the insertion of a system disk appears on the screen. Once this disk is inserted the usual power up message appears with an extra 'Oric DOS' line above it. If there is a file called 'BOOTUP.COM' on the disk it is loaded and executed. The file supplied on the system disk simply prints two messages explaining how to get help and how to run the demo program.

When we tried the system with an Oric-1 we found that we had to hit the reset button several times before the system would boot properly. This is almost certainly a problem with the Oric-1, as another sheet included with the manual explains that some of these computers will need to be modified before they will work with the system.

Most of the usual DOS commands are implemented but there was one worrying omission. A newly formatted disk presents you with 638 sectors (1 sector = 256 bytes) of free space. As you use the disk this space naturally becomes fragmented so that you may have 200 free sectors spread over a disk in chunks of 20 sectors or less.

When you try to save a 21 sector file on this disk the system reports that there is not

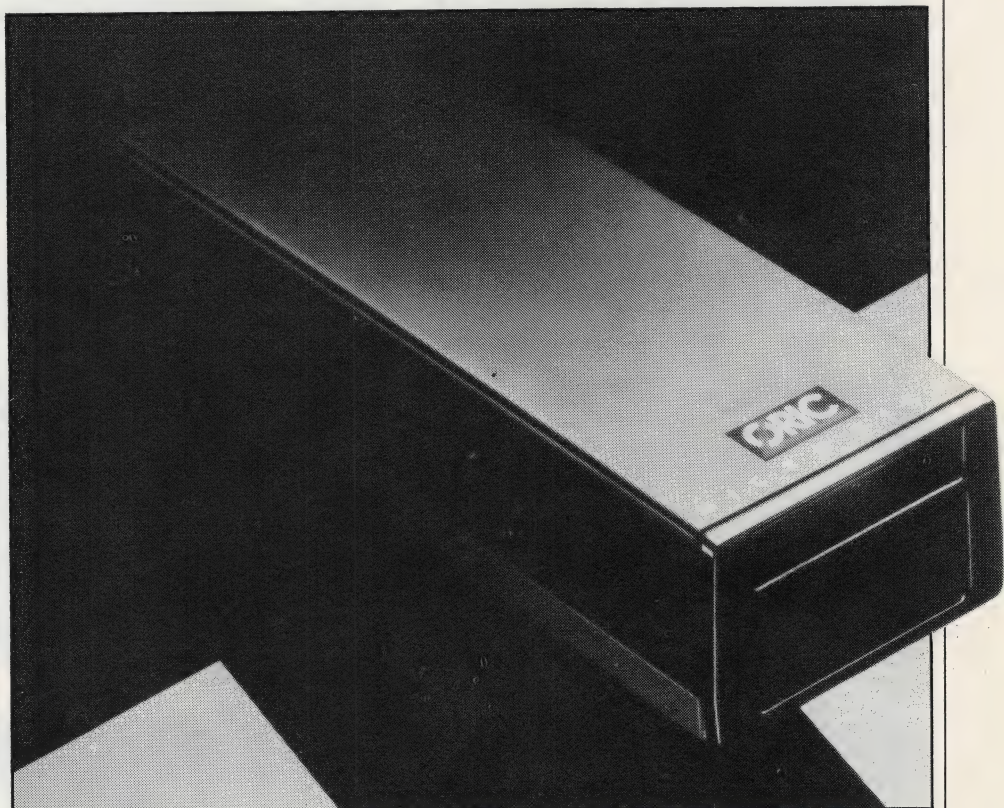
enough free space. This problem occurs on all disk systems and is usually solved by having a utility that will compact all of the free space into one big lump. Unfortunately Oric seems to have missed the boat on solving this problem. Copying all of the files to a new disk will get around the problem, but this takes quite a while on a single disk system and is hardly a satisfactory solution.

Anybody wanting to copy their cassette software onto disk will be disappointed as the noise in the disk cable drowns out any signal coming into the cassette port. Plugging the disk in after the cassette

same as the cassette system commands. The remaining operations only allow sequential access to disk files, which is a shame as it turns the disk into little more than a very fast tape drive.

Errata Addenda

Normally a disk error results in a message being printed on the screen. However, setting location 1277 (#4FD) to 1 will cause the DOS to store the error number in location 1279. This allows application programs to do their own error trapping and end-of-file processing. Files are allocated



software has been loaded will not work either as it must be reset to get the DOS running.

Very little space is taken from the Atmos RAM by the disk system, as the drive has its own DOS ROM that is accessed by bank switching. To do this the '!' routine is used and all DOS commands must be prefixed by this character. When the Atmos finds a line starting with '!' it runs a routine located at #4C0 which does the bank switching and invokes the DOS. The contents of this will remain a mystery until someone prints the inevitable disassembly (Oric give very little away in the manual).

From a programmer's point of view the disk system appears surprisingly limited. There are 6 file handling commands, OPEN, CLOSE, GET, PUT, STORE and RECALL. STORE and RECALL are the

in whole sectors so that if you write 257 bytes to a file you will use up two sectors. This seems quite reasonable until you try to read back the files. Upon reaching the 257th byte a program will not stop. It will simply carry on reading invalid data, until the end of the sector is reached when an end-of-file condition will occur. This is quite annoying but can be programmed around. It seems quite trivial when you find that PUT will only write strings or single byte positive integers (ie, 0-255) onto a disk. The only way to get reals, negative numbers or large integers onto a disk is to put them into an array and use STORE. And whilst we found no bugs in the disk system, it really needs some extra software. A space compacting utility and some random access routines would bring it up to the standards of other systems.

£1000

of software to give away in the Mr Mephisto Mystery



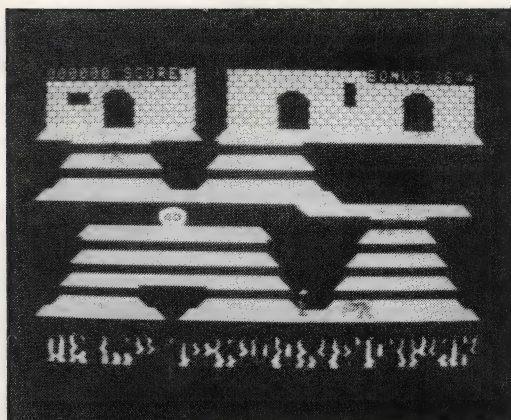
Competition time once again, and this month we are giving away £1000 worth of software from Eurobyte.

Our games reviewers, whose souls are already far beyond redemption, tell us that unholy consolation can be found in playing Mr Mephisto, a devilish new arcade game from Eurobyte, containing more than a hint of the traditional adventure themes.

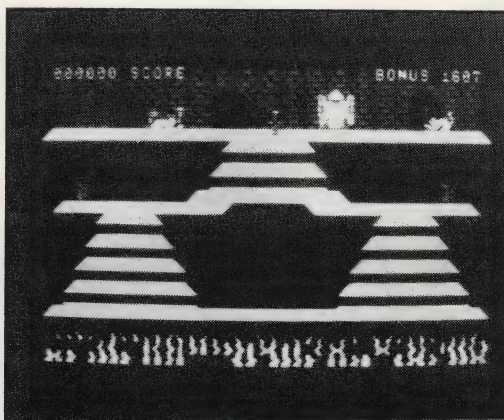
Your task is to explore Mr Mephisto's house, avoiding the unwelcome attentions of pitchfork-wielding demons and ghastly ghouls, to collect the valuable items hidden in various rooms.

If you are good enough you play six screens in increasing order of difficulty — these screens are illustrated below. Three of them we have labelled with the number of the level they display. All you have to do is identify the other three.

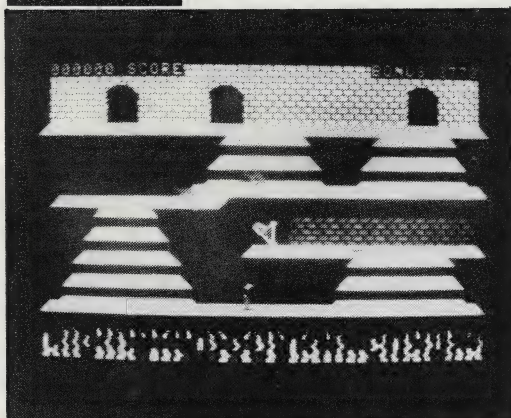
The 150 winners, who will each receive a copy of Mr Mephisto (please specify whether BBC 'B', Spectrum, Electron or CBM 64), will be the senders of the first 150 correct entries to be pulled out of the (extra large!) hat after our closing date of 15th August 1984.



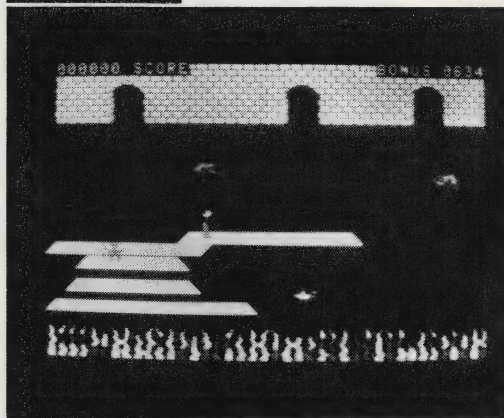
LEVEL 2



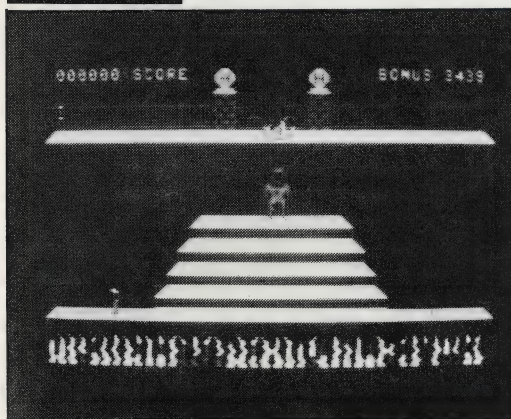
LEVEL A



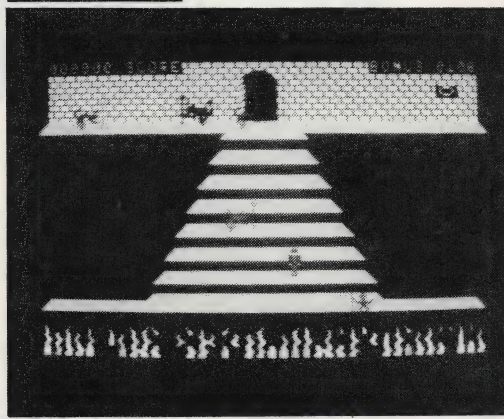
LEVEL 4



LEVEL B



LEVEL 6

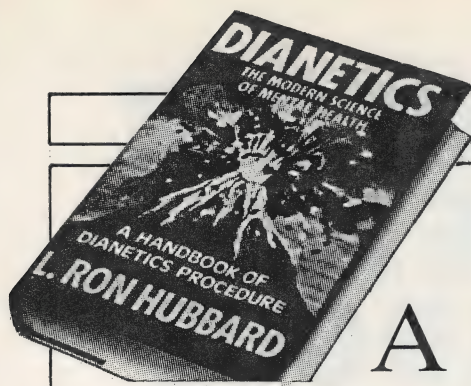


LEVEL C

Send your answers on a postcard to:

**Mr Mephisto Mystery, Which Micro & Software Review, Scriptor Court,
155 Farringdon Road, London EC1R 3AD**

No EMAP employee or their relatives may enter this competition. Winners will be notified by post. The Editor's decision is final and no correspondence will be entered into concerning the results, which will be published in a subsequent edition of Which Micro.



A PATH TO CLARITY OF MIND

Consider the potential of a machine with a thousand times the capacity of any computer currently available. Consider the potential of an organic computer that is self programming, self generating and limitless in its scope. What you are now considering is the human brain, the single most powerful computing machine on the earth. How then do we utilize the enormous capabilities of this on a machine? This was the problem that faced L. Ron Hubbard and "Dianetics: The Modern Science of Mental Health" is the detailed research to provide the answer.

It starts like this: "A science of the mind is a goal which has engrossed thousands of generations of Man. Armies, dynasties and whole civilisations have perished for the lack of it . . . and down in the arsenal is an atom bomb, its hopeful nose full-armed in ignorance of it".

An all-embracing statement of great propensity.

It then goes into 400 pages explaining how the mind works with its variety of compartments, memory banks and linkage of the senses and sets out a system towards bringing the mind to a condition of 'clear', a Dianetics term meaning a mind devoid of aberrations and which can perceive and compute rapidly.

Over several weeks I interviewed a considerable number of people asking what the book had done for them.

Mike Phillips is now 39 and he started his working life learning stage management from the bottom up. From provincial theatre he went to West End shows. The move came at a time when stage management was in a period of transition – lighting and sound arrangements had become very sophisticated.

"I needed to know a lot more about sound engineering", he said. "I had a mind necessarily filled with a dozen things but I knew I had to grapple with new

forms of electronics".

An acquaintance introduced him to the book on Dianetics which, he claims, had a salutary effect. "I followed the reasoning in the book and even took a short course. It is clarity of mind that emerges", he said, "It gave me the extra faculty to study highly technical books".

Ultimately he was appointed to a post of chief sound engineer with a major group in London and eventually brought highly technical innovations into the entertainment world.

Another type of engineer who took up the philosophy of Dianetics is George Turney. This man, qualified in structural engineering, has a great deal to do with oil rigs in different parts of the world.

He had a long period in California where the pace of work also carried the rewards of a sunshine life.

"I had a high social life as well", he says, "but there came a time when life was an endless round of work and weekendening at one place or another and I realised there were more things to do than this convivial merry-go-round.

"Dianetics: The Modern Science of Mental Health, was one of the subjects I read up and I began to plan a future with greater clarity. In time I came back to England and started handling my own affairs and business".

The third man in this category was Dale Bulbrook who runs computer operations for an organisation in Sussex. He has had a lot of experience at home and abroad. He worked some years with ICL machines and spent time in Australia working as a programmer and systems analyser.

Back in England, he came across the Dianetics book by chance. "I picked up the book at random", he said, "and found myself agreeing with points on logic and computerisation. The

philosophy on how the mind works proved fascinating and beneficial to programming".

The Analytical Mind

Now, turning to the book, Hubbard states this in a chapter on The Analytical Mind and the Standard Memory Banks: "The human mind can be considered to have three major divisions. First, there is the analytical mind, second, there is the reactive mind, and third, there is the somatic mind.

"Consider the analytical mind as a computing machine. This is analogy, because the analytical mind, while it behaves like a computing machine, is yet more fantastically capable than any computing machine ever constructed and infinitely more elaborate . . ."

He goes on, "What would you want in a computing machine? The action of the analytical mind – or organiser – is everything anyone could want for the best computer available. It can and does all the tricks of a computer. Over and above that it directs all the building of computers. And it is as thoroughly right as any computer ever was.

It does not take a great deal of intelligence to see what Hubbard is driving at. The mind with all its memory banks starts as a pure piece of machinery. And, of course, he points out, much can happen in the sequences of life that introduces clutter.

He postulates the theory that the memory begins from day one and goes on storing every experience from then on. The object of Dianetics therapy, he propounds, is to bring about a **release** or a **clear**.

The reference to therapy is the system in the book which can be self-tested in taking hinderences (clutter) from the memory or subconscious. Also Hubbard has adopted a series of expressions singular to the subject, hence:

A **release** is an individual whose major upsets and anxiety have been dealt with by Dianetics therapy. A **clear** is a person who, as a result of therapy, has neither active or potential aberration. To **clear**, he says, is to handle all the physical pain and painful emotion of the life of the individual with the result that the person is in full control of his

own life.

The second group of people of interviewed were in the highly creative field.

Nicky Hopkins and Graham Todd are names that may mean little to the average man in the street. But both, in their own way, are brilliant musicians. Hopkins was the pianist with the Beatles in recording sessions and later with the Rolling Stones. Now in his thirties he lives in a house in Hollywood and composes film music.

Todd is also a pianist and worked with Cliff Richards for six years and with other stars before that. He has composed theme tunes for TV series and his name is on more than 12 million records. Both these men portrayed the kind of life that comes with international travel, mass audiences and high-pressured talent.

"There comes a time when the mind loses awareness of time and place and it is then you want to find a basic value to make you realise where you are and where you age going in the world", said Hopkins. "In due course I came across Dianetics in America and figured that Hubbard was on the right lines. Since those days I followed the subject through and found the concentration and mental energy to compose music which has gone down well in America".

Todd also extolled the result of studying the book. In a staccato burst he said. "Gives you awareness, improves communications, clarifies my aims. You ought to try it . . ."

The experience of these people may be summed up in the words of Hubbard: "Dianetics will bring the optimum analytical ability for the individual and, with that, all recall. The experience of his entire life is available to the **clear** and he has all the inherent ability and imagination free to use it. His physical vitality and health are markedly improved . . . his ethical and moral standards are high, his ability to seek and experience pleasure is great".

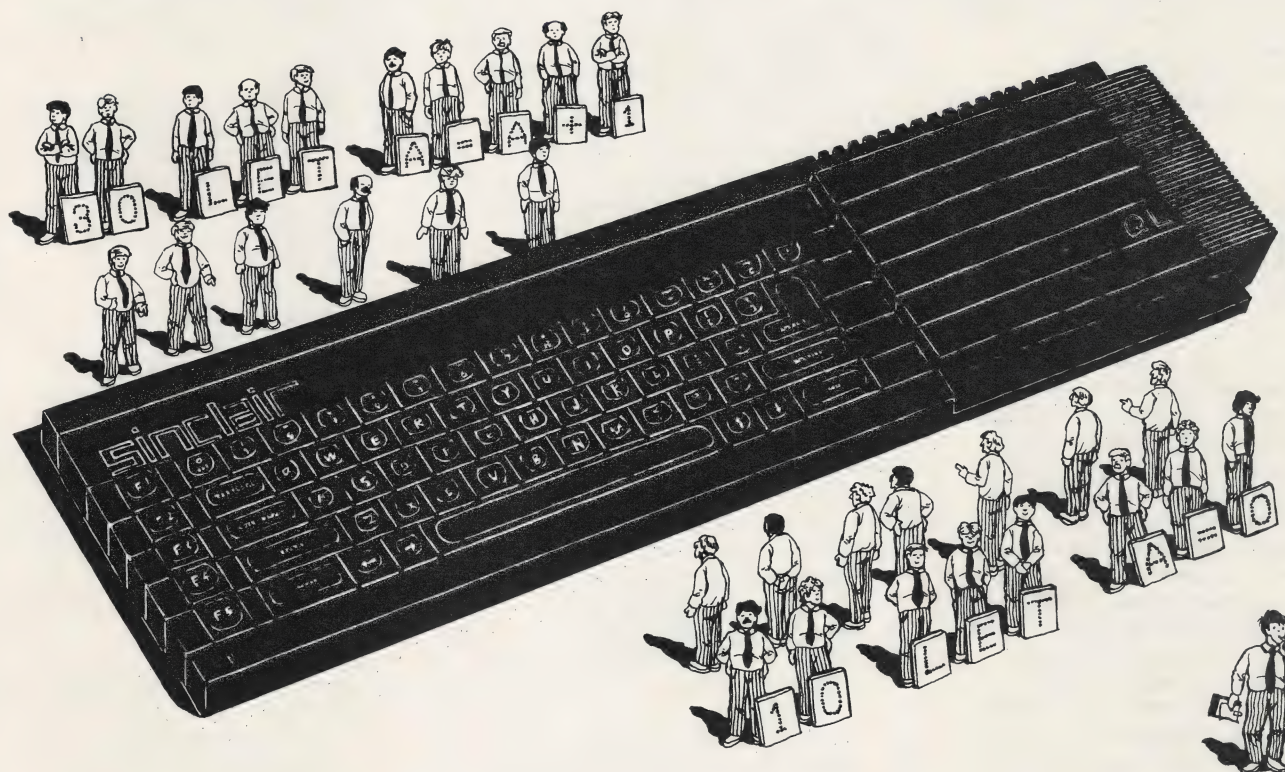
As a book the issue has brought on one thing clear to me. I have met some very interesting and exceptional people. As an independent observer I can say they are worth a book in themselves – G.S.

The publication is available from the Dianetics Information Centre, Saint Hill, East Grinstead, Sussex. price £3.95 including postage and package.

Adam Weston broadens his horizons to include the QL's SuperBASIC in another round-up of BASIC codes and conventions.

BASIC

- DIFFERENCES -



It is a distinct possibility that BASIC has grown up. A couple of years ago the only looping structures available to the BASIC programmer involved the use of FOR...NEXT loops or multifarious IF...THEN GOTO

constructs. Not any more. The advent of the BBC Micro has brought about a revolution in home-micro BASIC interpreters, so that we are now left in the position where the variety of repeating and controlling structures rivals that offered by the more famous block-structured languages along the lines of C and Pascal. Perhaps the most advanced example of this is the so-called SuperBASIC found on the Sinclair QL, which luckily lives up to its name (not so lucky for the person who wants to run a SuperBASIC program on a different computer!) Fortunately there is one very simple technique that will allow any problem like this to be overcome. Any looping structure can be coded down to forms using FOR...NEXT and IF...THEN GOTO — on *all* machines.

The key is to first bring the problem down to such a level where any machine can cope with it — cater for the lowest common denominator. Only then is it safe and simple to rewrite the program sections to take account of any useful functions the new machine may have to offer. A BBC BASIC REPEAT...UNTIL loop can always be recoded. For instance, the segment:

```
10 A = 0
20 REPEAT
30 B = 16 * A + 2 * X
40 A = A + 1
50 UNTIL A = 100 OR B = 352
```

can be re-written as:

```

10 LET A = 0
20 LET B = 16 * A + 2 * X
30 LET A = A + 1
40 IF A <> 100 THEN GOTO 20
50 IF B <> 352 THEN GOTO 20

```

so that you can take advantage of your BASIC's facilities. On the QL you would type:

```

10 A% = 0:REPEAT a loop
20 B = 16*A% + 2*X:IF B = 352
    THEN EXIT a loop
30 A% = A% + 1:IF A% = 100 THEN

```

EXIT a loop

```
40 END REPEAT a loop
```

And even this could be recoded into something less readable, but more efficient, if you wanted.

In all cases converting a standard REPEAT...UNTIL loop Acorn-style is easy. QL SuperBASIC conversions can pose a far greater problem though, as the language is far less line-number dependent. In fact the best way of regarding SuperBASIC loops is to pretend that you're programming in BCPL (or C), with each 'REPeat *identifier*' loop being treated as endless. The NEXT statement then becomes LOOP and likewise EXIT becomes BREAK. This is true in the case of FOR...END FOR loops in most cases too.

SuperBASIC, however, does have qualities that make it very hard to reproduce on other BASIC-running machines. In particular, a *FOR list* can exist, like:

10 FOR counter = 1,5,3,92,0 TO 7
with added difficulties from 'FOR loop
epilogues' caused by the use of the
ultra-structured NEXT and END FOR
keywords. Line 10 repeats the FOR loop as

many times as there are items in the list, starting with 1, going through 5, 3 etc, until it gets to the 0 TO 7 part. Then it acts like a normal FOR NEXT loop. Re-writing this sort of thing is not so easy. For computers with READ and DATA statements, something like this would probably suffice (though it's a bit messy).

```
10 READ c:d = 0
20 IF c = 0 THEN d R 1:FOR c = 0 TO
  7
... body of loop ...
100 IF d = 1 THEN NEXT c
110 IF d = 0 THEN GOTO 10
... rest of program ...
1000 DATA 1,5,3,92,0
```

There is obviously never a case when a particular programming construct cannot be programmed in a different way, but there is every possibility that the solution finally reached will bear no structural resemblance to the original. This, unfortunately, is BASIC.



First, bring the problem down to such a level where any machine can cope with it.

Now we come to GOSUBs, and their more modern alternatives — user-defined procedures and functions. GOSUB has nearly always been provided in BASIC dialects, but PROCedures are relatively new. The problem is not helped by the various ways that parameters can be passed to procedures and functions, and the fact that the newer BASIC's allow functions to spread across more than one line and thus become recursive. In other words, functions can call themselves. SuperBASIC even allows defined procedures to be incorporated into the language as new keywords.

Using GOSUB will invoke a subroutine, which is rather like a program within a program, except that variable names declared or assigned-to in the program will also be available within the subroutine, and vice versa. Such a situation can be made manifestly *not* the case in defined procedures and functions.

To understand how to convert procedures to a dialect that does not support them, you first need to understand the difference between functions and procedures — a fundamental precept. A function is a segment (of a computer program in this case) that returns a result to the caller, while a procedure is a segment that has an effect upon something, but never actually returns an answer. For instance, you would use a procedure to draw a mountain on the screen (it returns no result to the program itself) and you would use a function to convert a hex string into a decimal number (which is the result).

However, the only computers with procedure power worth speaking about are the BBC Micro/Electron, the Amstrad and the QL. Both functions and procedures have the ability to start with specific arguments handed to them by the calling

program. These are called the parameters. In BBC BASIC the parameters are always shown in brackets, but in SuperBASIC they are not (if they are, then the value rather than the variable itself is passed — very advanced stuff!). A BBC BASIC procedure could be:

```
1000 DEFPROC test(a,b,$)
1010 LOCAL a%,x$
1020 PRINT TAB(a,b);$
1030 a% = ASC(MID$(b,1))
1040 x$ = "Here..." + CHR$(a% +
  32)
1050 PRINT x$
1060 END PROC
```

This procedure would be called with a statement like PROCtest(10,4,"This is the test string"). The parameters then become 10, 4 and "this is the test string" respectively, so whenever one of a,b or \$ is referenced *within* the procedure they will be substituted with their actual values. Notice also that two variables have been declared as LOCAL to the procedure. This means even if they exist elsewhere within the program, the values used will only be those assigned within the body of the procedure and the values (if any) outside will not change.

When such a procedure is converted into a subroutine, things are different. Any variables declared or assigned-to will also exist within the main program; so if a variable name already exists, its value would be changed by calling the subroutine. This must be watched for and taken into account as it can be the greatest cause of trouble in subroutines. The previous example could be coded as a subroutine in the following way:

```
9000 REM variables a, b and $ must
      be set up before calling
9010 PRINT TAB(a,b);$
9020 a% = ASC(MID$(b,1))
9030 x$ = "Here..." + CHR$(a% +
  32)
9040 PRINT x$
9050 RETURN:REM if a% or x$
      existed before, they will now
      have different values.
```

It looks very similar, but is far wider ranging in its side effects — most of them unintentional!

QL procedures can likewise be recoded, but care must be taken to ensure that passed parameters are dealt with correctly, as a parameter of par1 is quite different to a parameter of (par1). You can also declare variables as being LOCAL to SuperBASIC procedures.



SuperBASIC has qualities that make it very hard to reproduce on other machines.

Functions have their own set of problems. A Spectrum function could only spread across one single statement line and only return a simple result. Both BBC BASIC and SuperBASIC functions are much more developed and can spread across any number of lines, be defined in

terms of themselves, invoke all sorts of other routines and generally make life a lot easier for the programmer. If your machine supports only one-line functions or doesn't support them at all, the only way to achieve



If your machine uses one-line functions, you must use subroutines to achieve the same effect.

the same effect is to write a subroutine that returns its result in a particular variable. For instance, here is a function for the QL that converts a hexadecimal string into the equivalent decimal number:

```
21000 DEFine FuNction hex(hex$)
21010 LOCal a,b,dec
21020 dec = 0
21030 FOR a = 1 TO LEN(hex$)
21040 b = (hex$(a) INSTR
  "0123456789ABCDEF") - 1
21050 IF b < > - 1 THEN
21060 dec = dec*16 + b
21070 ELSE dec = 0: EXIT a
21080 END IF
21090 END FOR a
21100 RETurn dec
21110 END DEFine
```

Typing PRINT hex("FA00") into a QL containing this procedure will result in 64000 being printed on the screen. But converting this to a non-function supporting BASIC is extremely arduous, especially as it's highly unlikely that the INSTR function on line 21040 will be provided in the same way (if at all) on another machine. Let's try re-writing it for the Spectrum.

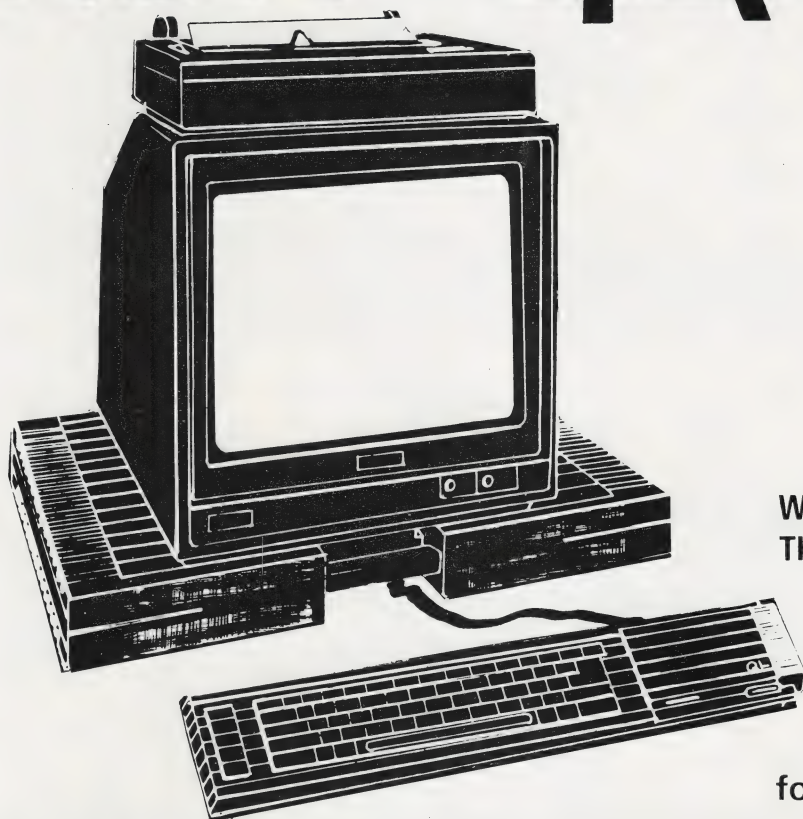
```
1000 REM gets parameter in h$ and
      returns result in d
1010 LET d = 0
1020 FOR a = 1 TO LEN h$:LET x = 0
1030 FOR b = 1 TO 16:IF
  "0123456789ABCDEF"(b) =
  h$(a) THEN LET x = b
1040 NEXT b:LET x = x - 1:IF x < > -
  1 THEN LET d = d*16 + x
1050 IF x = - 1 THEN LET d =
  0:RETURN:REM jumping out of
  loops in this way is bad practice,
  but OK on a Spectrum!
1060 NEXT a:RETURN
1070 REM changes the values of
  d,a,b,x
```

As you can see, it's a lot more complicated and not so easy to use. To get a result from this you now need to type LET h\$ = "FA00":GOSUB 21000:PRINT d.

So, it does seem that anything can be recoded, but often a complete change of algorithm — the steps needed to achieve a goal — is required. In the case of recursive functions, routines that cannot support multi-line functions cannot support recursive ones either, so a totally different way of going about things is required. This is not so much a conversion problem as a programming one in general and a look at some of the books on block-structured recursive languages is useful here.

More of the secrets of program-code translation next month.

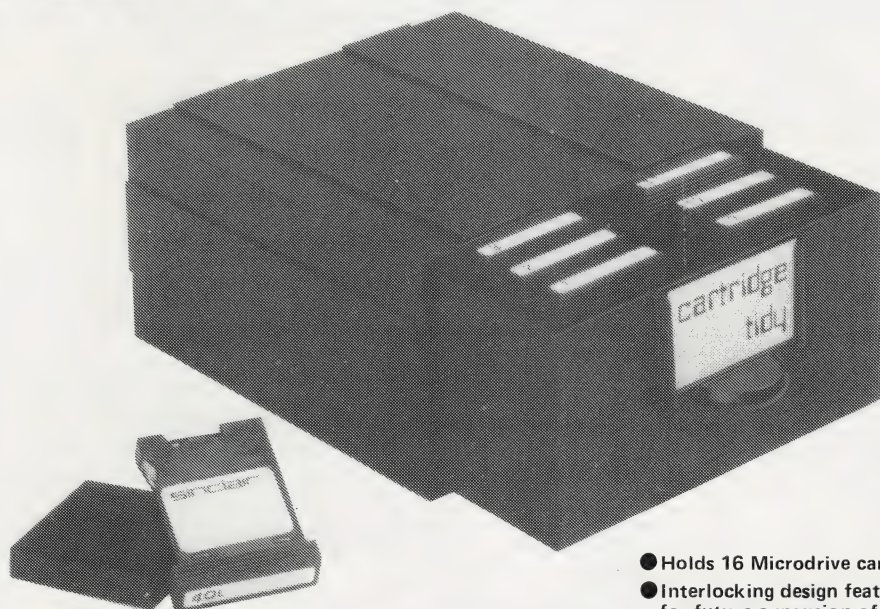
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Nicky Trevett reviews a larger-than-usual selection of books from the *Which Micro* bookshelf.

MANUAL OVERRIDE

Making Music on the BBC Computer by Ian Waugh, Sunshine Books, £5.95

This is sub-titled 'A Musician's Guide to Programming', but don't be put off — you don't have to be a Mozart to understand it. The book is all about the sound generator on the BBC Micro and will be of interest to any BBC owner who has not yet got around to exploring its musical capabilities.

While there are chapters on basic music theory, most of the book is devoted to making the BBC work to produce the sound effects you want, whether it be explosions, polyphonic music, or seagulls and foghorns.

Programs That Write Programs by Chris Naylor, Sigma Technical Press, £7.95

"Never write another program", says the introductory blurb on the cover of Chris Naylor's hilarious foray into the world of program generators.

A frank discussion of the reasons why anyone should want to buy a program generator in the first place is followed by an examination of what they do and how they do it, rounded off by a series of concise but excellent reviews of leading commercial products, including 'Codewriter' and 'The Last One'.

Of specific interest to small, and not so small, business, perhaps, but should also be of general interest to any keen programmer.

The Penguin Book of Personal Computing by John Graham, Penguin, £3.95

This is one more overview of a massive and sprawling subject, already examined, discussed and dissected in a growing library of similar volumes, some of which have done it better.

This one does not seem to know quite what it wants to do or whom it

wants to inform. It touches on everything — the history of personal computing, the architecture of personal computers, peripherals, programming, operating systems, networking, games... There should be something for everyone, business-user and games-player alike, but in fact there is no obvious appeal.

Comprehensive and worthy as it is (the appendices are exhaustive), the treatment is too dull to hold the attention for very long, but technically-minded amateurs might find it useful as a reference.

Commodore 64 Graphics and Sound by Steve Money, Granada, £6.95

This is clearly for anyone who owns a Commodore 64 and wants to know more about its graphics and sound capabilities. More, it is for 64-owners interested in graphics and sound and well-versed in the ways of their micro — jaded games players, perhaps.

It's a lively enough look at the possibilities, with plenty of sample programs provided. There's advice on creating music and sound effects, including how to 'play' the Commodore as a musical instrument. Most of the book, however, is devoted to graphics — character graphics, high-resolution graphics, colour, constructing shapes on-screen, animating them, creating perspective and 3D effects etc.

Expensive, for a paperback, but should occupy a good number of wet afternoons.

The Memotech Games Book by Owen Bishop and Audrey Bishop, Granada, £5.95

Granada seems to be unshakably convinced that the lure of games is as powerful as ever — they are probably right.

This time it's the turn of

Memotech-owners to benefit. Here they will find 21 games' listings (all working programs, dumped to the printer), with familiar-sounding names like Black Hole, Minefield, Bombing Run and the like.

Each listing is accompanied by a short introduction, a how-to-play-it section, a winning tactics paragraph, hints on keying in and a bit of programming theory — which bits of the program do what. Just to be different, there are two programs partly written in 'Noddy' language (Memotech-owners will know what I mean).

The Atmos Book of Games by Mike James, S. M. Gee and Kay Ewbank, Granada, £5.95

This is a sister book to the Memotech Games Book — same price, same number of programs, same mix of games, not dissimilar covers — but different micro, in this case the Atmos.

Here are 21 games' listings, all in BASIC, on the usual themes — Alien Invaders, Fruit Machine etc, plus pastimes like noughts and crosses and such. This collection is more overtly concerned with making the most of the Atmos colour graphics, and there is more emphasis on improving your own programming — picking out the subroutines to show you what they do, and things like that.

Worthy of particular mention is Smalltalker, a program which allows you to hold a "conversation" with your Atmos. That's if you want your micro to answer you back.

Beyond the Arcade by Nicholas Palmer, Mosaic Publishing, £6.95

This is sub-titled 'Adventures and Wargames on your Computer', but it's not just another book of games' listings. Rather, it offers a whole new dimension on the world of computer games.

It is a series of reviews of

commercial games' packages, together with advice on which home computers are best to run them. Most people are familiar with Adventure-type games like the Hobbit, but the book soon moves on to strategic planning and Grand Control, and rockets off into outer space. You too, it seems, can indulge your own megalomania. You can control armies and populations, direct the economy and ecology of planets and attempt to win mighty star empires. Heavy stuff, and most of it new to me.

It's all done by PBM — play-by-mail. You get a group of players together and the game is controlled by a master computer. You can even run a game as a small business — advice is given.

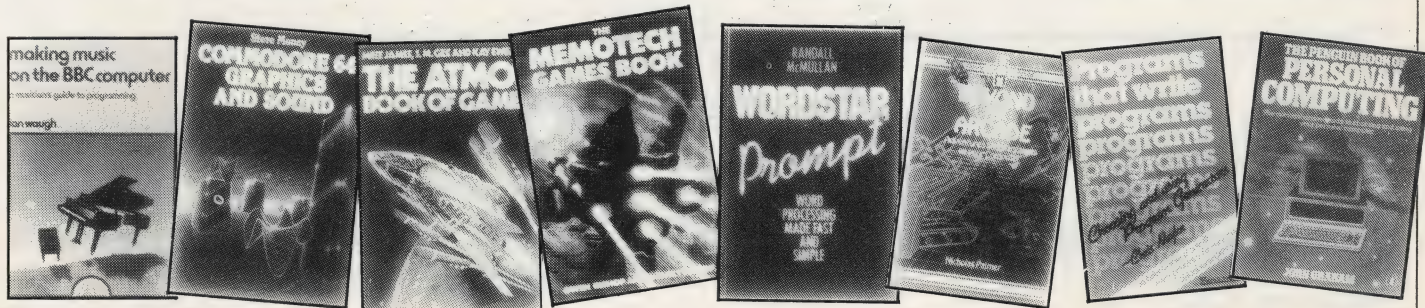
I found it all rather sinister in the way it's all taken so seriously. But it's certainly a far cry from Pac Man.

WordStar Prompt by Randall McMullan, Granada, £5.95

This is supposed to render the tricky business of word processing "fast and simple" ... Yes, even WordStar.

WordStar, of course, set the standard for word processing programs, but no-one has ever pretended it's in any way friendly or easy to learn. This book doesn't, either, but it makes a very creditable attempt to initiate the user into its mysteries, starting at the beginning ("Switch the computer on...").

A short step-by-step guide to the program's functions, accompanied by huge diagrams that with any other program would be an insult to the intelligence, is succeeded by a concise exposition of what WordStar is all about. The book ends with a handy summary of WordStar commands, and a few appendices. If nothing else, it should be kept as a quick reference guide, in case you should ever encounter WordStar.



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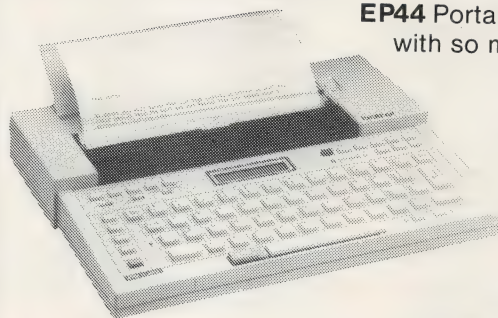
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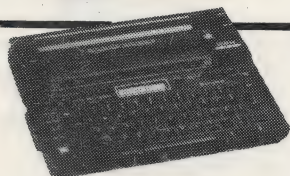


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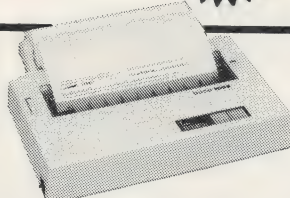
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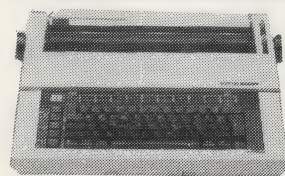
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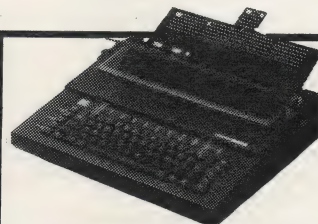
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ISLAND SEARCH

PROGRAM OF THE MONTH

This is an adventure for the 48K Spectrum, by G. P. Jones, in which you must locate a secret formula on an island which once belonged to a scientist who is now dead. You are a government agent who has been sent to retrieve the formula before it falls into enemy hands.

The following single letter commands can be used:—

n = go north
s = go south
e = go east
w = go west
u = go up
d = go down

The following single word commands can be used:—

inventory (or i) — lists all objects you're carrying
recap (or r) — redescribes a location

save — saves game at current position
quit — ends game

The following verb commands can be used:—

take = pick up and carry an object
drop = put down an object

Verbs should be used in the form verb followed by noun and there are other verbs that can be used to manipulate objects. The maximum number of objects which can be carried is five.

Restrictions on the vocabulary which you can use are given in the section 'COMMANDS'.

20-30	Initialise pointers to subroutines
40	Go to first location
50-270	Input command and decode
1000-1440	Describe locations and set pointers to surrounding locations
2000-2010	Set direction pointers to zero
5250-5280	Print objects in current location
5500-5520	'Say' subroutine
5750-5780	Finished subroutine
6000-	Save subroutine
6250-6260	Quit subroutine
6500-	Cut subroutine
6750-6770	Read subroutine

7000-7300	Light subroutine
7250-7290	Lassoo subroutine
7500-7550	Inventory subroutine
7750-7800	Shoot subroutine
8000-8020	Dig subroutine
8250-8330	Unlock subroutine
8500-8540	Drop subroutine
8750-8810	Take subroutine
9000-9040	Split command into verb, noun
9500-9520	Initialise locations of object
9530-	Initialise flags
9540-9580	Print out title page

init	Pointer to initialise subroutine
deco	Pointer to command decoder
take	Pointer to take subroutine
drop	Pointer to drop routine
unlo	Pointer to unlock subroutine
dig	Pointer to dig subroutine
shoo	Pointer to shoot subroutine
inve	Pointer to inventory subroutine
lass	Pointer to lassoo subroutine
ligh	Pointer to light subroutine

read	Pointer to read subroutine
cut	Pointer to cut subroutine
quit	Pointer to quit subroutine
save	Pointer to save subroutine
fini	Pointer to finished subroutine
say	Pointer to say subroutine
see	Pointer to look around subroutine
a\$	Command as input
n,s,e,w,u,d	Pointers to surrounding locations
b\$	Verb of decoded command
c\$	Noun of decoded command
o\$()	Array containing names of objects
l()	Array pointing to locations of objects
carry	Number of objects being carried
f	Various loops
place	Pointer to current location
bullet	Flag indicating loaded gun
open	Indicates door in cliff is open

1 REM

ISLAND SEARCH
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```

10 INK 6: PAPER 0: BORDER 0: C
LS
20 LET init=9500: LET deco=900
0: LET take=6750: LET drop=8500:
LET unlo=8250: LET dig=8000: LE
T shoo=7750: LET inve=7500: LET
lass=7250: LET ligh=7000: LET re
ad=6750: LET cut=6500: LET quit=
6250: LET save=6000: LET fini=57
50: LET say=5500: LET see=5250
30 GO SUB init
40 GO TO 1000
50 INPUT "What now?": LINE a$
: IF a$="" THEN GO TO 50
55 PRINT "INK 5:a$
60 IF a$="n" AND n THEN LET pl
ace=n: GO SUB 2000: GO TO place
70 IF a$="e" AND e THEN LET pl
ace=e: GO SUB 2000: GO TO place
80 IF a$="s" AND s THEN LET pl
ace=s: GO SUB 2000: GO TO place
90 IF a$="w" AND w THEN LET pl
ace=w: GO SUB 2000: GO TO place
100 IF a$="u" AND u THEN LET pl
ace=u: GO SUB 2000: GO TO place
110 IF a$="d" AND d THEN LET pl
ace=d: GO SUB 2000: GO TO place
115 IF LEN a$=1 AND a$<>"i" AND
a$<>"r" THEN PRINT "I can't go
that way.": GO TO 50
120 IF a$="save" THEN GO TO sav
e
130 IF a$="quit" THEN GO TO qui
t
140 IF a$="recap" OR a$="r" THE
N GO TO place
150 IF a$="inventory" OR a$="i"
THEN GO TO inve
160 IF a$="dig" THEN GO TO dig
170 GO SUB deco
180 IF b$="cut" THEN GO TO cut

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190 IF b$="lassoo" THEN GO TO l
ass
200 IF b$="shoot" THEN GO TO sh
oo
210 IF b$="drop" THEN GO TO dro
p
220 IF b$="take" THEN GO TO tak
e
230 IF b$="read" THEN GO TO rea
d
240 IF b$="light" THEN GO TO li
gh
250 IF b$="unlock" THEN GO TO u
nlo
260 IF b$="say" THEN GO TO say
270 PRINT "I don't understand."
: GO TO 50
1000 CLS: PRINT "You are standi
ng on a small beach. To the
east is the sea, to the north i
s a path going uphill into a
forest, to the west is a simi
lar path and to the south is a
cave."

```




```

1010 GO SUB see: LET e=1420: LET
s=1030: LET w=1120: LET n=1150
1020 GO TO 50
1030 CLS : PRINT "You are in a s
mall damp cave. The cave mouth
is to the north, there is a fli
ght of stairs to the west going
up."
1040 GO SUB see: LET n=1000: LET
u=1060
1050 GO TO 50
1060 CLS : PRINT "You are on a n
orth-south path in the forest.
To the south is a hut, to the
north is a clearing. There
is a hole in the ground with st
airs leading down and east."
1070 GO SUB see: LET n=1120: LET
d=1030: LET s=1090
1080 GO TO 50
1090 CLS : PRINT "you are in a s
mall hut, the exit is to the nort
h. The number '6693' is writ
ten on the wall."
1100 GO SUB see: LET n=1060
1110 GO TO 50
1120 CLS : PRINT "You are in a c
learing in the forest. You ar
e standing at the foot of a shee
r fifty foot high cliff, a stur
dy branch overhangs the cliff top.
To the south is a path, to the e
ast is the beach."
1125 IF L(167)=1 THEN PRINT "A rop
e is hanging from the branch
h, it looks strong enough to te
ke your weight." : LET u=1270
1130 GO SUB see: LET e=1000: LET
s=1060
1140 GO TO 50
1150 CLS : PRINT "You are in a c
learing in the forest. To the
south is the beach, to the
west is a path."
1160 GO SUB see: LET s=1000: LET
w=1180
1170 GO TO 50
1180 CLS : PRINT "The path ends
at the foot of a sheer fifty fo
ot high cliff. At the base of th
e cliff is a door." : IF open THE
N LET u=1210: PRINT "it is open
steps lead up and west behind
it." : GO TO 1190
1185 PRINT "it is locked."
1190 GO SUB see: LET e=1150
1200 GO TO 50
1210 CLS : PRINT "You are standi
ng on hilly land. To the east ar
e woods, to the west is a cras
hed jeep, to the south you can
see an opening in the floor. By
your feet is a hole with stairs go
ing down and east."
1215 PRINT "There is a door at t
he bottom of the stairs." : IF o
pen THEN PRINT "it is open." : LE
T d=1180: GO TO 1220
1216 PRINT "it is locked."
1220 GO SUB see: LET s=1390: LET
w=1240: LET s=1270
1230 GO TO 50
1240 CLS : PRINT "You are on the
floor of a gully a badly burnt
jeep lies on the gully floor.
The exit is east, to the south i
s a lake with an island in the
centre. If you go south you will
have to swim, no boats are in s
ight."
1250 GO SUB see: LET s=1400: LET
e=1210
1260 GO TO 50
1270 CLS : PRINT "You are standi
ng on the east bank of lake,
there is an island in the middle
of the lake. To the east are w
oods, to the north is a hilly ar
e, by your feet is a tiled openin
g with steps leading down and so
uth. If you go west you will

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have to swim, no boats are in s
ight."
1280 GO SUB see: LET w=1400: LET
e=1390: LET d=1300: LET n=1210
1290 GO TO 50
1300 CLS : PRINT "You are standi
ng at the foot of some stairs. T
o your south is a door."
1305 IF NOT bullet THEN PRINT "
it is open." : LET s=1330: GO TO
1310
1307 PRINT "it is locked."
1310 GO SUB see: LET u=1270
1320 GO TO 50
1330 CLS : PRINT "You are standi
ng in a passage running north
and south. To the north is an op
en door, through this door are
steps going up. To the south is a
locked door with no visible loc
k."
1340 GO SUB see: LET n=1300
1350 GO TO 50
1360 CLS : PRINT "You are in a s
mall office, through a larg
e window you can see the forest
, the beach and the sea. The exit
is north."
1370 GO SUB see: LET n=1330
1380 GO TO 50
1390 CLS : PRINT "You step into
a thick forest the air is thick w
ith dust suddenly you feel claus
trophobic and rush towards t
he daylight visible to the
east. Suddenly you break thro
ugh into daylight, your lungs gas
p in the fresh air as you plummet
fifty feet to your death."
1395 GO TO quit
1400 CLS : PRINT "The water is w
arm and a green slime floats o
n the surface, you have swum only
a few feet when you can stand
the stench of the stagnant water
no longer. As you turn back to t
he bank something under water gr
abs your leg after about half a m
inute your thoughts begin
s to fog due to lack of oxygen
, just before you black out you
feel sharp teeth digging into y
our leg."
1410 GO TO quit
1420 CLS : PRINT "You wade into
the sea until the water laps aga
inst your chin, you decide tha
t there is nothing interest here."
1430 PRINT "Suddenly you see the
black triangle of a sharks
fin, an instant later you fe
el the sharp pain of teeth tearin
g into your leg, with your last
breath you scream in agony, as
the shark pulls you below the
surface."
1440 GO TO quit
2000 LET n=0: LET e=0: LET s=0:
LET w=0: LET u=0: LET d=0
2010 RETURN
5250 LET found=0: PRINT "You can
see the following:" : FOR f=1 TO
11: IF L(f)=place THEN LET found
d=1: GO SUB 7530
5260 NEXT f
5270 IF NOT found THEN PRINT "no
thing."
5280 RETURN
5500 IF c$="" THEN INPUT "Say wh
at ?" : LINE c$: GO TO 5500
5510 IF c$<>"6693" OR place<>133
0 THEN PRINT "Nothing of interes
t happened." : GO TO 50
5520 PRINT "The door swings open
." : LET s=1360: GO TO 50
5750 PRINT PAPER 1: INK 7: BRIGH
T 1: "IN THE BOTTOM OF THE HOLE Y
OU HAVE DUG IS A METAL BOX, IN
SIDE THE BOX IS A PIECE OF PAPER
WITH THE SECRET FORMULA WRITTEN

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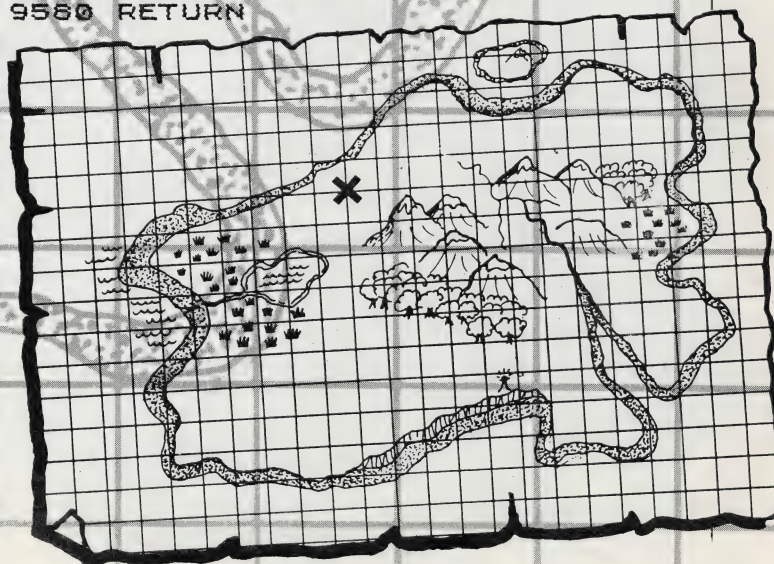
ON ITCONGRATULATIONS ADVENTURER
YOU HAVE COMPLETED ISLAND SEARCH
H !!!": PRINT "Press any key to
new."
5760 IF INKEY$<>" " THEN GO TO 5
760
5770 IF INKEY$="" THEN GO TO 577
0
5780 NEW
6000 SAVE "island" LINE 50: PRIN
T "REWIND TAPE AND PRESS PLAY."
VERIFY "island": PRINT "OK.":
GO TO 50
6250 PRINT "Do you want another
game ? (y/n)": INPUT d$: IF d$="
y" THEN RUN
6260 NEW
6500 PRINT "I can't.": GO TO 50
6750 IF c$="" THEN INPUT "Read w
hat ?": LINE c$: GO TO 6750
6760 IF c$<>"map" OR L(11) THEN
PRINT "You can't": GO TO 50
6770 PRINT "It is a map of the i
sland with a large X on the bea
ch.": GO TO 50
7000 IF L(3) THEN PRINT "You hav
e nothing to light.": GO TO 50
7010 IF c$="" THEN INPUT "Light
what ?": LINE c$: GO TO 7010
7020 IF c$<>"lamp" THEN PRINT "Y
ou can't.": GO TO 50
7030 PRINT "Nothing of interest
happens.": GO TO 50
7250 IF place<>1120 THEN PRINT "
There is nothing to lassoo here.
": GO TO 50
7260 IF L(6) THEN PRINT "You hav
e no rope.": GO TO 50
7270 IF c$="" THEN INPUT "Lassoo
what ?": LINE c$: GO TO 7270
7280 IF c$<>"branch" THEN PRINT
"You can't.": GO TO 50
7290 PRINT "The rope hooks over
the branch and appears climbabl
e.": LET carry=carry-1: LET L(6)
=1: LET u=1270: GO TO 50
7500 PRINT "You have with you th
e following.": FOR f=1 TO 11: IF
NOT L(f) THEN GO SUB 7530
7510 NEXT f
7520 IF carry=0 THEN PRINT "noth
ing.": GO TO 50
7525 GO TO 50
7540 IF o$(f,1)="o" THEN PRINT "
an "o$(f): RETURN
7550 PRINT "a "o$(f): RETURN
7750 IF place<>1300 THEN PRINT "
There is nothing here to shoot.
": GO TO 50
7760 IF L(9) THEN PRINT "You hav
en't got a gun.": GO TO 50
7770 IF c$="" THEN INPUT "Shoot
what ?": LINE c$: GO TO 7750
7780 IF c$<>"lock" THEN PRINT "Y
ou can't.": GO TO 50
7790 IF NOT bullet THEN PRINT "T
he door is open.": GO TO 50
7800 LET bullet=0: PRINT "The lo
ck shatters and the door swings
open revealing a passage going
south.": GO TO 50
8000 IF place<>1000 THEN PRINT "
You can't dig here.": GO TO 50
8010 IF L(8) THEN PRINT "You hav
e nothing to dig with.": GO TO 5
0
8020 GO TO fini
8250 IF c$="" THEN INPUT "Unlock
what ?": LINE c$: GO TO 8250
8260 IF c$<>"door" THEN PRINT "Y
ou can't.": GO TO 50
8270 IF place=1300 OR place=1330
THEN PRINT "You can't.": GO TO 5
0
8275 IF L(4) THEN PRINT "You don
't have a key.": GO TO 50
8280 IF place<>1180 AND place<>1
210 THEN PRINT "There is nothing
here to unlock.": GO TO 50
8290 IF place=1210 THEN GO TO 83
20

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8300 IF NOT open THEN PRINT "OK.
. ....Stairs lead up and west behi
nd it.": LET u=1210: LET open=1
: GO TO 50
8310 PRINT "It is already open."
: GO TO 50
8320 IF NOT open THEN LET d=1180
: LET open=1: PRINT "OK.": GO T
O 50
8330 GO TO 8310
8500 IF c$="" THEN INPUT "Drop w
hat ?": LINE c$: GO TO 8500
8510 FOR f=1 TO 11: IF (c$+"
") ( TO 20)=o$(f) AN
D NOT L(f) THEN GO TO 8540
8520 NEXT f
8530 PRINT "You don't have a "c
$: GO TO 50
8540 LET L(f)=place: LET carry=c
arry-1: PRINT "OK.": GO TO 50
8750 IF c$="" THEN INPUT "Take w
hat ?": LINE c$: GO TO 8750
8760 FOR f=1 TO 11: IF (c$+"
") ( TO 20)=o$(f) AN
D L(f)=place THEN GO TO 8800
8770 NEXT f
8780 PRINT "There isn't a "c$:
GO TO 50
8800 IF carry=5 THEN PRINT "You
can't carry any more.": GO TO 50
8810 LET L(f)=0: LET carry=carry
+1: PRINT "OK.": GO TO 50
9000 LET b$="" : LET c$="" : FOR f
=1 TO LEN a$
9010 IF a$(f)=" " AND b$="" THEN
LET a$=a$(2 TO ): GO TO 9000
9020 IF a$(f)<>" " AND c$="" THE
N LET b$=b$+a$(f)
9030 IF a$(f)=" " THEN LET c$=a$
(f+1 TO ):
9040 NEXT f: RETURN
9500 DIM o$(11,20): DIM L(11)
9505 LET n=0: LET s=0: LET e=0:
LET w=0: LET u=0: LET d=0
9510 RESTORE 9520: FOR n=1 TO 11
: READ o$(n),L(n): NEXT n
9520 DATA "Knife",1000,"driftwood
d",1000,"lamp",1030,"key",1030,"
battery",1050,"lassoo",1090,"roc
k",1120,"spade",1150,"gun",1240,
"bar",1270,"map",1350
9530 LET place=1000: LET carry=0
: LET bullet=1: LET open=0
9540 PRINT "ISLAND
SEARCH"
9550 PRINT "You are being tax
en to an island at a secret locat
ion which was once the home of
a scientist. The scientist rec
ently died and you must retrieve
his secret formula before it
falls into enemy hands."
9560 PRINT "Press any key
to begin...."
9570 PAUSE 0
9580 RETURN

```



Amazing how played out some things



become.

Will you think the same of your micro in 6 months' time?

Remember the days when every record player was gifted with a needle instead of a stylus. 45's were "in," 78's were "out."

Before the days of hi-fi and laser discs. When a graphic equaliser was a breakthrough on the football pitch instead of in music technology.

Look at a record player now and it's a museum piece.

It's like that with micros too. The machine you thought would give endless hours of fun and interest often becomes a five minute wonder. Played out within months. Or so you thought.

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daily with the very latest computer news and reviews. Paging a special Bulletin Board. Feasting from "Prestel's vast menu. Even downloading a choice of software *absolutely free*.

In fact, imagine 30,000 pages at your fingertips and you've imagined what it's like to be on line with the Micronet 800 system.

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READERS PROGRAMS

Welcome to the August 1984 Readers' Programs section. Pressure of space this month restricts us to one program, a BBC Micro game with a wildlife theme.

We do check the listings but occasionally a little debugging may be required. But if you decide to send us your program PLEASE try to ensure it's bug-free.

We are looking for more good listings and programming tips to fill these pages in the months to come, so if you feel your latest game or utility

deserves an airing in *Which Micro*, send it now.

Yes, we do pay for your contributions, the exact amount depending on the length of the listings. As a guideline, it usually averages out at around £60 per packed page.

Send your printed listings to R.P., *Which Micro*, Scriptor Court, 155 Farringdon road, London EC1R 3AD together with a copy on cassette.

Please do not send us your only copy as we cannot return it!

MILLY THE MINK

This BBC Model B game from William Prew has an unusual theme — you take the part of Milly the Mink. Milly's five youngsters

are all very hungry. You have to explore the outside world, collecting food for your offspring and avoiding the many dangerous

adversaries which lurk outside.

When you use up all the food in one stretch of territory, you move to another. After ten screens your

youngsters are sufficiently grown up to look after themselves and you can take a well-earned rest from your parental duties.

```
>LIST
10REM Program: Milly The Mink
20REM Author : William Prew
30REM PROGRAM SUBJECT TO COPYRIGHT
40:
50PROCassemble
60DIM HI$(9,1),HI$(9)
70FOR NX=0 TO 9
80HI$(NX)="#Minksville#"
90HI$(NX,1)=100
100NEXT NX
110:
120*FX229,1
130MODE7
140PROCinst
150MODE2
160PROCinit
170PROCshowchrs
180VDU19,0,7,0,
190SX=0:HIX=100:XX=10:YX=10:ScrX=1:Me
nx=3:TimeX=0:BonX=0:TerX="FREDS"
200VDU23,10,32,0,0,0,12
210PROCinit
220PROCdisp
230PROCwall
240PROCspare
250PROCmaces
260:
270REPEAT
280VDU17,1,31,XX,YX,224
290PROCtime(SPX)
300PROCdisp
310IFINKEY(-98)=-1THEN move$="L"
320IFINKEY(-67)=-1THEN move$="R"
330IFINKEY(-73)=-1THEN move$="U"
340IFINKEY(-105)=-1THEN move$="D"
350VDU17,RND(5),31,XX,YX,227
360IF move$="L"THEN XX=XX-1
370IF move$="R"THEN XX=XX+1
380IF move$="U"THEN YX=YX-1
390IF move$="D"THEN YX=YX+1
400IF XX<2 THEN XX=2
410IF XX>17 THEN XX=17
420IF YX<3 THEN YX=3
430IF YX>21 THEN YX=21
440IF FNscrn(XX,YX)<>32 THEN PROCcheck
450TimeX=TimeX+1
460BonX=BonX+1
470IF TimeX=99 THEN PROCfinito
480IF BonX=99 THEN MenX=MenX-1
490UNTIL ERR=44
500:
510DEFPROCinst
520PRINTTAB(0,0);CHR$(131);"Milly The
Mink By William Prew 1984"
530PRINTTAB(0,1);CHR$(130);"=====
=====
540PRINT;CHR$(134);" Milly has just 9
iven birth to five"
550PRINT;CHR$(134);"cute, little minks
who are ravenous.You"
560PRINT;CHR$(134);"have to wander and
und the territories"
570PRINT;CHR$(134);"collecting the org
anism's and return"
580PRINT;CHR$(134);"to your den and fe
ed the young ones -"
590PRINT;CHR$(134);"Molly,Mandy,Michae
l,Morris,Matthew and"
600PRINT;CHR$(134);"the 'extremely naug
hty Mankey'"
610PRINT;CHR$(134);" Every screen is
a different territory"
620PRINT;CHR$(134);"and different anim
als and insects are"
630PRINT;CHR$(134);"among the hunters
and boulders which"
640PRINT;CHR$(134);"will immediately k
ill you if touched!"
650PRINT;CHR$(134);" If you clear ten
territory's your"
660PRINT;CHR$(134);"young have grown u
p and can then fend"
670PRINT;CHR$(134);"for themselves lea
ving you relieved!"
```



```
680PRINT;CHR$(134);" Also your time i
s limited!"
690PRINT;CHR$(130);"=====
=====
700PRINT;CHR$(131);"PRESS THE #SPACEB
R# TO CONTINUE ....."
710PRINT;CHR$(130);"=====
=====
720REPEAT UNTIL GET=ASC" "
730CLS
740PRINTTAB(5,2);CHR$(131);"TO MOVE MI
LLY-USE-1-"
750PRINTTAB(5,3);CHR$(130);"=====
=====
760PRINTTAB(5,5);CHR$(131);" /Z/ ----
Left"
770PRINTTAB(5,6);CHR$(131);" /X/ ----
Right"
780PRINTTAB(5,7);CHR$(131);" / / ----
UP"
790PRINTTAB(5,8);CHR$(131);" / / ----
Down"
800PRINTTAB(5,9);CHR$(130);"=====
=====
810PRINTTAB(5,11);CHR$(131);"ENTER YOU
R SPEED-1-9";REPEAT EX=INSTR("123456789
",GET$)
```



```

820UNTIL EX:PRINT,EX:SPX=(EX-1)*20
830PRINTTAB(5,12);CHR$(130);"=====
=====
840PRINTTAB(5,14);CHR$(131);"ENTER YOU
R LEVEL 1-9";REPEAT EX=INSTR("123456789
",GET$)
850UNTIL EX:PRINT,EX:level=EX
860PRINTTAB(5,15);CHR$(130);"=====
=====
870PRINTTAB(5,17);CHR$(131);"PRESS THE
#SPACEBAR#"
880PRINTTAB(5,18);CHR$(130);"=====
=====
890DEFPROC UNTIL GET=ASC "
900DEFPROC showchrs
910CLS
920CLS
930COLOUR3
940PRINTTAB(0,2)"MILLY THE MINK"
950COLOUR2
960PRINTTAB(0,3)"=====
970COLOUR1:PRINTCHR$(224);" .. MILLY"
980COLOUR2:PRINTCHR$(225);" .. HUNTER"
990COLOUR4:PRINTCHR$(226);" .. BOULDER
"
1000COLOUR5:PRINTCHR$(230);" .. FROG"
1010COLOUR5:PRINTCHR$(231);" .. FISH"
1020COLOUR5:PRINTCHR$(232);" .. EGG"
1030COLOUR5:PRINTCHR$(233);" .. BIRD"
1040COLOUR5:PRINTCHR$(234);" .. WATER V
CLE"
1050COLOUR5:PRINTCHR$(235);" .. DEAD RA
BBIT"
1060COLOUR5:PRINTCHR$(236);" .. SNAIL"
1070COLOUR5:PRINTCHR$(237);" .. SNAKE"
1080COLOUR5:PRINTCHR$(238);" .. DEAD FO
ULTRY"
1090COLOUR5:PRINTCHR$(239);" .. EEL"
1100COLOUR3
1110PRINT+"PRESS THE #SPACEBAR#"
1120COLOUR2
1130PRINT"=====
1140REPEAT UNTIL GET=ASC "
1150DEFPROC
1160DEFPROC Init
1170X=10:Y=10
1180MOVE$="R"
1190ENVELOPE1,0,0,0,-1,1,1,1,0,1,0,254,
120,123
1200ENVELOPE2,0,0,12,0,4,100,4,121,-2,-
1,-1,120,0
1210ENVELOPE3,3,0,2,0,0,255,0,127,0,0,-
127,00,00
1220ENVELOPE4,136,-1,-1,-1,30,2,2,-10,0
,-10,-10,60,143
1230VDU23,224,24,126,60,90,102,60,24,60
4,56
1240VDU23,225,152,152,184,255,248,152,2
4,56
1250VDU23,226,255,129,129,129,129,129,1
29,255
1260VDU23,227,0,0,0,0,0,0,0,0
1270VDU23,228,32,112,248,252,254,255,25
5,255
1280VDU23,229,255,255,255,153,153,255,2
55,255
1290VDU23,230,129,219,60,60,60,219,1
29
1300VDU23,231,0,48,120,221,255,124,56,0
1310VDU23,232,0,56,124,254,239,223,124,
56
1320VDU23,233,97,225,125,126,60,16,56,5
6
1330VDU23,234,24,60,254,255,63,30,18,36
1340VDU23,235,36,60,60,126,126,60,12
6
1350VDU23,236,0,0,200,220,126,63,31,15
1360VDU23,237,0,0,0,85,170,0,0,0
1370VDU23,238,96,192,208,123,127,59,17,
56
1380VDU23,239,3,7,12,24,48,96,192,128
1390DEFPROC
1400
1410DEFPROC wall
1420VDU5
1430COL0,13:MOVE190,1000:PRINT"MILLY T
HE MINK"
1440COL0,12:MOVE195,1035:PRINT"MILLY T
HE MINK"
1450MOVE800,280
1460IF MenX>0 THEN 1470
1470FOR m=1 TO MenX
1480COL0,3
1490VDU224
1500NEXT m
1510VDU4
1520COLOUR1
1530PROC disp
1540PROC tcollect
1550PRINTTAB(1,25)"ORGANISMS:"
1560COLOUR2
1570PRINTTAB(1,26)"SECONDS LEFT:"
1580COLOUR3
1590PRINTTAB(1,27)"BONUS LEFT:"
1600COLOUR6
1610PRINTTAB(1,28)"TERRITORY:";Ter$
1620FOR wall=2 TO 22
1630COLOUR132
1640COLOUR3:PRINTTAB(1,wall);CHR$(226)
1650COLOUR3:PRINTTAB(18,wall);CHR$(226)
1660NEXT wall
1670FOR wall=1 TO 18
1680COLOUR132
1690COLOUR3:PRINTTAB(wall,2);CHR$(226)
1700COLOUR3:PRINTTAB(wall,22);CHR$(226)
1710NEXT wall
1720COLOUR128
1730ENDPROC
1740DEFPROC maces
1750FOR mace=0 TO 5
1760VDU17,6,31,RND(16)+1,RND(18)+3,223+
ScrX
1770NEXT mace
1780PROCtime(100)
1790ENDPROC
1800DEFPROC time(tX)
1810FOR DelayX=1 TO tX
1820NEXT DelayX
1830ENDPROC
1840DEFPROC sPear
1850FOR spe=0 TO ScrX*3
1860VDU17,4,31,RND(16)+1,RND(18)+3,223
1870VDU17,2,31,RND(16)+1,RND(18)+3,223
1880NEXT spe
1890PROCtime(100)
1900ENDPROC
1910DEFPROC disp
1920IF ScrX>50*ScrX THEN PROCnewscreen
1930PRINTTAB(11,25);INT(ScrX)
1940PRINTTAB(14,26);INT(TimeX)
1950PRINTTAB(12,27);INT(BonX)
1960IF ScrX=1 THEN Ter$="FREDS"
1970IF ScrX=2 THEN Ter$="BERTS"
1980IF ScrX=3 THEN Ter$="SARAHs"
1990IF ScrX=4 THEN Ter$="HIDEYAS"
2000IF ScrX=5 THEN Ter$="AYINGOS"
2010IF ScrX=6 THEN Ter$="POGOS"
2020IF ScrX=7 THEN Ter$="NOELS"
2030IF ScrX=8 THEN Ter$="RICHARDS"
2040IF ScrX=9 THEN Ter$="J.R.S"
2050IF ScrX=10 THEN Ter$="J.R.S"
2060ENDPROC
2070DEFPROC tcollect
2080FOR SX=1 TO 10
2090IF ScrX=0+SX THEN PRINTTAB(1,23)"CO
LLECT:";CHR$(229+SX)
2100NEXT SX
2110IF ScrX=11 THEN CLS:PROCyounggown
2120ENDPROC
2130DEFPROC fNscrn(x%,y%)
2140VDU31,x%,y%
2150CALL code
2160=7&70
2170
2180DEFPROC check
2190IF FNscrn(x%,y%)=133+ScrX THEN ScrX=
ScrX+10:SOUND3,2,54,2
2200IF FNscrn(x%,y%)=132 THEN PROCcrash
2210IF FNscrn(x%,y%)=129 THEN PROCcrash
2220ENDPROC
2230DEFPROC newscreen
2240PRINTTAB(5,10);Ter$
2250PRINTTAB(4,11)"TERRITORY"
2260PRINTTAB(3,12)"INVESTIGATED"
2270FOR IncX=BonX TO 100 STEP1:SOUND0,1
3,1:VDU17,12,27;IncX
2280NEXT IncX
2290PROCtime(3000)
2300ScrX=ScrX+1
2310TimeX=0
2320BonX=0
2330PROCvictor
2340PROCtime(5000)
2350CLS:GOTO200
2360ENDPROC
2370DEFPROC victor
2380STORE 2430
2390FOR M=1 TO 10
2400READ P,D
2410SOUND3,5,P,D
2420NEXT M
2430DATA 129,7,117,3,121,3,129,7,101,7
2440DATA 121,3,129,3,137,3,145,3,149,3,
149,3
2450ENDPROC
2460DEFPROC crash
2470VDU17,13,31,x%,y%,229
2480SOUND0,4,54,5:MenX=MenX-1
2490IF MenX<0 THEN PROCfinito
2500PROCtime(5000)
2510CLS:GOTO230
2520ENDPROC
2530DEFPROC finito
2540SOUND0,4,54,5
2550PRINTTAB(6,9)"GAME OVER"
2560PROCtime(10000)
2570IF ScrX>HIX THEN PROCcenter ELSE 2580
2580PRINTTAB(1,29)"PRESS #SPACEBAR#"
2590REPEAT
2600A$=GET$
2610UNTIL A$=""
2620IF A$="" THEN 170
2630END
2640
2650DEFPROC center
2660VDU22,7
2670NX=1
2680REPEAT
2690NX=NX+1
2700UNTIL ScrX>HIX<NX,0)
2710IF NX=9 THEN 2720 ELSE FOR MX=8 TO
NX STEP-1:HIX(MX+1)=HIX(MX):HIX(MX+1,0)=
HIX(MX,0):HIX(MX+1,1)=HIX(MX,1):NEXT MX
2720PRINTTAB(7,1);CHR$(129);CHR$(141);"
Congratulations!"
2730PRINTTAB(7,2);CHR$(129);CHR$(141);"
Congratulations!!"
2740PRINTTAB(3,4);CHR$(131);CHR$(141)"Y
ou are in the Hall Of Fame"
2750PRINTTAB(3,5);CHR$(131);CHR$(141)"Y
ou are in the Hall Of Fame"
2760PRINTTAB(6,7);CHR$(133)"Please ente
r your name"
2770VDU31,32
2780FX15,0
2790PRINTTAB(9,9);CHR$(131);STRING$(12,
" ")
2800PRINTTAB(9,9)
2810INPUT Name$
2820HIX(NX)=LEFT$(Name$,12)
2830HIX(NX,0)=ScrX
2840CLS
2850PRINTTAB(2,1);CHR$(131);CHR$(141)"
Milly the Mink Hall of Fame"
2860PRINTTAB(2,2);CHR$(131);CHR$(141)"
Milly the Mink Hall of Fame"
2870FOR NX=0 TO 3
2880PRINTTAB(2,NX*2+4);CHR$(134);NX*1,7
";TAB(6,NX*2+4);CHR$(134);".....";HIX(
NX);TAB(2,NX*2+4)" .....";TAB(31,NX*2+4
);HIX(NX,0)
2890NEXT NX
2900PRINTTAB(8,38);CHR$(136);CHR$(131);
"Press the #SPACEBAR to Play again"
2910SPACE=GET$
2920IF SPACE#="" THEN VDU22,2:GOTO100
2930ENDPROC
2940DEFPROC assemble
2950DIM code 10
2960osbyte=&FFF4
2970PX=code
2980
2990OPT0
3000LDR#135
3010LDR osbyte
3020STX &70
3030RTS
3040
3050ENDPROC
3060DEFPROC younggown
3070CLS
3080COLOUR13:PRINTTAB(0,5)"CONGRATULATI
ONS!"
3090COLOUR3
3100PRINTTAB(0,7)"YOU HAVE REARED YOUR"
3110PRINTTAB(0,9)"YOUNG ONES WELL,TAUS"
3120PRINTTAB(0,11)"YOU ARE RELIEVED OF"
3130PRINTTAB(0,13)"THIS GREAT BURDEN!"
3140PROCtime(20000)
3150PROCcenter
3160END

```


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MUSICAL MICROS



PHOTO BY RICK CORDELL

'Computer Music' is not confined to expensive digital instruments — the humble micro possesses considerable creative potential. In the first of a two-part series, Gary Herman looks at the music/micro interface.

MUSICAL MICROS

Computer music is almost as old as the computer itself. In fact, since long before there were computers, music and technology have been tightly intertwined. The high points of the mechanical age were not great weaving machines or steam engines, but intricate clockwork music boxes and the symphony orchestra. Back in ancient Greece, Pythagoras (of the theorem) sought — and thought he found — mathematical perfection in musical harmony and musical beauty in mathematical order.

Far from being the bitter enemies of popular myth, the mysteries of music and computation are loving twins. In the years following the introduction of the first lumbering wonders of the computer age, a few brave souls recognised and explored the relationship. Their efforts and those of a number of lesser lights were directed at musical composition by computer and direct synthesis of sound. Much of their work was carried out as a by-product of the interest of vast commercial institutions. The sound laboratories and music studios at Bell Telephones (AT & T) and RCA were not, regrettably, established out of the sheer love of a good tune.

Perhaps it was rock 'n' roll that made all the difference, for that was the first predominantly recorded (which is to say, predominantly electronic) music to come into being. It also presaged the international success of popular music and the immense financial power of pop's institutions. Anyway, during the sixties great strides were made in the development of specifically musical electronics.

The increasing use of silicon in the manufacture of semiconductors and the progress in recording and amplification techniques made the invention of the synthesiser inevitable. And once musical synthesis had begun to approach the practical limits of analogue techniques, it was equally inevitable — given the introduction of micro-chip technology — that digital devices would begin to find their way out of the labs and into affordable instruments and equipment.

The professional musician is, as yet, most interested in the possibilities offered by the digital control of existing electronic devices — if only because these existing (analogue) devices are tried, tested, reliable and relatively cheap. But true digital sound synthesis is becoming closer and closer with each passing day. This progress can be gauged, to some extent, by the introduction of digital recording techniques (for example, the compact disc). Such techniques have probably done more to break down the distinction between

digital and analogue in the music field than anything else. The home computer owner, too, can be in the vanguard of tomorrow's music thanks to some remarkable little devices called Programmable Sound Generators (or PSGs). However, to understand the real significance of the PSG it is first important to know a little about direct synthesis of sound.

DIGITAL DEFINITION

Pulse waves are the stuff of computing. Seen on an oscilloscope, a pulse wave looks like the castellations on a fortress wall — that is, a line of little rectangles joined by

of a 2000 Hz sound and the number 11111111 would produce half a cycle of a 500 Hz sound.

In this way, music of a sort can be produced just by sending a series of numbers to a loudspeaker. True, the music will sound like a buzz and will all be at the same volume level, but it will be music. This sort of process is used on the Sinclair Spectrum and was used on early versions of the Apple. A slightly more complex and tuneful version of the technique is used on the Lynx and the Dragon.

Most direct synthesis techniques today use digital-to-analogue converters (DACs) which add an extra stage. Numbers sent by the computer are transformed into volume and frequency 'analogues' before being converted into sound. If appropriate filtering and tone control circuits are added, the result can be quite tuneful.

The PSG does away with a lot of the fuss and bother associated with direct synthesis, without giving up the benefits of digital devices. A PSG is, essentially, a highly complicated chip which uses digital singles (that is, numbers) to control sound



lines at their bases. Computer people, who generally don't like or approve of electronics, often call the space where a castellation or pulse might be, a *bit*. Loosely speaking, if there is a pulse in this space, then the bit takes the value '1' and if there is no pulse, then the bit takes the value '0'. Two or more pulses in a row produce a single pulse of twice or more times the duration of the standard (clock) pulse. So a train of pulses of varying width can be written as a binary number: 10011000, for example. In direct synthesis, such binary numbers may, for example, be fed via a suitable amplifier to a loudspeaker. The frequency of the sound produced could be altered simply by changing the relevant binary number. For example, 11110000 might produce a single cycle of a 1000 Hz (cycles per second) sound. The number 11001100 would then produce two cycles

production and modify the sounds. The point to realise is that you put numbers in one end and the PSG produces musical sounds at the other.

A typical PSG costs a few pounds to buy (between, say, £4 and £20) and computer manufacturers have tended to include them in their machines largely for the purpose of adding sound effects and musical spice to games. As a rule, you won't find a PSG on a business machine and, by the same token, you won't find enough of them on a home computer to give you the facilities of a dedicated music synthesiser. However, you will find single PSGs on a number of home computers offering you three or four channels of independently controllable sound and, when all's said and done, they remain minor miracles of technology.

The biggest problem, as usual, is software — programming the PSGs is

invariably a long and complicated task. The BBC's ENVELOPE command (also available on the Electron) is the most notorious example of this. Some people may like the idea of having 14 parameters to play with, but the point is that it is the PSG that gives you the control, while the language you use to operate it should give you simplicity. Probably the best answer is to have high-level languages dedicated to music-making, and there are already some pieces of ROM-based software around which go some way to doing this. As yet, however, an attractive combination of software and hardware does not exist.

Having said that, it's time to look at the market. The machines are dealt with in alphabetical order and I have included only those that I think provide adequate musical facilities. A great deal is promised by the Japanese companies involved in the MSX project. Since many of them already produce analogue and hybrid synthesisers, the promise may be fulfilled. But, as we should all have learnt by now, a computer is only as good as its availability. Those included here are all available now.

frequencies, such modulation produces a range of semi-pitched buzzes and rings. At high frequencies and using pseudo-random rather than periodic modulation, the sound resembles white noise. In fact, the white noise produced by all PSGs at present is produced this way — it is not true white noise at all, but a good enough simulation of it. And if we're being totally honest, the vast majority of similar white noise generators don't produce *true* white noise either.

The Pokey chip's big advantage over its competitors is that four channels of music allow you to produce pretty much the full range of chords, including sevenths and diminished chords, for example. However, it can only produce pulse waves, which give a certain sameness to the sound. There appear to be no facilities (at least, none available to the user) for synchronisation, note queuing or proper timing. Envelope control is through direct handling of attenuation levels, whose 16 values (0 to 15) give you the same range as any other chip on the market, but which seem to be rather more hesitant and jerky than with

their specified range. However, this will be of no interest if you're not prepared to experiment. Unfortunately, there is no means of feeding the sound signal to an external amplifier or loudspeaker (sound is heard through the TV) and this, too, renders Atari machines of limited usefulness to the musician. One big point in Atari's favour is the existence of their Music Composer software which remains the best compositional aid I have yet seen for a home micro. As a performance machine, however, the Atari is limited.

Overall, the sound facilities clearly demonstrate the company's philosophy of going for the games market. As an effects' generator the Atari is both versatile and easy to use. As a music generator it is rather less than wonderful.

BBC MODEL B

In the glaring light of its runaway propaganda success, it's easy to forget that the BBC computer is not the greatest piece of microelectronics the world has ever seen. It is, in fact, a plucky contender for the welterweight title: a general purpose machine at the middle to low end of the market with several winning features — notably (and remarkably for a machine running on a 1MHz clock) its speed.

Acorn's essential philosophy has been to produce a machine that spans the home and small business markets and, as such, it sits a trifle uneasily in both: too much of a hobbyist machine for the real business user and too expensive for the mass consumer.

The BBC's PSG and sound facilities are good examples of the compromises. The machine uses a Texas Instruments' 76489 — rapidly becoming the workhorse of digital sound generation. Like the Pokey chip on Atari machines, the 76489 offers only pulse waves. However, it also offers evidently superior gating arrangements and consequent control of synchronisation, note queuing and attenuation. It is inferior only in its failure to provide four fully independent channels. The 76489 gives you three channels of music and one, mixable, noise channel. Predictably, it is essentially a shift register-based device, but its electronics are simple, elegant and remarkably versatile.

As far as sound features are concerned, BBC BASIC is a pain. I shall not repeat the old litany once again, but just say that to operate effectively the two sound commands — SOUND and ENVELOPE — probably requires a course in computer studies. Taken together, they are virtually a language in its own right — only it is as dense and difficult a language as it is possible to get. To take but one example: there are at least four separate ways of affecting note duration, through the SOUND command, the ENVELOPE command and FOR-NEXT or REPEAT-UNTIL loops.

That said, the combination of the BBC's speed and the 76489's elegance allow the crafty programmer to create some quite acceptable music, even in real-time. The BBC's speed makes it especially good at playing polyphonic tones — which can



ATARI 600 XL

Being compatible machines, all the Atari computers feature the same music facilities. These derive from the quaintly named 'Pokey' chip — a PSG of Atari's own devising. Observation leads to the conclusion that it is essentially a package containing four independent shift registers each capable of being programmed for frequency, attenuation (level) and — an unusual and useful feature, this — pulse width.

Atari computers are unique in offering *four* sound channels, rather than the more common three channels plus noise. This follows from the pulse width feature, which means that a special noise channel is unnecessary since a range of noise sounds can be produced by modulating the pulse width on any channel. At relatively low

other chips.

Atari BASIC offers one sound command — SOUND, which is followed by four parameters: channel (0-3), frequency (0-255), distortion (ie, pulse width modulation, governed by an even number between 0 and 7), and volume (0-15). This has the virtue of simplicity so that, for example, note duration is determined by the use of familiar FOR-NEXT loops, but at the cost of flexibility.

Other objections must include the fact that sound generation is noticeably slowed down when more than one channel is used and despite a nominal spread of around six octaves, only the two or three around middle-C are really usable for musical purposes.

Intriguingly, the Pokey chip begins to behave very strangely if you set parameters (especially volume) outside

MUSICAL MICROS

include up to three notes and one semi-pitched, or pseudo-random noise. A little practice can also make you quite a dab hand at arpeggios, sequences, chorus effects and the like. The envelope facility, too, can be used to create a deal of interesting effects. All this, however, shows up the 76489's greatest deficiency — its total reliance on pulse waves and the lack even of a pulse width modulation feature.

In one department, the BBC scores over every other machine on the market. That is its expansion facilities. ROM-based software, a user port, the A-D converters, the expansion bus and the fast disk drive

PSGs. It's as simple as that. At the musical heart of the machine is Mostek's 6581 chip, a miracle of sound generation produced exclusively for Commodore (since the company owns Mostek) and designed to be compatible with the 6502 MPU family. Before I start salivating over the keyboard, let me describe the 6581 in brief. Three tone generators produce triangle, sawtooth or pulse waves, or pseudo-random white noise or (if you search a bit) combinations of these. The chip has a full eight octave range and features pulse width modulation on every channel, synchronisation, note queuing, ring modulation, digital filtering,

Commodore's software and — it must be said — a deal of their supporting hardware. Unfortunately, the Commodore is a relatively slow machine and while the 1MHz clock is fast enough to run the 6581, controlling the chip from BASIC sometimes results in unwanted delays in real-time performance. Also, the BASIC is, to say the least, inadequate. All sound commands take the form of POKEs (or, sometimes, PEEKs) to the 6581's 29 registers. This is tiresome for the programmer and often results in convoluted and slow-running programs. The 6581 deserves a better BASIC — indeed, it deserves a better language altogether.

That said, the Commodore 64 must be the best buy for anybody interested in micro music. Some of its features are just plain amazing in a machine costing typically less than £200. When you consider that you're getting a computer thrown in (and one that probably has as much sophisticated software available for it — in the US, at least — as anything on the market), then the thing is unbeatable... so far. Incidentally, if



allow the BBC to become the heart of a fairly sophisticated home-brewed system. The musician, then, will be disappointed that the machine fails to include an audio output socket — all the sound being produced by a rather 'tinny' on-board speaker.

The Acorn Electron employs a customised sound generator (not a 76489) which provides only one music and one noise channel. It is also slower than the BBC. The software remains as complex to use, however (in Acorn's attempt to maintain compatibility between the BBC and the Electron) while dispensing with some crucial features like the BBC amplitude envelope facility. All-in-all, the Electron should be avoided by actual or potential computer musicians.

COMMODORE 64

The Commodore 64 has set the standard in

resonance, sophisticated ADSR control (that's attack-decay-sustain-release or amplitude enveloping), the option of using analogue control signals via external potentiometers or internal control using one of the oscillators or one of the envelope generators and the option of mixing the sound with an external signal through (if required) the digital filter. There is also an overall amplitude control, separate from the ADSR envelope (unlike the 76489) and an audio output on the Commodore.

Obviously, the chip could be improved — four channels instead of three, 256 bit resolution on the volume control instead of 16 bit, 256 bit resolution on each of the attack, decay, sustain and release controls instead of 16 and so on. But this is niggling when faced with the overwhelming superiority of the 6581 over every other PSG on the market.

What is not niggling is to complain about

you're worried about the BASIC, take a look at some of the extended BASIC packages available. If you're still not convinced, remember that the Americans are producing MIDI hook-ups, musical keyboards and the like to latch on to the Commodore all the time.

MEMOTECH MTX 500

The Memotech's PSG is a 76489 — which, unlike the BBC, is controlled by a 4MHz Z80A microprocessor and can reach the outside world by means of an audio output socket. The choice of three sound and one noise channel using pulse waves is identical with the choice offered by the BBC micro. Where Memotech's approach differs is in the software.

Memotech's SOUND command is similar to the BBC's except that, if envelopes are required, the data (considerably simplified as against the

BBC) is tacked on to the end of SOUND. Synchronisation, note queuing and the playing of melodies are dealt with by means of buffer memory — a solution inherent in the BBC system, but less well executed there.

The Memotech sound buffer is accessed by use of the SDBUF command and notes are handled like ordinary BASIC arrays. The system is simple and powerful but, typically, suffers from this very simplicity.

The fact that micros are not produced as dedicated music machines is once again revealed in the compromises made by manufacturers. Memotech have plumped for ease of use and, in doing so, have dispensed with much of the versatility provided by the 76489. Fortunately, the machine's Z80 CPU, its built-in assembler/disassembler and its machine-code monitor allow you to recapture that versatility by directly engaging with the 76489. Happily, Memotech provide technical documentation that is comprehensive. However, you would have to be something of a computer specialist to

envelopes which can be a very useful feature for anyone 'fazed' by the thought of setting all their own ADSR parameters. It also has separate outputs for its three music channels which, in the Orics, are wired together but which could be separated by anyone with a screwdriver and a soldering iron. The 8912's fourth channel is, as with the 76489, a noise channel mixed with one of the other three channels before exiting the chip.

Oric BASIC is, in some ways, similar to BBC BASIC — including REPEAT-UNTIL, but not including procedures, for example. And as far as sound goes, the BASIC uses three commands: SOUND, which can handle the full spectrum of available frequencies (some six octaves' worth), MUSIC, which handles only predefined notes separated by semi-tones and PLAY which mixes channels set by the other commands, selects a preset envelope if required and enables the sound. The BASIC also allows four preset sounds: ZAP, PING, SHOOT and EXPLODE.

I find this system attractive — the PLAY

use and relatively versatile.

RUNNERS-UP

In the computer music stakes, there are as many different approaches as musicians and would-be musicians. A number of machines have been left out of my list for no better reason than they don't suit my approach. All the same, some of them deserve at least a mention.

In the van is, of course, the Apple IIe. Although it has effectively no inherent musical capability, the Apple has so many hardware add-ons and software packages available for it that it would be churlish and stupid not to acknowledge it. There is the complete alphaSyntauri system — a synthesiser controlled by an Apple. There are a number of boards (Zapple and Mockingbird, for example) using the 76489, 8912 or 8910 (also by GI) which plug into the Apple. There is the £2000 Mountain Computer Music System, capable of performing a complete orchestral work.

At the other end of the scale, you might prefer to mess around with a Spectrum and



make full use of these features. In short, the MTX is not aimed at musicians. It is, however, a well thought out and attractive computer, whose operating system and expansion potential are a match for the BBC.

The computer buff, who likes to *play with* music, rather than play it, could do worse than get one — especially at a price £100 or more less than the BBC.

ORIC ATMOS

The Oric Atmos — like its predecessor, the Oric 1 — is a mysteriously underrated machine. For would-be computer musicians it is a good each-way bet. At its price (£170, list), the Atmos is a bargain and well worth investigating.

The Orics use a General Instruments AY-3-8912 PSG — very like the 76489 but, in my view, just that bit superior. This chip supports a small number of preset

command handling all the sync and queuing problems (it also governs duration), while SOUND and MUSIC set up channels, volume and frequencies. Although there is no specific command to build your own envelopes, the 8912 allows you to use loops or arrays to feed appropriate data to a SOUND or MUSIC command. Likewise, using the SOUND command you could create pitch envelopes to produce vibrato or whatever. For most purposes, however, the preset envelopes are perfectly adequate. The onboard loudspeaker is also of a superior quality to that of the BBC and Oric's includes an audio output as well.

Unfortunately, the machines are not very well backed by software — which is a great shame. Nor, in truth, are they well suited to expansion. They remain, however, excellent introductory machines for potential computer musicians — easy to

some add-on boards. I wouldn't recommend it, but it can be a fascinating exercise. Direct synthesis using a home computer is best achieved on a Lynx. This machine allows you to build notes, waveforms and envelopes using machine code. It also has a nice powerful loudspeaker, even if only supports one sound channel.

Finally, there's the Sord M-5, which *would* have featured, but due to its cost and relatively few numbers, has been left out. A shame really, since the music potential of the 76489 on this machine is possibly the best of the lot.

With thanks to Her Majesty's Theatre, London and Vic Oddens of London Bridge.

The second and concluding part of this feature will concentrate on hardware add-ons and composition software.

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AI

FOR MICROS

Chris Naylor follows up last month's introduction with a bold foray into the domain of the Expert System.

Seeing as it's summer, there's one thing that most people in this country expect to see. Maybe it will only be a fleeting glimpse, but it will be a glimpse of something so rare that you may well spend the rest of the year waiting to see such a sight again... And the object you hope to see? The Sun.

Lazy summer days are what you most have in mind at this time of year and yet, perversely, whenever the sun does come out it always seems to coincide with that 'Great Pestilence' of all mankind — work.

As you sit indoors struggling to complete some task or other, you inevitably think of your computer — if they're so clever, why can't

they do the thinking for you? Why do you have to risk straining your brain, solving the problems of the universe when you've got an electronic '48K-of-mass-produced-brain' that could do the straining for you.

Real Expertise

For twenty years or so, computer scientists have felt exactly the same about work and, over those years, they've come up with an answer — develop Expert Systems which will free you from the drudgery of having to think for yourself.

Like a human expert, the system will be able to help you with any task for which it has the necessary knowledge. Unlike the human expert, however, it will never tire, go to sleep, want paying, make mistakes or object when you switch it off. And such expert systems *do* exist. They aren't a science fiction dream or an experiment. Programs like DENDRAL can already analyse molecular structure for working chemists — producing results so good that several learned journals publish academic papers which rely on DENDRAL's advice. Expert systems configure large mainframe computers — like the R1 program used by DEC. They diagnose infectious diseases using MYCIN, and heart-related diseases using PUFF. They help search for precious metals (PROSPECTOR); and all are working, commercial, expert systems. Every year the list gets

bigger as new systems are written which are expert in new areas.

So, why not write an expert system for your own micro? Let that do the thinking, while you bask in the sunshine. There's no reason at all why you shouldn't do this — a micro is perfectly adequate for many expert systems. But, first of all, you ought to stop and ask: what, exactly is an expert system?

The Big Pay Off

It's fine to talk about a system that replaces a human expert, but suppose that you wrote a small salaries program. Doesn't that replace human experts? Some years ago there were a lot of 'salary clerks' jobs, but now a quick glance through your local paper will provide surprisingly few. Yet, this work *did* require some expertise and now a program has replaced that human expertise with machine expertise. So, maybe, you could call a salaries program an expert system.

Maybe you could, but very few people would be happy with that description — largely because of the odd position of artificial intelligence as a subject. AI is the

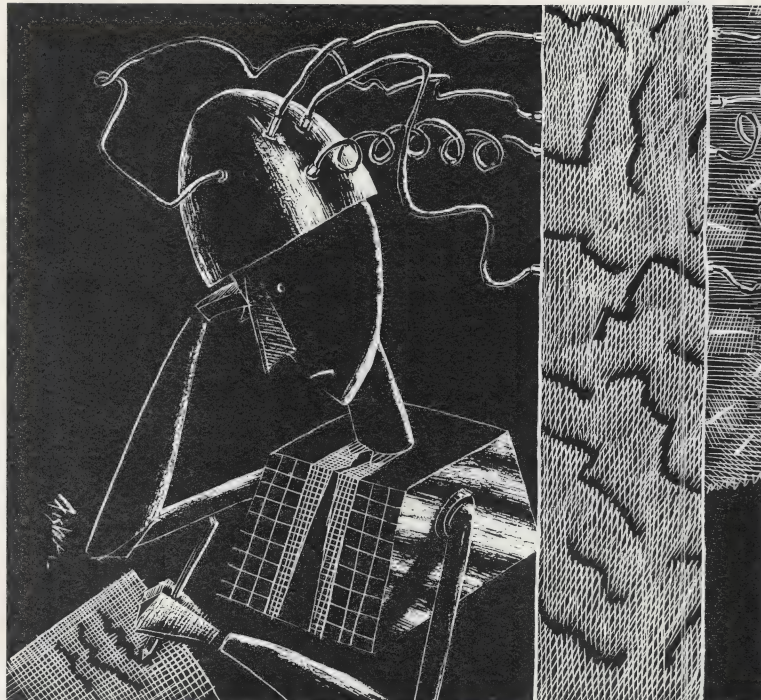
subject which covers things which haven't been done before, ideas which are not yet in widespread use. And, as salary programs are in widespread use, then they can't be AI. And, as expert systems are a branch of AI, salary programs can't be expert systems.

It's as if, by producing the term 'expert systems' we have to think of something rather different — even if we have to stretch the meaning of the words a bit in order to produce this difference.

And that's where the problem lies — there isn't any universally accepted definition of an expert system. There really isn't any one set of features which an expert system has to have in order to

first is that the data becomes more transparent in some way. It becomes easier to understand by the average person. This is because it's often rather fuller and more 'wordy' than a typical slab of conventional data. Which is one reason (possibly the only reason) why it's called 'knowledge' rather than 'data' — it's an attempt to encapsulate human knowledge and then make the machine understand *that*, rather than forcing human knowledge into a form which machines can process easily.

The second advantage arises from this knowledge-orientated approach and it stems from the fact that a lot of human knowledge



prove it's an expert system. All we can do is to outline some of the main trends that seem to be taking place when people start to talk about the things.

Arranging Blocks

Typically, the most noticeable feature of expert systems is that they are arranged in a slightly different way to most conventional programs. In an 'ordinary' program you have the *program* and the *data*. In an expert system you have an *inference engine* and a *knowledge base* which in many cases correspond to exactly the same things as program and data. The difference, where there is one, lies in the way the programmer approaches the task. In a conventional program, the bulk would lie in the program, with data being called in only as necessary. In an expert system you try to turn things around the other way and place the bulk of the work into the knowledge base, devising a 'driver' program (called the 'inference engine') to control this knowledge and act sensibly on it.

There are two main advantages that come from this approach. The

can be represented in very similar ways. Suppose, for instance, that you had an expert system which could diagnose infectious diseases. That means there is an inference engine which will drive a knowledge base and that this knowledge base currently happens to hold information on infectious diseases. But if, for instance, you had knowledge on a different subject which was structured in much the same way, then this new knowledge base could be equally well driven by the same inference engine. So, in theory, you could unplug the infectious diseases knowledge base and plug in, say, a knowledge base on heart diseases and suddenly you have an expert system which is expert in some totally new field. And that, incidentally, isn't at all fanciful. MYCIN diagnoses infectious diseases; but take away its knowledge base and you're left with the inference engine (called EMYCIN, for: Empty MYCIN — ie, it is empty of all knowledge). Then fill it up with a knowledge base covering heart infection and you have a new expert system. In that example, the new expert system

was called PUFF and, just to assure you that this isn't beyond the capabilities of the micro, PUFF has actually been re-written into BASIC!

Layout Matters

So far, this approach might sound pretty promising or, at least, fun. But there are drawbacks — the main one being that not all human knowledge can be represented in exactly the same way. PUFF and MYCIN work in different areas, but they both work within the overall framework of medical diagnosis. DENDRAL, which works in terms of chemistry symbols, simply couldn't be adapted to fit into the EMYCIN

advise you on a micro to buy. Well, in a sense, that's not too hard — the knowledge base will consist of the model name, price, colour capability and memory size (say) and the inference engine has to take all of this into account when it comes to advising you on your choice of micro. But, really, all the inference engine would be doing is to put up a number of ideas (the number of different micros you could buy) and ask a few questions to whittle down the choice. And that isn't wildly different from, say, trying to find out why your car won't start in the morning, or whether or not you've got measles.

Considerations of this sort can

conclusion and, even, be able to explain any line of reasoning which it followed. Some expert systems can do this, but, if you decide to build your own, bear in mind that this can be one of the hardest tasks.

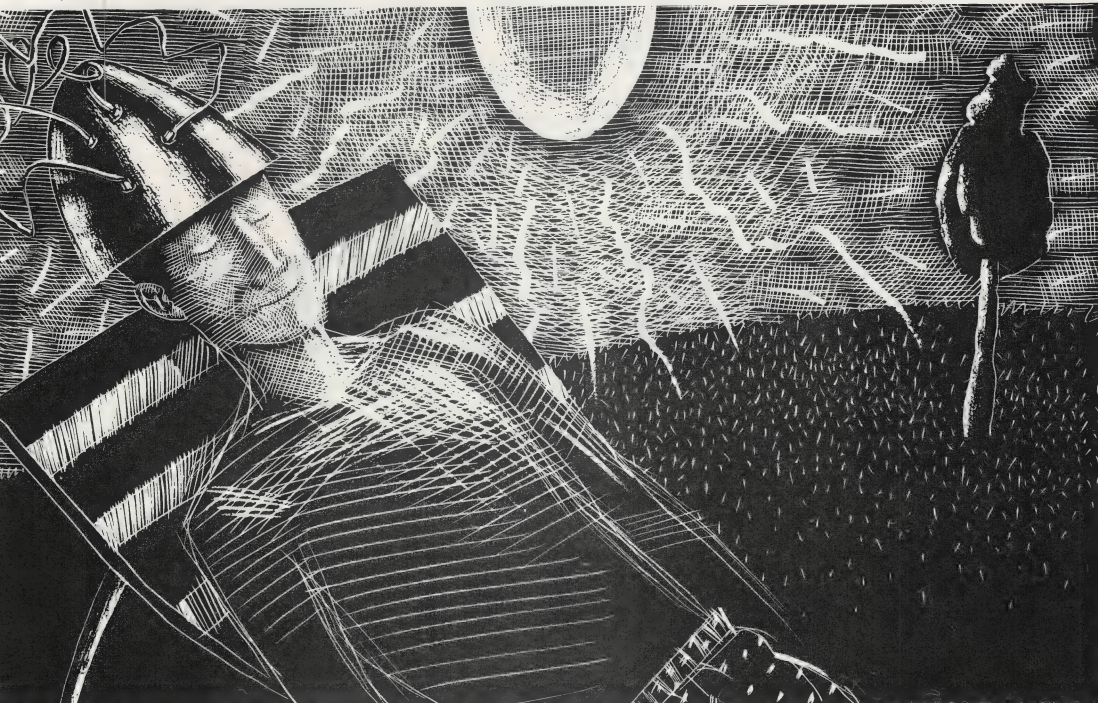
Theoretical Doubts

The only remaining problem is how to write an inference engine — the program that's going to work on the knowledge base. But, maybe, 'only' is an understatement since some of the methods used are extremely complex. For instance, suppose your expert system asks you a question and you don't know the answer. What does it do?

will be expert in some field not involved with purchasing (like trying to decide why your car won't start in the morning, or identifying particular fossils from your description of them). But, while you're modifying it, try to do it in such a way that it can still act as an expert on the original problem — that way you might gradually finish up with a general-purpose inference engine of your own which can be used as an expert system in a wide variety of situations.

The program presented here is designed to allow you to build up a body of advice for someone who wants to buy a micro. You can add to, or alter, the knowledge base (lines 1000 onwards) pretty much as you wish — but check that any alterations are in the same format as the current examples, or be prepared to alter the inference engine. Additional numeric variables can be added easily by increasing the value of V in line 50. Note that special code is needed to handle non-numeric variables (as in lines 100, 120 and 130).

The program works by using a fairly simple method of checking the knowledge base for the micro that best matches the requirements you key in and then gives you details of this best match by way of explanation for its decision.



framework because the knowledge is so very different in structure.

So, if you decide to build an expert system of your own, the first thing you have to decide is the 'Domain of Expertise' — a classy phrase which only means that you have to decide what it is that you want your system to be expert at (*well why didn't you say that in the first place — Ed*). Having decided on some domain you then have to think about the kind of knowledge the system will need in order to be expert in this field. You don't have to think it all out in detail, but you do have to think out its structure. What form is the knowledge to take? Once you've started to do this two things should start to become fairly clear. The first is the form the inference engine should take — it's no use thinking of a nice knowledge base if you can't write a program to handle it. The second thing that should emerge is whether this structure is unique to this particular domain or whether it happens to match other domains as well.

Suppose, for instance, that you decided to develop an expert system which would be able to

go a long way to help you decide what sort of an expert system to write because, the more generally-applicable the structure the more things you can use it for.

If, however, you wanted an expert system that would help you to solve problems in maths then that wouldn't be impossible — but it would be hard to think of anything else which it might usefully be made to do — the inference engine could be just a little too domain-specific.

Apart from the attraction of writing general purpose inference engines that can become expert in a number of different fields, expert systems also tend to have the user of the program very much in mind. After all, if you had a real, live, expert he wouldn't just pronounce judgement and then walk out the room (or if he did, you'd probably ignore the advice). You would be able to ask him to explain his advice or decisions — you could talk to him and discuss the problem you have.

And, in an ideal world, you should be able to do something like that with an expert system as well. It should be able to explain why it came to a particular

Somehow it has to allow for your uncertainty. And, even if you do know the answer, that particular answer might suggest something to the expert, but it might not suggest it with any great certainty. There can be lots of room for doubt with many of the problems expert systems are given to solve and, often, this doubt is handled by using probability theory in the design of the inference engine. Probability theory and other solutions are covered in several books (eg, *Build Your Own Expert System — Sigma*) but, for an example of a simple expert system have a look at the example code on this page. This is designed to help decide which micro to buy. Notice that the DATA statements contain the knowledge base which can be extended or altered independently of the inference engine (the main part of the program). The system is very simple and, with a bit of thought, you should be able to modify it so that the same inference engine can be used for other tasks which have a similar nature — such as becoming expert in some other purchasing decision. Then try modifying it even further so that it

```

10 REM INFERENCE ENGINE
20 HOME : PRINT "EXPERT": PRINT
30 PRINT : PRINT "REPLY BY NUMBE
R " : PRINT "IF THE ANSWER IS
NON-NUMERIC USE " : PRINT "N
UMBERS INSTEAD - EG, 1/0 FOR
Y/N"
40 PRINT : PRINT
50 X = 100:V = 3: REM X IS THE N
UMBER OF DIFFERENT MODELS TH
E PROGRAM CAN CONSIDER AND V
IS THE NUMBER OF DIFFERENT
VARIABLES ON EACH MODEL
60 DIM R(V,X),A$(V),D(X),M(V),MS
(V),M$(X),U(V)
70 RESTORE :E = 0
80 READ M$,A$(1),A$(2),A$(3)
90 READ A$: IF A$ = "999" THEN 1
90
100 E = E + 1: READ R(1,E),C$,R(3
,E)
110 M$(E) = A$
120 IF C$ = "YES" THEN :R(2,E) =
1
130 IF C$ = "NO" THEN :R(2,E) =
0
140 FOR I = 1 TO V
150 M(I) = M(I) + R(I,E)
160 MS(I) = MS(I) + R(I,E) ^ 2
170 NEXT
180 GOTO 90
190 FOR I = 1 TO V
200 U(I) = MS(I) / E - (M(I) / E)
^ 2
210 NEXT
220 FOR J = 1 TO V
230 PRINT A$(J); " " : INPUT X
240 FOR I = 1 TO E
250 D(I) = D(I) + ((X - R(J,I)) ^
2) / V(J)
260 NEXT :NEXT
270 D = 1E38:HD = 0
280 FOR I = 1 TO E
290 IF D(I) < D THEN :HD = I:D =
D(I)
300 NEXT
310 PRINT : PRINT "I ADVISE " :M
$(HD): PRINT : PRINT "BECAUSE
E THAT MATCHES": PRINT "YOUR
REQUIREMENTS BEST"
320 PRINT : PRINT "IT HAS :-":
PRINT
330 FOR I = 1 TO V
340 PRINT A$(I); " " :R(I,HD)
350 NEXT
360 END
1000 REM KNOWLEDGE BASE
1010 DATA MODEL NAME,PRICE,COLO
UR,MEMORY SIZE
1020 DATA MODEL A,200,YES,48
1030 DATA MODEL B,300,YES,64
1040 DATA MODEL C,100,NO,48
1050 DATA MODEL D,50,NO,12
1060 DATA 999
1070 REM 999 IS THE STOP CODE A
ND FOLLOWS THE FINAL ITEM
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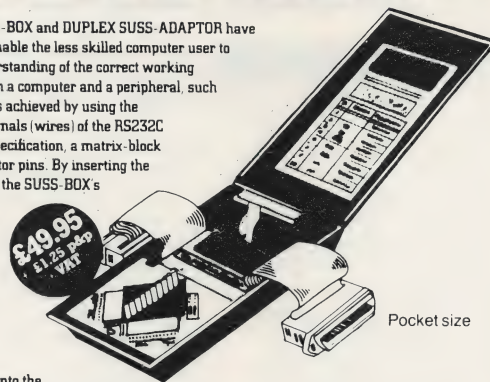
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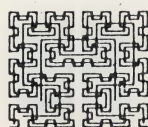
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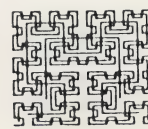
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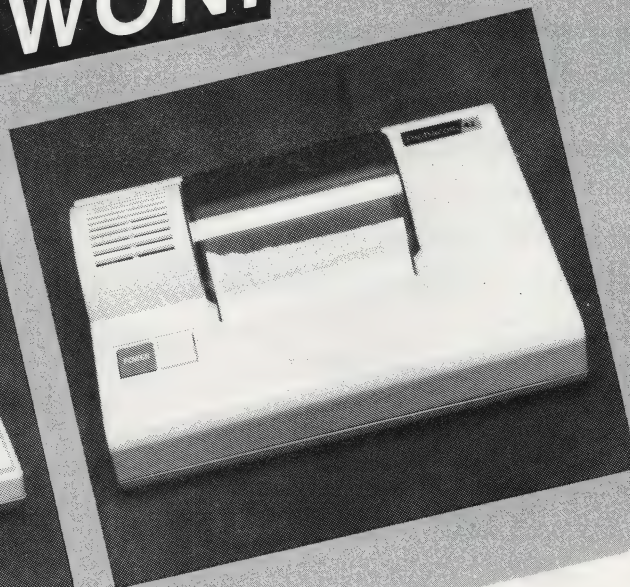
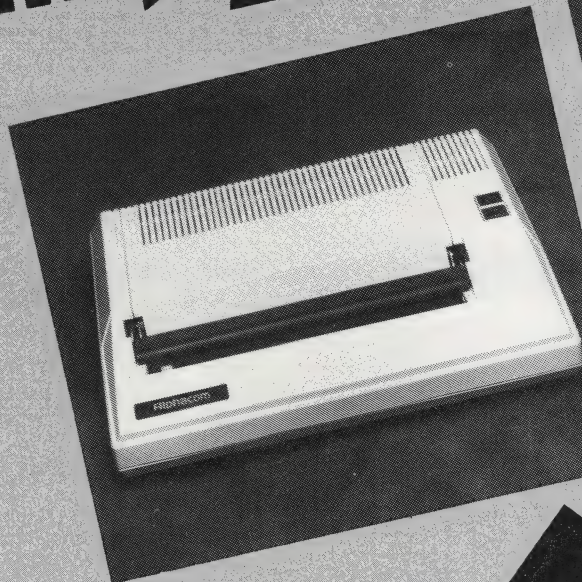


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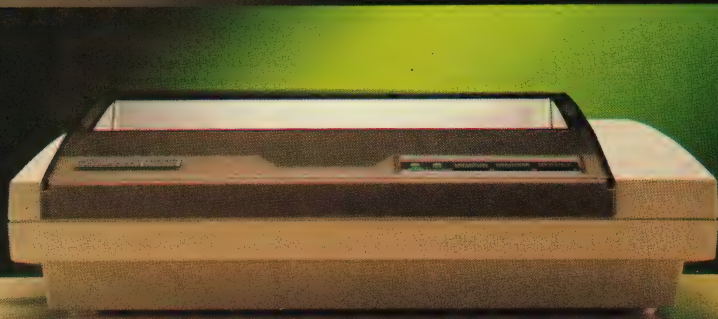
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Printers and monitors are the most important peripherals for home micro

PRINTERS &

Buying a torture rack is one way in which the home computer user can extend their new toy (sorry, system). However, thankfully there are a few more practical approaches. Most users start their computing days with the basic machine itself, and perhaps a humble cassette deck as a storage medium. However, as time goes by the desire to 'keep up with the Joneses', down at the local computer club, grows and so the bank balance must be searched in order to find out which expansion will come first.

In order to lessen the risk of you rushing out and buying a totally unsuitable piece of equipment, thus wasting money that would be better spent on a ten year subscription to *Which Micro*, this month's supplement features a round-up of available and popular monitors and printers. Some, but we must point out not all, have been field tested using a variety of home micros, and have proved to be reliable and useful additions to the system.

Monitoring Monitors

Monitors can be an expensive purchase, and before buying one it's worth spending a bit of time sitting down and deciding whether or not you really need one. After all, most home computers can quite happily work off a domestic television, and if they can't maybe you shouldn't be buying that one in the first place.

For some kinds of work it is vital that the resolution and clarity of the display generated by the computer is of the highest possible standard, and a clapped-out fifteen year old television is not going to produce the finest of pictures.

It is also a lot, lot easier to work with a high quality display for any length of time than it is to work with a poor display. Eye strain can be an occupational hazard in the computing world.

So, for whatever reason you decide that a monitor is going to be needed. The question then comes down to: which one to buy?

Guiding Light

Monitors, rather like televisions, come in all shapes and sizes.

There are two main types of monitors available, and the difference between the two determines what sort of picture you are going to see on your screen. Bear in mind that a monitor is generally not going to be capable of generating any sound, so if your computer

produces sound through the television set (like most Commodore equipment) then this is a point to watch out for. Spectrum, Oric, Electron owners have no such worries.

The type of display that you'll get is related to the way information is displayed on the screen. This can be done using either a dot-phosphor screen, or a striped phosphor screen. Dot phosphor ones are better at producing individual character displays, and for something like word processing, where the user will be staring at the screen for long periods of time, these are to be preferred.

They are also capable of displaying information to a much higher pixels per line ratio. That is, the number of individual dots that can be displayed on one horizontal line of the screen. Needless to say there are drawbacks to using this sort of monitor, and chief amongst these is that they cost more! However, the likelihood is that the monitor is going to last a lot longer than the computer that it's being used with, and it's a comforting feeling to know that as you upgrade your system the monitor will be able to cope with any increase in resolution that you might wish to display.

All monitor manufacturers tend to quote impressive figures at you about scanning frequencies, positional errors, and so on, but your main requirement is the resolution, and the overall display, so if possible get to see a model working with your computer before you buy it.

The two main ways of sending a monitor signal are RGB (where the signals are sent as three separate colours, namely red, blue and green, and a separate sync signal that combines the lot), or composite video (which sends the whole lot down as one bunch with the three main colours already synchronised). Find out which, if any, your computer has before scanning the shops for the model of your dreams.

After deciding that you can justify the cost, what resolution you want and can afford, and that the monitor you want will actually work with the computer that you've got at home and is capable of producing what for you is an adequate display, you're home and dry.

For those of you still far away from home and distinctly wet, we'll start our round-up of available monitors.

SPECIAL



On Display

First of all, is it possible to cut a few corners and save yourself some money into the bargain? This is not always desirable, but if you want to take the plunge and hope that you're not going to end up with something no better than an ordinary domestic television, then it might be worth considering a company who've recently announced that they're converting certain television sets into monitors.

The company in question is a Scottish one called Doublemode, where they produce RGB sets for BBC owners (at present) for just under one hundred pounds. They also say that they hope to be producing some composite video

ones for Atari and Commodore people shortly (they might well be doing this by the time you read this supplement), and even a special Spectrum set sometime this year.

Screen widths are 20 inches, 22 inches or 26 inches, which is a bit large if the monitor is going to be sitting two feet away from you on your desk, but if for some reason you are prepared to sit further away then it might be all right.

However, back to monitors that really are monitors, and an interesting range from Opus Supplies Ltd.

They produce two models, one with a high resolution of 580 by 470 pixels, and one with the slightly lesser resolution of 370 by 470 pixels. The former is priced at

users. Pete Gerrard, Gary Evans and Clive Williamson look at the options.

R MONITORS



monochrome, that will, with the correct model chosen and the correct cable installed, work with just about any computer you can care to name, including the BBC, Electron, Commodore, Apple, Hewlett Packard, Atari, and so on.

Of all the monitors that we tested out, Digivision were ahead of the rest, in terms of picture quality, resolution and indeed mere aesthetic appearance, but bear in mind that we weren't able to look at every machine offered by every manufacturer.

This 'top of the list' award is perhaps due to Digivision's long standing relationship with the industrial world, which meant that any monitors produced by them had to be of a very high standard. Fortunately those standards haven't dropped in being transferred over to the home user.

If you do choose a Digivision, remember that they do an awful lot of different models, most of which are individually 'tweaked' to suit different makes of micros. For instance, their RGB models are designed for things like the BBC, and it is only the monochrome ones (monochrome not necessarily meaning black and white: the colour displayed on the black background is very much up to you) which offer the sort of composite video input required by machines like the Commodore 64.

The resolution offered on the higher priced models is quite staggering: up to 1476 pixels per line on a 20 inch model, and this only drops to 1046 pixels per line on a more standard 20 inch. You can even get the executive casing to match your executive life style, giving you a swivelling, tilting case, but whether any of us would be able to find the money to buy that particular model is a different question.

Another set of RGB models comes from the renowned Japanese company Kaga Electronics Ltd, but there are several distributors for those over here, including Data Efficiency Ltd.

Kaga models are interesting ones in that they have more than one connector at the back of the set to cope with a variety of different cable interfaces. This means that a greater range of micros than usual can be connected up to the one, standard monitor, although we are still restricted to those that produce a true RGB signal. The width, height and deviation of the picture displayed can all be altered by the user quite easily, although if

anything else is required the unit should really be returned to the place from where it was bought.

Again, the picture displayed on the one used here was of a much higher standard than the display that we're usually used to, and it remained stable even after prolonged use. The screen display of 12 inches diagonally was also a lot easier to work with than some of the other, larger models tested. Still, you pays your money ...

The final model we looked at was one of a range available from Microvitec Ltd.

They have a wide choice of models available under the general name of Cub colour displays, with screen sizes ranging from 12 inches through 14 inches and up to 20 inches. Resolutions offered are the usual standard, medium and high, and you even get a choice of three display cases as well.

Guess what? We're into RGB land again, so it's good news for BBC owners, and bad news for everyone else. With a choice of controls for brilliance/brightness and contrast these machines were easier to change than most, and for the more technical of you out there Microvitec obligingly came up with a set of circuit diagrams for the insides of the beast. Be careful with those warranties though if you start tampering with it.

And The Rest

More and more companies are now producing monitors for home computer use, and some of the more experienced companies who've gained recognition in the past for their work on ordinary domestic television sets are now seeing the advantages of producing cheap monitors as well.

Philips is one such company, who've had the foresight to equip their 12 inch monitor with a loudspeaker for those computers that rely on the TV to produce their sound. This is well worth a look if you're counting the pennies, as their model number V7001 costs a mere £69.95.

Another one from Philips is called the TP200, retailing at about £75. Complete with anti-glare screen, this is yet another RGB model. Distributors in the UK include EMCO down south, and Vako Displays for those of you 'up north'.

ITT Television is a name that should ring a few bells, and they're offering a choice of either RGB or PAL sets, which should keep most users happy. Both of these have 14 inch screens, and the RGB one

£229.95, while the latter is retailing for £179.95. Both of these are RGB only, which means that they'll quite happily work with BBC computers, Electrons, Spectrum QLs (although whether you'll ever be able to get one to prove that point is another question!), Lynx, Oric and Apple machines, to name but a few.

Both models have a 14 inch screen, which is really about as big as you need to get. Not too overpowering, but at the same time not too tiny that you have to keep peering at the thing in the hope of seeing anything, which defeats the point of having a monitor in the first place.

Their only control other than an on/off switch is a brightness one,

whereas some models we'll be looking at later came with contrast, horizontal and vertical hold etc. However, the price is rather nice, and if you really want to get at things like vertical and horizontal hold they are there if you're prepared to be a dab hand with the old screwdriver.

The one used here performed quite happily for a reasonable length of time, and the picture quality remained constant throughout. Interesting, because one of the ordinary television sets usually used has a habit of 'jumping' every now and again.

Collected Chroma

Digivision produce a range of monitors, both colour and

will set you back around £280, the PAL one around £310.

Some computer manufacturers produce their own dedicated monitors. Commodore owners would do well to consider Commodore's own monitor, since it is one of the few that will actually work with the Commodore kit, and it is not over-expensive.

Commodore expert Barry Miles is quoted as saying that 'I was so impressed with it (as a review copy) that I went out and bought one'. Seasoned campaigners will know what a compliment this is. At least he didn't buy the company.

In the end, after due consideration over which model you want to buy, we can only reiterate the advice given earlier: see it working with your computer before you part with any money. You might save yourself a small fortune.

Printers: To Buy Or Not To Buy

Before going on to consider various printers on their individual merits, it's worth pausing a while to consider some general rules that ought to be applied when you're faced with 'the decision'.

The most obvious question is 'do you really need the printer at all?' They can be expensive commodities, and if you waste two hundred, four hundred, a thousands pounds or more on a machine that is not being used

more than 1 per cent of the time, neither you nor your bank manager will be very happy.

Use And Abuse

The first use of a printer for most people will probably be obtaining hard copies of program listings. Lengthy programs become virtually impossible to de-bug when you can only see a small window of the listing on the screen at one time, whereas life is made a lot easier if you can trace program flow through the whole listing.

If it is only to be used for listing programs, then a simple dot-matrix printer should be considered. However, what if you want to later use the printer to send out letters to people as your system grows and you decide to do more and more of life's mundane tasks with it. Perhaps your mum wouldn't mind too much if you sent her a letter printed out on the Sinclair printer, but we can't imagine too many business associates being very impressed. Especially when they get covered in grime as the letter disintegrates in their hands.

Most printers produce the same image all the time. That is, the quality of the output cannot be changed at all, and the only difference in the image that you seen on the paper is dependent on the age and quality of the ribbon being used. However, there are a select breed that allow you to print

in what is known as 'double strike' mode. This gives a much heavier impression on the paper, since the printer is literally printing out each character twice.

Naturally enough, this slows the printer down to half its normal print speed, but since the quality of the output is now much more impressive, you could send letters out that have been printed in double strike mode and then revert back to normal mode when simply printing out listings.

Daisy, Daisy

If the printer is to be used solely for what might generally be termed 'business use', then the choice of printers widens to include the daisy wheel. These tend to be much slower in printing than normal dot matrix printers we discussed earlier, but on the other hand the quality of the output is greatly increased, and the end result is something that could have been produced by a typewriter.

Some daisy wheel printers can also double as ordinary typewriters when not hitched up to the computer, and if this is your area of interest and the budget can stretch that far this type of printer is well worth considering.

One further area of use ought to be mentioned, since there are now a growing number of printers (Alphacom produce one, for interest) catering for a particular market. These are generally 40

column printers, using thermal paper, and although the quality of the output is not brilliant, these printers are significantly cheaper than anything else. If, for instance, your only use for a printer is to print out address labels, or perhaps produce prescription slips, or anything like that, these 'budget' jobs could save you a small fortune.

Regular readers of this magazine will recall a saga related some issues ago about trying to link up a complete Commodore system, and coming unstuck when one manufacturer's interface was another peripheral's poison.

Just because a computer boldly states that it has a Centronics interface on board, is no reason to assume that it is going to quite happily start communicating with a Centronics printer as soon as you hitch them up. Centronics interfaces, like the other great communications standards (RS-232 and IEEE-488) are only standard in the way that you spell the word. Various companies have their own definitions about what standard is supposed to mean, so you must always make sure that your computer really can communicate properly with the printer of your choice.

Specific Models

We mentioned Alphacom earlier, and the thermal print models that they do are capable of working



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CANON	PW1156A 160cps (NLQ)	£339.00
EPSON	RX 80T 100cps	£199.00
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EPSON	FX 80 160cps	£324.00
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MANNESMANN	MT80 80cps	£199.00
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RICOH	RP1600S	£1190.00
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RP1600S Sheet Feeder		£459.00
RP1600S Tractor		£138.00
EXP550 (P) 16cps		£570.00
SMITH		
CORONA	TP1 12cps	£195.00
TEC	STARWRITER F1040 40cps	£895.00
TEC	STARWRITER F1055 55cps	£1235.00
TEC	Sheetfeeder	£459.00
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UCHIDA	DWX-305 (S or P) 18cps	£299.00

** PLOTTERS **

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with most of the popular home computers, since a variety of 'intelligent interfaces' are supplied as optional extras for each printer. These interfaces are configured for particular types of computers, and most home machines have now had one designed for them.

The two most common models that they produce are the Alphacom 81 and the Alphacom 41, which are respectively 80 and 40 column machines. Although they wouldn't be of much use in the office environment, as 'cheap and cheerful' little printers they certainly fit the bill.

Distributed over here by Dean Electronics, some of you may find the noise that they make a little off-putting, but if you can put up with that, and most of us learn to live with whatever irritants are sent along in the computer world to try us, then you shouldn't have any complaints.

On a totally different scale, the Brother HR15 is a leading contender for being cheapest daisy wheel printer of the year. At a mere £340, plus whatever it costs to have the required interface for your computer (£18 for the BBC one that we tested), this is a remarkably inexpensive piece of kit.

It may be slow, at around 13 characters per second (CPS from now on), but you do get a choice of RS232 or Centronics interfaces to work from, and changing the

ribbon and the daisywheel was much easier on this machine than some of the ones we looked at.

Quality of output was pretty reasonable, albeit cluttered out at a noisy (but certainly not intolerable) level, and with that very low price this should be one for your daisywheel shortlist.

Enhanced Dot Matrix

If you're looking for a dot matrix printer that is almost capable of producing letter quality output à la daisy wheel, then it might be worth your while contacting X-Data Ltd, and asking them about the Microline series of printers complete with OK-Writer attached.

In normal dot matrix mode, the printer can shunt along at a highly respectable 120 CPS when it's printing at 10 characters to the inch, and at half that rate when printing a mere 5 characters per inch. As is common with a lot of printers nowadays, you can select your character set from a wide number of options, and the DIP switches which must be altered to do this are rather more accessible on this model than they are on some of the others we've seen.

As a pure dot matrix printer it is good enough to be considered anyway, but an extra £100 or so will provide you with the OK-Writer kit, which brings the quality of the output on this particular series of printers up to almost letter quality.

Your printing speed obviously suffers a little, but it is nowhere near as slow as most daisy wheels, and the print quality is highly acceptable.

As a footnote, X-Data provide the kind of backup service that most people will be interested in knowing about before buying any particular printer. Ribbons, print heads, spare sheets of paper, and just about anything else you might care to name, are all from the same source.

Famous Names

There are many famous names in printing that regrettably we haven't got the space to cover in any great detail. People like Qume, Mannesman and others will have to wait till we get to the round-up at the end. For now, we'll concentrate on just three types of printers that would seem to cover the needs of most users: daisy-wheels, dot matrix, and a combination of both.

One excellent low cost daisy wheel printer is available from Keyaki Ltd. The model is known as the Daisystep 2000, and costs a mere £289 plus the ubiquitous VAT. Considering that this is a pure daisywheel (none of your 'near letter quality' here) this price alone makes the Daisystep 2000 worth considering. Tractor feeders and sheet feeders are optional extras, at a cost of £85 and £199 respectively.

It comes with Centronics interface fitted as standard, although you can buy interfaces for most of the micros currently available. With a print speed of 18 CPS it may not be the fastest printer in the world, but we've seen slower ones, and, an important point, much noisier ones as well.

Changing ribbons and daisywheels was exceptionally easy, perhaps the easiest printer of the entire collection examined. There are a number of features in the machine which come directly under software control. In other words, you can change them whilst running a program, rather than continually flipping DIP switches up and down all the time. Amongst these features are subscripts and superscripts, horizontal and vertical tabs, proportional spacing, whilst if you must tamper with a few switches, you can also select bit- or uni-directional printing, no line feed or an automatic line feed, the number of characters printed per inch, amongst other options.

Since it is also compatible with Qume daisywheels and Qume ribbons it would make a good second printer for anyone with one of those beasts already lurking in the office. For a first machine, it seems hard to beat.

Dot Matrix Family

When it comes to selecting a

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specific dot matrix printer, we'll admit to being a teeny-weeny bit biased. Why? Simply because the printer that is always in constant use here has never let us down, performs admirably at high speed, and can produce very high quality output at a slower speed when required.

The printer in question is the Epson FX-80, which will set you back around £450, and which comes complete with a Centronics interface. For a little further outlay you can also have either an RS-232 or an IEEE-488 interface fitted as well, and swopping between Centronics and whatever you ended up installing is an easy matter of inserting or removing about half a dozen screws.

It bounds along at a healthy 160 CPS when in normal strike mode, although this is reduced down to 80 CPS when you enter double strike mode. As with all the Epson printers the manual supplied is superb, and changing just about anything on the printer can be done with consummate ease. The only problem seems to occur when you try and wind paper backwards out of the printer (well, you have to sometimes), but as long as you persevere there shouldn't be any unsurmountable problems.

For permanent, rather than temporary changes, there are the usual number of DIP switches inside which can be fiddled with

and altered, and we've seen the Epson coping quite happily with a wide range of micros and interfaces.

But the FX80 isn't the only model that they do. In the time honoured tradition of confusing the customer by bringing out several different models with roughly similar names, they also have on their books the RX80, which costs a little less than its big brother, at just over £300.

Needless to say it doesn't have all the features of the FX model, and prints at the slower rate of 100 CPS, but as with all things the size of your wallet will probably determine which model you buy.

To finish with Epson, their latest model is called the FX-100. At £569 it is the most expensive of the dot matrix printers, but it does appear capable of making the tea, collecting the post, and performing just about everything you'd require in a dot matrix printer.

Either Way Bets

Printers that can perform in either dot matrix or daisy wheel mode are becoming more and more common, and to take one typical example we had a look at the Taxan KP810 NLQ printer, from Kaga Electronics Ltd. You may remember them from the monitor section earlier, as both their monitors and printers are distributed by the same company, namely Data Efficiency Ltd.

The Kaga Electronics monitor was quite reasonable, and so is their printer. The NLQ incidentally stands for Near Letter Quality, so there is some method in the madness usually employed to choose the name of these products. This retails at a shade under £300, and begins life with a Centronics interface fitted, although you can opt for a serial interface if you require it.

Standard print speed in dot matrix mode is around 160 CPS, although you can switch to the NLQ mode as soon as you turn the beast on, which brings the print speed down somewhat.

If you want a quiet life you can also select the 80 CPS 'quiet' mode of printing, which is a useful option if you happen to be on the phone when the machine starts making a racket.

All the usual features are there, such as superscripts and subscripts, proportional spacing and so on, as well as a selection of 9 character sets. The number of characters printed to the line is normally 80, although this can be increased to 136 if you're willing to supply a magnifying glass free with each letter that you send out.

With the added bonus of being Epson compatible, there is one other model in the Taxan range, which goes under the name of the KP910. The only difference between this and the KP810 (apart from the price!) is that the KP910

has a print width of just over fifteen and a half inches. This means that it is capable of printing up to 156 characters to a line, so if spreadsheets be your thing, then perhaps the 910 ought to be considered.

These printers work with most micros that are currently available, but as ever you should get a demonstration of the machine in action with your computer before handing over the dough.

Best Of The Rest

There are a number of companies who are always worth writing to when it comes to considering purchasing a printer, and amongst those not listed so far are Triumph-Adler. They produce a variety of printers to meet a variety of needs, as do Smith Corona.

One company who have in the past supplied a number of computer manufacturers with their supposed in-house printers are Mannesman Tally. Amongst their products are the MT80, an £800 dot-matrix printer, with the ability to connect up to just about anything from a Commodore 64 to a toaster.

Another printer from Mannesman is aimed as a competitor to the RX-80 from Epson. Going under the name of the M-T (there's original), this is an 80 CPS bi-directional dot matrix printer, complete with either Centronics or RS-232 interfaces.

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Standard features present include normal, compressed, double height and double width characters, and compatibility with ASCII and Epson codes. It costs £285.

The earlier mentioned X-Data have a range called Dyneer, going under the names of DW16, DW20 and DW36, where the letters simply stand for Daisy Wheel and the numbers relate to the print speed when in certain modes of operation.

Qume was another company mentioned earlier, and one outlet of theirs is a company called ISG Data Sales. One of their models is the Letterpro20, named with staggering intelligence since it has a print speed of, yes, you guessed it, 20 CPS. With a choice of over 100 typefaces, £695 doesn't seem to be a totally unreasonable price to pay.

Thame Systems have recently produced a new brother for the Brother range of printers, and this one is known as the HR25, since it has a print speed of about 25 CPS. It can also re-print previously typed text, since it has a 3K storage buffer for anything you might wish to recall later. Saves on finger wear and tear I suppose. This one will set you back about £795, with a choice of either a Centronics or a serial interface, but not (I understand) both.

More daisywheels for around £400 include the KDC WP 550

from Hal Computers. A ridiculous name maybe, but this printer has a number of options, including the ability to print at 10, 12 or 15 characters per inch and comes with an RS-232 or Centronics interface.

Still in the £400 price bracket is a printer called the Juki 6100. This offers you the usual 10, 12 or 15 characters per inch modes, with a print speed of about 17 CPS. It too has a text storage buffer of around 2K, which allows you to get on with something else while around 2 pages of text can be happily printed out. Again, it has a wide range of control codes available, along with the ever present collection of DIP switches. One thing to beware of, as with all printers and companies new to these hallowed shores, is the availability of peripherals should anything go wrong.

Have a chat with Micro Peripherals, who stock the thing, before taking any further steps with this particular model.

If you're looking for a company that seems to supply everything, you could do worse than contacting Access Data Communications. They stock, amongst others, Facit, Qume and NDR series printers, and most of these seem to be available for rental as well as a straightforward purchase, a useful option if you're not too sure about what to buy straightaway.

Even if the basic printer itself isn't capable of doing quite everything you require, there are a number of companies who are now producing various interfaces and peripherals to make printers dance and sing better than a dog that's just been offered a pint of John Smiths (although why anyone should want to dance and sing when offered a pint of that is beyond us).

For instance, Watford Electronics have produced a ROM-based program called Beebfont (guess which micro this one's for), which gives you six new typefaces and allows you to define up to two new character sets. It may cost £45 for the privilege of doing this, but it's considerably cheaper than some of the competition. For example, a product called Fancy Font which does much the same thing, with a few more character sets, will set you back getting on for £160. Still, both products seem to work with most popular dot matrix printers.

Interfacing

Before any computer will work with any printer you'll have to find a suitable interface to connect the two together. Although we're not going to be covering interfaces in this month's supplement, it seems wise to point out a few 'rules of thumb' to consider when buying an interface for your printer and computer.

If you opt for a printer made by the manufacturer of your computer, the odds are that there will be no great problems attached in using it. The odds are that it will also not be a terribly good printer, since few computer manufacturers have the reputation for producing quality printers.

So, you will probably find yourself with two conflicting companies and two conflicting signals to marry together, and since the printer is not going to work without the correct interface installed, the time taken to check out an interface in the working environment will be well saved later on. If the printer refuses to co-operate at first, you could be in for a long hard struggle, as many of you will know from bitter and expensive experience.

Finally, just because a printer, a computer and an interface seem to be getting along quite happily is no guarantee that they will work together when you attempt to do anything more dramatic than

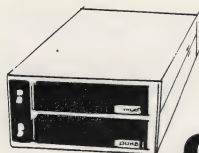
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Check the software that you'll be using as well as everything else. Then, and only then, should you be ready to part with some money and begin a long and hopefully happy relationship with the new addition to your computer system.

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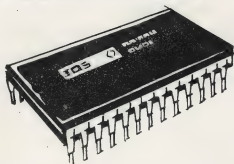
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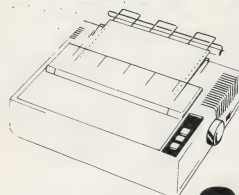
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800K Mitsubishi 40/80T.....£439

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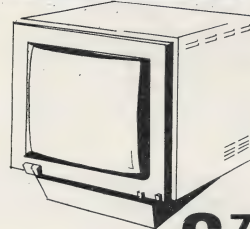
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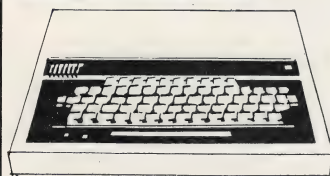
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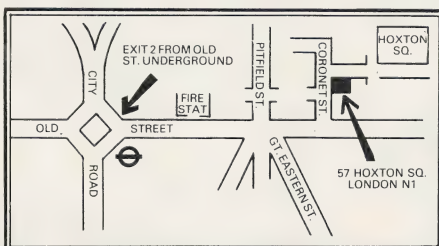
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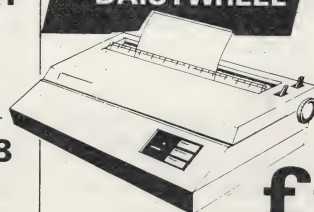
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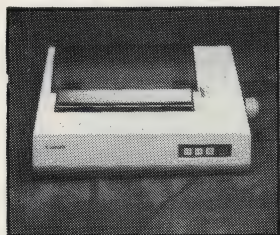
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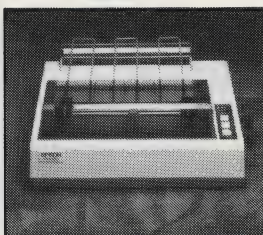
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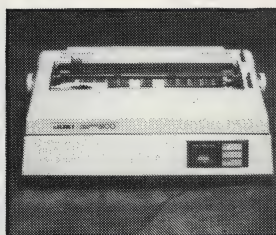
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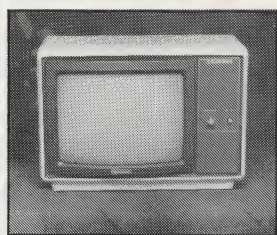
Canon PW-1080A



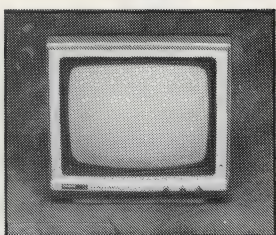
Epson FX80



Juki 6100



Electrohome RGB



Philips monitor

Canon PW-1080A

At last a dot-matrix printer which offers something approaching letter quality for under £400! The Canon PW-1080A uses the same control codes as the popular Epson FX80, and hence gives a similar range of print styles (including italic, elite, condensed, bold, proportional spaced and so on). These are arguably not quite as attractive or legible as the equivalent Epson styles, but there is an important addition — 'Near Letter Quality' typeface, or NLQ for short, is also available on the machine.

This builds up each letter in two passes of the print head, giving an effective print matrix of 18×22 ; ie, double the normal resolution. The results are very good indeed in this mode, as the NLQ character set has been well designed. Print speed in this mode is down from the unit's normal 160 CPS to only 27 CPS, but this compares very favourably with the daisywheel alternatives in the same price range. The speed is kept up well by fast, efficient line-feeds, which is unusual on a printer of this type. Paper-feed is by friction or tractor, and loading the paper is extremely easy.

Generally the unit is very quiet in operation, although this is partly a result of a reduced 'impact-strength', giving a less dense printout than comparable machines under normal circumstances. Like the Epson FX80, the Canon PW-1080A has a 2K print buffer, which can be used to store customised character definitions if required. Altogether, the Canon offers exceptional versatility for a dot-matrix printer, and at a good price. The compatibility with Epson's control codes is an added bonus. The PW-1080A costs around £367 including VAT. A 156 column version, called the PPW-1156, is also available.

Epson FX80

An extremely popular printer of the dot-matrix variety, the FX80 is Epson's follow-up to the successful MX80 FTIII, which was almost a 'standard' in its day. As the '80' in its name implies, the FX normally prints 80 characters on a line, but this can be increased to up to 137 characters depending

on the print style chosen. The enormous number of alternative typefaces includes italics, enlarged, condensed and emphasised styles. The latter 'blurs' the dots sideways to improve legibility, and a double strike option can be turned on in some modes, which reprints the line of text with a slight vertical displacement, concealing the dots even further and producing a nice 'solid' look to the text. Double strike is considerably slower than the FX80's fastest 160 cps print speed though.

A further improvement to the print quality is the ability to switch a proportional print mode on, and the resulting proportionally spaced text is very easy to read indeed. The FX has a 2K print buffer, which can either be used to speed up printing, or to store up to 256 user-defined characters. Paper feed is either by friction or tractor, but whereas the good old MX80 allowed a variety of paper widths for 'tractor' operation, the FX can only accept fan fold between 9.5 and 10 inches wide. The feed mechanism and paper path seem to have been designed to put you off ever changing the paper — in other words they are very tricky to master!

In use, Epson's FX80 proved extremely reliable, and gave very 'steady' results throughout the writing and printing of two books! The precision of its printout makes it exceptional for screen-dumps of graphics, and it is well supported with software to do this (particularly for the BBC Micro). A good machine for use in the home, or a more demanding environment such as business or school, as long as someone can cope with installing the paper.

Juki 6100

The Juki 6100 is currently one of the most successful daisywheel printers, and justifiably so! Well designed and built, this Japanese unit uses Diablo protocols to enable features like 'bold', 'shadow' and underline printing, and also supports 10, 12 or 15 characters per inch as well as proportional spacing. The 100 character daisywheel is Triumph Adler compatible, and the Juki uses IBM Selectric carbon ribbons, so replacements should

not be a problem.

Printing at around 18 cps by virtue of its bi-directional and logic-seeking action, the unit is fairly quiet in operation (bearing in mind that all daisywheels are noisy beasts!). It comes with friction feed and a Centronics parallel connection as standard: tractor and cut sheet feeds and the RS232 serial interface are available as optional extras at around £114, £275 and £62 respectively.

The unit has a 2K buffer and gave neat, good quality printing under test. The DIP switches were mercifully easy to gain access to for alteration of character sets, line feeds and so on. The Juki 6100 seems strong enough to withstand handling at home, or in a small office environment, and costs £458.85 from Micro Peripherals Ltd.

Opus Monitors

Opus Supplies market two JVC colour monitors which are imported from Canada. These are standard and medium resolution, although confusingly Opus call them medium and high resolution, but they sell at a reasonably low £221.89 and £279.39 respectively. The prices include a cable suitable for the BBC Micro, VAT and carriage.

The JVC sets are quite bulky, and do not easily incline to a comfortable viewing angle, but the picture quality is certainly acceptable in both cases for the price. The 'medium res' set is nothing special as true 'standard res' sets go but few would quibble for the money. However, the so-called 'high-res' set is particularly interesting, providing an economical way of obtaining an acceptable 80 character display for word processing and fairly crisp colour graphics into the bargain.

Philips V7001

Attractively styled, the V7001 has a folding stand underneath, giving two viewing angles, and is capable of taking its input from either a 1 volt composite video signal, or an RGB output from a micro such as a BBC or a Lynx. The RGB socket on the back of the unit includes a sound input, and the on-off switch on the front of the set also acts as

a volume control for the internal loudspeaker. Other controls are provided on the front panel for contrast and brightness, and there are easily adjusted presets on the back of the set for image width, height and vertical hold.

The V7001 gave highly watchable results when connected to a BBC Model B working in 80-column screen modes, especially for an asking price of £79.35. The only minor criticism of the unit is that the composite video input is via a low-cost 'CINCH' (UHF TV-style) socket, rather than a sturdier BNC or F & E connector.

The Microvitec Range

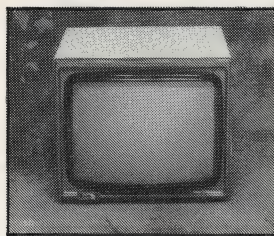
Microvitec have a range of RGB monitors suitable for use with a wide range of micros, including the BBC Micro, the Electron, the IBM PC and the Spectrum. These are the Cub series, which are available with 12", 14" or 20" screens in standard, medium or high resolution. The 14" standard resolution set is well-engineered, and costs about £229 inclusive. The price includes full servicing backup, which is readily available as Microvitec are a British company.

The latest model is a medium resolution monitor, which has a new tube giving excellent contrast and reduced bother from reflections, while the high resolution monitor, with a .31mm slot pitch gives incredibly sharp pictures, and has a rock-steady image which makes it ideal for prolonged use with an 80 character display. The price of the medium resolution set is £344, while the high-res version costs £506. The Cub range comes with either a beige and brown high density structural foam case, or a metal one in the same colours, and a plinth is available as an optional extra.

Interpod

Interpod is a module that vastly expands the communications capability of both the Commodore VIC 20 and 64 computers. It allows the connection of up to 30 parallel IEEE devices and one RS232 device. Of the range of IEEE compatible peripherals those of most note include the 1541 disk drive (a serial device)

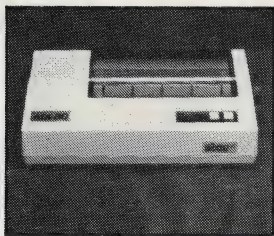
THE BUNCH



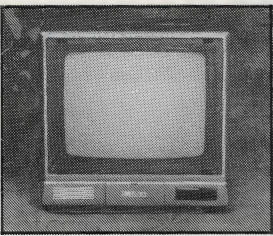
Microvitec Cub



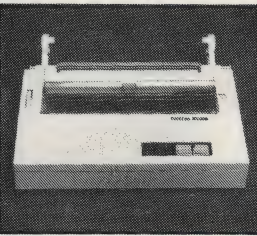
Interpod



Star STX-80



Fidelity CM14



Brother HR5

and, possibly of more interest to users envisaging a lot of disk access, the 8050 parallel disk drive. RS232 devices suitable for use with in Interpod include printers, such as the Brother HR5 and modems, assuming suitable control software.

Interpod is connected to the VIC20 or 64 via a multiway cable terminated in a DIN plug. When powered up the Interpod runs a self test routine that lasts for approximately 1.5 seconds after which, if all is well, a LED that flashes during the test will glow continuously.

The brief, yet instructive manual supplied with the Interpod provides full details on how to configure the device for various peripherals. For example to address an RS232 printer a command of the form OPEN 4,4:PRINT#4,"INTERPOD":CLOSE would be issued. This would send the message INTERPOD to the printer. To send a BASIC listing to the same device the command would be:

```
OPEN 4,4:CMD 4: LIST
PRINT#4: CLOSE 4
```

Interpod is a well made add-on for Commodore computers that should appeal to any user that wishes to extend the communications facilities of their machine.

Star Signs

The Star range of printers offer designs from a low cost thermal dot matrix model to professional printers offering high quality output and large print buffers.

The STX-80 printer is similar to the Brother HR5. It features a 60 CPS bi-directional print mechanism and outputs 80 characters per line. The standard of construction of the Star printer is slightly better than that of the Brother, the printer having a more solid feel to it. In most aspects though it is virtually the same as the HR5.

The Gemini 10X is a 120 CPS impact dot matrix printer with a 9 wire print head. The printer has a 816 character buffer with an option to increase this to either 4 or 8K. True descenders are produced on the printer's 9 x 9 matrix. The printer supports the usual emphasised and double strike modes of printing as well as bit

image graphics at a number of resolutions ranging from low to ultra high. The full ASCII character set is supported together with a number of special and graphics characters. In addition it is possible to download user-defined character sets. The Gemini 15X is the same as the 10X variant with the exception that the carriage is 15" as opposed to 10" wide.

Fidelity CM14

The Fidelity CM14 monitor comes from a company with considerable experience in the domestic TV market. The CM14 is well built and attractively styled. The unit provides both RGB and composite video inputs via a single SCART connector. The SCART socket may be unfamiliar to many of you but it is now the 'Euro standard' video connector and can be expected to appear on more and more equipment of European origin.

The well written manual supplied with the monitor details the connections for both forms of video input as well as giving a full run down of the SCART connector's pin designations. An unusual feature of the CM14 is the provision of a 2 watt audio amplifier, the input to this being by way of the same connector as the video information.

The 14" monitor has a video bandwidth of 12 MHz which produces an excellent display and is capable of the finest resolution when driven by an RGB signal. There are four user controls which provide control over the displays brilliance, contrast, colour balance and the volume level of the internal amplifier.

Ready assembled leads are available for the BBC/Electron, the Dragon, Oric, Commodore 64 and Atari machines and the SCART connector itself is also available for anyone wishing to prepare their own custom lead.

Brother HR5

The Brother HR5 is one of the smallest 'full feature' printers available on the market. The printer measure only 303 x 74 x 65 mm yet it supports 80 column printing and a full character set (96 ASCII characters plus 63 graphic blocks). The HR5 makes use of technology that is similar to those

employed in the company's highly successful EP22 and EP44 typewriters although in order to incorporate the sophistication of bi-directional printing some changes to the mechanics of the printer have been made.

An unusual characteristic of the low cost HR5 is that only an RS232 interface is supplied on the standard printer. By no means do all home micros support this serial interface and thus the HR5 will have a limited appeal at the lower end of the market, although as one moves up the price scale it is more common to find a serial interface as standard on microcomputers. An additional point to bear in mind is the connection lead that hooks the HR5 up to your computer.

The HR5 can either be operated from batteries (four UM-1s) or from an optional mains adaptor

providing a 6V DC output. When using batteries it is rather easy to forget to switch the printer off after a session at the computer and as there is no auto power off feature this can prove rather expensive (this is the voice of experience).

The HR5 can be used with plain paper in which case a ribbon cassette must be fitted or with special thermal paper.

Thermal paper, although more expensive, is to be preferred if the best quality results are to be obtained. When ordinary paper in order to produce legible printing it is necessary to select smooth paper with a gloss finish. Photocopy paper is ideal.

With thanks to Microfast and Pedro's Computer Services for supplying 'last minute' equipment.

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High recommendation indeed from Personal Computer News. Meanwhile Acorn User said:

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WM2

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Mugsy

A rather special gangland drama, where you play 'Mr Big' . . . or is it really Mike Gerrard?

Some time ago Melbourne House announced that their follow-up to the 'mega-successful' *Hobbit* would be an adventure based on the Sherlock Holmes stories. However, while we've all been waiting for that they've managed to put out *Mugsy*, which is so impressive that the mind boggles as to what the Sherlock Holmes one will be like.

Not that *Mugsy* is an adventure, it's a simulation game putting you in charge of a gang of hoods in the setting of the mobster era of 1920's Chicago. But to describe it just as a simulation is like saying that Al Capone was a little bit naughty at times. It's also an interactive comic strip, incorporating several sections of moving cartoon-style graphics with an arcade-type

question, and once you've decided that you might get an answer like, "Cripes, Boss, they could fight a war with the hardware that'll buy!"

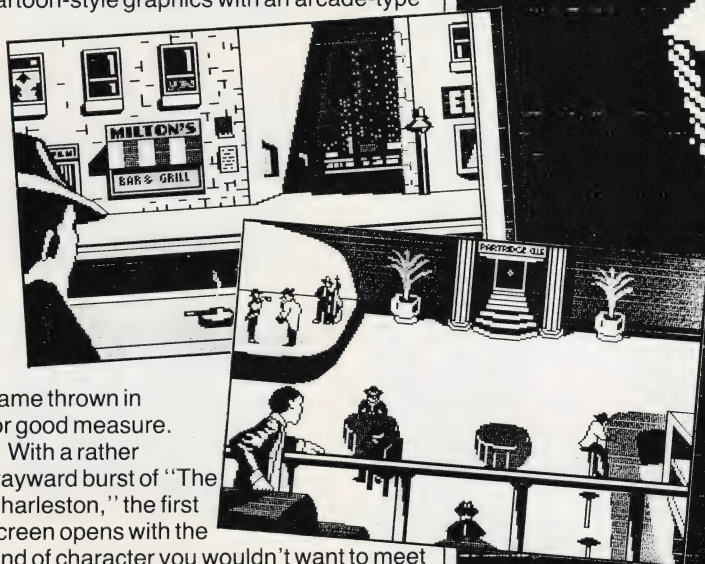
Then you choose how many of your customers to put the squeeze on, which costs you a grand a time. After that it's a case of setting aside the annual kickback to the cops, who are a pretty greedy bunch and prone to taking more dough than you've got in "da safe" if you don't grease their palms enough.

window with bullet holes.

You're told the results of your operations for the year, how much you squeezed out of your customers, how many hoods were killed, lost to other mobs, or recruited, what kind of cut the cops took of your ill-gotten gains, whether there were raids by other mobs, and so on. Then you go on to deal with another year, trying to build up your payroll and your mob into the toughest in town. If you're running a little low on dough then you can always turn to Nick the Greek who'll loan you anything you need at a very modest 99% interest. If you can't pay him back, though, out of your earnings, well . . . "What a Schmuck you are, Mugsy."

The arcade game comes if you've had a contract put out on you by some other mobster, and the hit-man comes in from Detroit to face you in a *Speakeasy*. You have to be quick on the keyboard to move up, down, left and right, and fire at the hit-man before he leaves you lying on the ground. A simple task, hardly arcade standard, but with such good graphics making it very tricky to do (tough guys to kill, these hit-men from Detroit).

The game does have some very nice touches, which you discover as you play. For instance, if you try to spend more than you've got in the safe then Louie will offer to



game thrown in for good measure.

With a rather wayward burst of "The Charleston," the first screen opens with the kind of character you wouldn't want to meet down a dark alley telling you, "Hi Boss, it's Louie your sidekick here wit' da lowdown on da mob . . ." You're then told what's been happening on your patch, and you begin each game with 40 hoods in your mob, 400 'customers' in need of a little of your special kind of protection and \$675,000 marked as "Dough in da safe."

You can use some of that dough to buy further customers from the Syndicate, or sell some back again. This is your first decision, once you're told the going rate for the poor saps. The new figure for "Dough in da safe" is given, with all the prompts and responses going in speech bubbles in the cartoon illustration that fills each screen. "How many grand are ya gonna give the boys for artillery and ammo?" is the next

At the end of all these decisions you're told that a year goes by, and you're shown a cartoon highlight . . . or, to quote the cassette, "a visual micro-movie of the highlight of the year." Having played the game several times, there only appear to be two of these, but they are both graphically very impressive. In one you're looking through a window onto a street scene, in which a girl wiggles by and a guy who was leaning against the wall reading a newspaper follows her. Then a car drives across the screen, stops and splatters your

keep quiet about your 'stoopidity' for a grand. While *Mugsy* sets new standards for graphics, just as *The Hobbit* set for adventures, we do have our reservations about its long-lasting appeal because it is, at heart, a much scaled-down version of the kind of simulations that CGS put out. You can't expect a good simulation and this standard of graphics on a home micro (yet), but even if the game proves not to keep you entertained for as long as *The Hobbit* did, for just £6.95 it's worth buying . . . and dat's da tooth, sweethearts.



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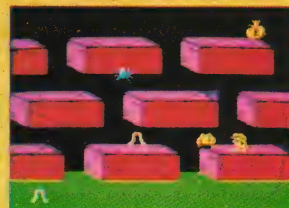
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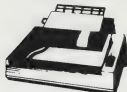
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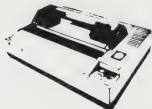
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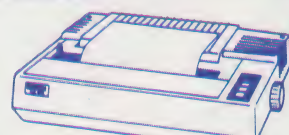
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SOFT RELEASE

Lupin

Computer: Vic 20 with 8K expansion

Price: £5.50

Supplier: Enigma software, 208 Aigburth Road, Liverpool L17 9PE

With a title like Lupin, this game should really have been about deranged highwaymen marching about the countryside demanding 'your lupins or your life', but fans of Monty Python should take note that in this game there isn't a lupin of the flowering variety in sight.

Instead you take on the role of a character called Lupin, who has to enter the castle of the evil Count Von Vic and rescue some treasures that are being kept in there. As well as the treasures you are also in search of your girlfriend, who was kidnapped along with her jewellery by the wicked count and deposited in the castle.

This girlfriend looks like she's worth finding, since she had a lot of jewellery on her when she was kidnapped, so she's obviously worth a bob or two.

The imaginative graphics of the game display the section of the castle that the action takes place in. You start at the bottom of the screen in your trusty getaway van, while at the top of the screen are five gold bars. Between you and the bars are a number of maze-like corridors protected by guard dogs, robots and patrol cars. Collecting all five bars takes you on to level two, to find that there are now five dollar bills to be collected. If you manage to get through this level and the next three you'll finally get to meet your long lost girlfriend.

However, although the guards, robots and cars are fairly easy to avoid on the first screen, their numbers increase as you go through the levels. Not always

sensibly though, since we once had one and a half patrol cars chasing after us. Colliding with a dog or a car loses one of your lives, while colliding with a robot restores any treasures you might have collected and taken back to your van back up to the top of the screen again.

A frustrating game that would probably take a long while to master, Lupin suffers from a couple of bugs (the aforementioned patrol cars, occasionally losing a life for no apparent reason) and has a musical soundtrack that has you lost in admiration for a short while, and then rapidly turning the volume down as your irritation with it reaches new heights. Overall, it's worth investigating.



The Lords of Midnight

Computer: 48K Spectrum

Price: £9.95

Supplier: Beyond Software, Competition House, Farndon road, Market Harborough, Leics LE16 9NR

After many teasing adverts in the computer press, *The Lords of Midnight* has at last arrived, complete with keyboard overlay and 32-page glossy booklet explaining this complex adventure/strategy/epic game. Handsome packaging doesn't always mean handsome software, but in this case there are no worries as *The Lords of Midnight* more than lives up to expectations.

You are in control of no less than



four characters who are travelling through the Land of Midnight, a map of which appears both on the back of the box and the back of the instruction book. You'll need the maps as the program contains some 32,000 possible graphics scenes for the various locations. You look through the eyes of each character, and a single key-press will turn you quickly round the eight compass points for the eight different viewpoints, and another press switch you instantly to any of the other three characters.

The people you are controlling are Luxor the Moonprince, his son Morkin, Rorthron the Wise and Corleth the Fey, though not too Fey we hope, as he has to help the others contend with the evil Doomdark, whose armies are trying to take over the Land of Midnight. All four start at the Tower of the Moon, though facing different directions, and if you get three of them to move to the same place you can see them on horseback through the eyes of the fourth character. The graphics are static and done in the fairly simple style of *Valhalla*, but are effectively atmospheric.

At each location, in addition to seeing all the viewpoints, you can

elect to THINK, which will tell you a little more about your situation, or CHOOSE, which will invite you to select from several options, usually including SEEK, which may uncover some hidden goodies or men, whom you must recruit if you are to stand any chance of facing up to Doomdark's armies, which move by night.

Eventually you could be controlling several characters, but most care must be taken over Luxor and Morkin, as their survival is essential.

There are two different ways to play the game, either emphasising the strategy element by sending armies north to battle Doomdark and his foul hordes, or emphasising the adventure element by sending Morkin to seek the Tower of Doom and destroy the Ice Crown, which gives Doomdark his power.

Whichever way you play it, you're sure to need the SAVE feature (or the COPY feature for a print-out) as the game will keep you hooked long beyond several midnights, guaranteed.



RULE OF THUMB

Each review carries our exclusive "Rule of Thumb" to give you an instant guide to how we rate it. Our chart shows 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 program's value.



Avoid at all costs.

Eagle

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

This game is essentially a sophisticated lunar lander, with a few quirks thrown in to make the game playable.

Unfortunately it doesn't altogether succeed, as the easy parts of the game are very easy and the hard parts are too difficult.

The game consists of five distinct stages. In the first you simply have to reach the bottom of the screen without hitting any of the numerous meteors. This isn't too difficult but you get bonus points if you manage to pick up any of four 'pods'. These pods are placed on the screen in every level accompanied by loud sound effects, but their graphic representation is merely a dot. They are worth 500 points each, and collecting them is the real object of the game.

To aid you in your task you are equipped with the customary shields which can take a limited number of batterings. You can also manually turn your shields on, making you impervious to all things. Only trouble is that the energy drain is (characteristically) gigantic and you can't get away with this for too long.

The next part of the game is also fairly undemanding. The obstacles here are cave walls, but a low-scoring transit is simple. Which brings us to the third level. Here the obstacles are randomly generated and removed laser beams. One-pixel-thick red lines to the rest of us. The only sure



method of survival (unless you are incredibly quick-fingered) is to turn your shields on, but this invariably kills you as soon as you've finished. Getting through this stage is extraordinarily tricky.

To get the most from this game you will need to be a real lunar lander freak — others might find it less than inspiring. But if you *do* enjoy this sort of game, *Eagle* is one of the better examples. The

graphics and sound are both up to scratch, and keyboard response is sufficiently sensitive to leave the clumsy player no excuses.

This game was reviewed under the wrong name (and another put in its place) in our May issue — our apologies to Salamander Software.



Chariot Race

Computer: Unexpanded Vic 20
Price: £6.95
Supplier: Micro-Antics,
 Littlehome, Hawthorne Lane,
 Codsall, Wolverhampton

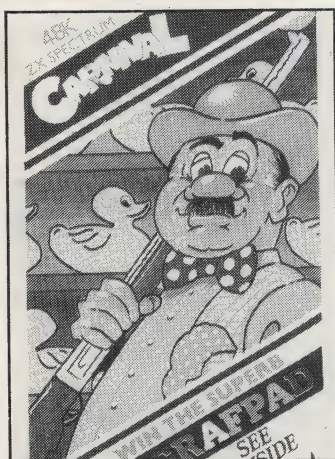
'Exceptional Software' boasts the cover for this little gem, and if everything Micro-Antics release in the future comes up to the standard of this game, Vic owners are in for a happy time.

We're taken back in time to the days of ancient Rome, when they had nothing better to do than hold chariot races in massive amphitheatres. In this one or two player game your task is to control your chariot around the race track, trying to dodge opponents or push them into the buttresses surrounding the course. There are twenty laps to complete before you can complete the course, if you manage to survive that long, and on each lap a certain minimum speed must be maintained. Of course, the more laps you manage to complete, the higher this minimum speed becomes. If you go too slowly the crowd start getting a little restless and begin to hurl fireballs onto the track. Hitting one of these is understandably fatal, so you have to travel as fast as you can.

With loving attention to detail, the screen depicts the track as a continuous straight line: well, you can't have everything. The stars of the game are the chariots and their horses, which can be seen to be galloping as you race along. On either side of the screen is shown the 'pushing power' for your team of horses. This determines how easy it is for you to push opponents onto the walls, or conversely how easy it is for them to do the same to you. Other ways of losing a life are by crashing into a fireball, or by running into the back of an opponent in front of you. Eight paces of this, and another race is lost (we told you it was a toughie!).

We found that the only way to get any appreciable distance into this game was to try and avoid causing any harm to your fellow charioteers. If too many of them meet a sticky end against the walls of the arena they start to get a little bit mean, and barge into you from all sides. However, if you treat them with respect and just charge along at a reasonable speed you can manage to get through quite a few laps before they turn on the heat and begin to push you inexorably against the walls.

This is one of those rare breed of games that is very hard to tear yourself away from and write a review about. If every Vic game was as good as this, no work would ever get done at *Which Micro*. Go and buy, beg or borrow a copy now.



Carnival

Computer 48K Spectrum
Price: £5.95
Supplier: Eclipse Software, 4
 Oxford Road, London N9 0NA

Carnival is being launched with the chance for you to win a Grafpad for your Spectrum, not by being an ace shot in this shooting

gallery game but by answering four fairly simple questions that appear on the screen... and no, you don't have to wade through 87 different levels of the game before you get to them. In fact if anyone did wade through that many levels they would deserve a free Grafpad and a medal for endurance, for although the game is very well done, it has to be said that it soon becomes rather tedious because of the lack of variety.

You can use an Interface 2, Fuller or Kempston joystick, although keyboard is perfectly adequate as you're only moving left, right and firing.

You're controlling a gun at bottom of screen, firing up at three rows of moving targets coming down the screen from top left in conveyor belt fashion till they disappear at bottom right. You can elect to have the background music on or, preferably, off as it is a painfully out-of-tune version of "Somewhere, My Love."

Among those moving targets

are several ducks, and when these reach the bottom row they may dive down and quack away ten of your bullets, which lie at the bottom of the screen. Shooting the ducks is obviously tactic number one. There are also boxes of bonus bullets, if you can hit them, and a further bonus if you can hit the letters B, O, N, U and S in that order.

Behind the targets is a circle of moving pipes, more bonuses, and if you clear a screen you get the chance to fire at a bonus bear which prances along, changing direction each time you hit it.

While the graphics are good and there are six levels of play, the game is very repetitive as it merely continues, screen after screen after screen. The same might be said of *Space Invaders*, of course, but this is far from being in that league and we weren't too disappointed when we felt our judging of the *Carnival* was over.



Perseus and Andromeda

Computer: 48K Spectrum
Price: £9.95
Supplier: Digital Fantasia, 24 Norbreck Road, Blackpool, Lancs FT5 1RP

The series known as the Mysterious Adventures has been around for a while, but now new versions with high-res graphics have been released, not only for the Spectrum but the Oric-1, Atmos, Commodore 64, with versions for other machines to follow. The standard price of £9.95 might be fine for other machines, but is rather on the high side for a pice of Spectrum software.

What you get for your money is an adventure set in the days of the Greek Gods, when people with unpronounceable names tended to do unspeakable things to each other. You are Perseus and are instructed to rescue one Andromeda from the clutches of Medusa, the Gorgon, whose party trick was the ability to turn men to stone with a single glance. Any

resemblance to Prime Ministers is purely coincidental.

The graphics are simple but effective, and one neat trick is the way you switch from graphics mode to text mode simply by pressing ENTER. Once the first drawing has been made, you can flip from one mode to the other, and stay in that mode as you move around. Unfortunately the program could do with a few more neat tricks, as it is one of those where not all possible inputs have been catered for, which is always irritating. In the temple you find an ivory pedestal, so WHAT NOW? CLIMB PEDESTAL, perhaps? The program doesn't recognise the word 'pedestal.' CLIMB IVORY PEDESTAL? No good. GO IVORY PEDESTAL? That's what you must do, and similar restrictions apply in other locations.

The text, too, is of the most basic kind, such as "I'm in a Royal Chamber." No pages full of glowing prose here, but nevertheless this series of adventures has proved to be very popular over the years so perhaps

players don't mind that too much. The tasks start off in a fairly straightforward manner — a thirsty beggar, a leather sack, a pool of water: not too difficult to sort that one out, but they do get trickier as you progress, thank goodness. The author has a few

cunning moves up his sleeves to tax your ingenuity, but there are many tougher adventures around. For us, then, not a Greek hit, more a Greek myth.



Mr Mephisto

Computer: Commodore 64
Price: £6.95
Supplier: Euro-Byte Ltd., Churchmill House, Ockford Road, Godalming, Surrey GU7 1QY

Thank heavens for fast-loading tape systems, as Mr Mephisto leaps into action in the shortest of loading times.

You take on the role of Hugo Twol (that has to be an anagram for something), whose mission it is to explore the strange house of Mr Mephisto. Old Mephisto is no fool, because to guard him and his house are an evil bunch of aliens, all of whom have to be avoided at all costs. Most of them bear pointed tails and pointed ears as well, which should give you some hint to their origin.

From here on in this is not a startlingly original game, but what there is is well done. As Hugo, you have to roam around collecting whatever you can lay your hands on, and it is only after collecting various goodies that you can exit from one level and progress onto

the next. At the fastest speed on the highest skill level this is well-nigh impossible, but luckily there are four speeds and three skill levels to choose from.

Your chief hazard, apart from the aliens, is the moving stairways that abound all over the house. Falling off a stairway is sadly fatal, and since they do keep on the move all the time that's what you've got to do as well. No respite, as the aliens keep marching determinedly around, some possessed with the ability to vanish through walls and floors, an ability you unfortunately do not possess.

A nicely presented opening demonstration allows you to see the levels that it will take many hours of play to get to, and for those who can't understand the cryptic clues given on the inlay card, a help sheet is available from the suppliers.

Another in the genre of arcade/adventure then, owing much more to arcades than adventures. Nice one.



Touchstone

Computer: Dragon
Price: £8
Supplier: Microdeal, 41 Truro Road, St Austell, Cornwall

With several of their more successful games, Microdeal could be accused of merely copying favourites from arcade or other micros, like the Spectrum, but which Dragon owner would ever complain about being given the opportunity to play what are usually excellent implementations of the best games around. Touchstone, for instance, is a Tutankhamun variation, the first we've seen for the Dragon, and almost as smooth and fast-moving as some of the Spectrum versions — a credit to the programmer.

Touchstone is a game for one or two players, joysticks only, and in

it you must make your way through a series of mazes comprising underground treasure chambers in your search for the Touchstone itself. The exact size of the whole maze is difficult to explain simply, but there are eleven different levels, each level having four distinct mazes, with each maze being up to about six screens in length — the mazes only scroll left to right.

On each level there are doors to pass through to reach the next level, ranging from one door at the start to five doors on the final level to take you to the Touchstone. Keys and locks are all identical, which simplifies things, but what complicates matters is that the keys aren't scattered one per chamber, and you can only carry one at a time. Having escaped one chamber by the skin of your teeth, you frequently have to go straight back in to collect the key to take you out of the following chamber.

Another sadistic touch is that your little man can only fire his gun left and right, which means that getting trapped by monsters in a vertical corridor is not a good idea, and a lot of tricky running and manoeuvring has to be done to avoid that. To help you there are Zoom Chambers, which pass you from one part of the maze to another, and the monsters appear from the strangely named Poof Chambers, which we hope refer to the celebrated Magic Dragon and nothing else.

All in all an excellent game, well up to Microdeal's highest standards.



Ten Little Indians

Computer: 48K Spectrum
Price: £9.95
Supplier: Digital Fantasia, 24 Norbeck Road, Norbreck, Blackpool, Lancs FY5 1RP

And then there were ten in the Mysterious Adventure series, all by the prolific Brian Howarth, and this latest title is now complete with graphics and re-released alongside all the earlier ones. The Agatha Christie title, temporarily borrowed, lets you know that you are in private detective territory with this adventure, which begins with you in a railway carriage on the way to visit the old Mansion of Major Johnston-Smythe. In order to fox his family the Major converted all his treasure into gold, which he then turned into a figurine, and since his death this has never been found. There are ten other figurines, all worthless, hidden around the Mansion, but all these have to be found to enable you to locate the Golden one.

Ignoring the temptation to look at the 'Help' sheet provided, we spent a good half-hour in the opening location examining everything in sight, and some things that weren't, before we realised what you were meant to do. Like most things, it's easy when you know how, but even then the author tries to trick you as you've only temporarily solved the first problem and have to work at it some more.

He has solved the problem of graphics, which can be irritating if you wait for them to be drawn each time, by allowing you to skip from a text-only description to a picture, and back again, by a single press of the ENTER key. The text is of the briefest kind, and if you've tried one of these adventures before then you'll know what to expect.

Every object has a purpose, and you tend to be confronted with one task at a time. Where the problem in most adventures is which objects to carry, and tasks are solved simply because you happen to have the right thing, here you have to figure out how the one or two objects you do have must be used to get round the obstacle facing you.

The response of the program is quick, but is far from comprehensive, with many perfectly ordinary words not understood. Perhaps the graphics have put an undue restriction on the memory available, though as an adventure this one does seem tougher than some from the same series. It's far from the standard of 'The Hobbit,' though not too far from its price, but as it seems to keep most adventurers going for some considerable time perhaps it does offer value for money at that.



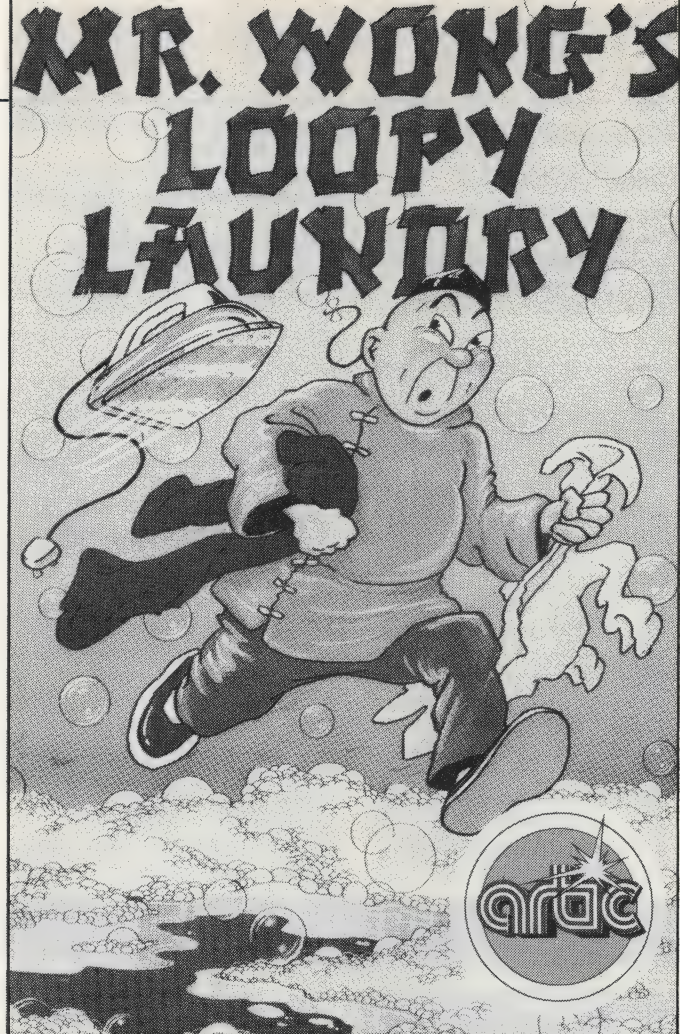
Mr Wong's Loopy Laundry

Computer: 16/48K Spectrum
Price: £6.95
Supplier: Artic Computing, Main Street, Brandesburton, Driffield YO25 8RL

As well as their very popular series of adventures, Artic have published a range of arcade-style games, though these do tend to vary a great deal in quality. To their credit, they do include quite a lot of material for 16K machines amongst them.

Mr Wong's Loopy Laundry is basically a version of *Space Panic*, with Meanies replaced by bags of laundry with evil intent, not to mention murderous soap suds and an angry iron. Mr Wong starts each game at top left, and scattered around the screen are various items of laundry. He must run along the four levels and the interconnecting ladders, collecting one piece at a time to take to the laundry chute at top right. The laundry then tumbles down the chute into the bath beneath, and Mr Wong must go off and collect the next pair of pants or whatever.

The iron, the bag and the suds are chasing him round the screen, but in his defence he has five pieces of starch with which he can freeze these deadly enemies, allowing him to walk through them when in a tight corner. Once all the starch is used up, though, it's quite a while before he's allowed to replenish his supply, and only one piece of starch is effective at a time. He also has five lives, and once a screen has been cleared of laundry he moves onto another one with a different, more difficult network of ladders.



The game can be played with an Interface 2 connected, or a Kempston joystick, though in fact we got better scores just using the keyboard: Q and A for up and down, and O and P for left and right, with any key on the bottom row to unleash your starch. It's for one player only, with a high score record and bonuses for clearing the screen in double-quick time.

Control of the character is good, and while the graphics are simple they're effective enough for a 16K game. If you have a version of *Space Panic* then this isn't for you, and while it isn't a stunningly original game there's nothing much wrong with it, either.



Pooyan

Computer: Commodore 64
Price: POA
Supplier: Datasoft Incorporated

You've seen it in the arcades, now play it in the homes. Konami's Pooyan has appeared in another guise before now: the game called *Swagman*, from Paramount Software. But this purports to be the original game, and the story line certainly owes more to the arcade version than Paramounts description of kangaroos and evil swagmen.

For those of you who by now haven't got the faintest idea of what we're on about, a few words of explanation. Pooyan is an interesting idea for a game. You take on the role of a pig who has to protect her piglets from the marauding wolves who descend from the skies clutching helium filled balloons.

You are sitting in a basket on the right hand side of

the screen, and using a clever Heath Robinson-ish assortment of wheels and pulleys can manoeuvre yourself up and down the screen.

The wolves, evil coves that they are, are throwing acorns at you, and if one of them manages to hit you, another life bites the dust. You can, however, deflect them off the top or the bottom of the basket. In your defence you can either attempt to shoot the wolves or their balloons with your endless supply of arrows, or if you're lucky you can grab some meat which occasionally appears at the top of the screen and throw it at them. Being greedy wolves they all let go of their balloons in an attempt to grab the meat. This, of course, causes them to fall to their doom.

Once you've managed to kill some thirty odd wolves the action switches to another scene. You're still sitting in your basket travelling up and down the screen, but now the wolves appear at the bottom of the screen and start flying

upwards in an attempt to reach the top. At the top there is a cliff with a large boulder sitting on it, and if seven wolves make it to the top they push it down at you, causing you to lose yet another life.

This is more difficult than the first level, as some of the wolves' balloons contain other balloons inside them, and thus have to be shot several times before the wolf topples to the ground. There's supposed to be a bonus screen after scene two, but we never managed to survive that long.

With the addition of an annoying, continuously playing soundtrack, this doesn't really compare to Paramount's program mentioned earlier, either musically or graphically. It may have a story line close to the original game, but in this particular case you'd be better off sticking to the kangaroos and swagmen of Paramount's game.



Jack and the Beanstalk

Computer: Spectrum 48K

Price: £5.95

Supplier: Thor Computer Software, Erskine Ind. Est., Liverpool L6 1AP

In the eternal quest to find something new to write a game about, companies are turning increasingly to the old classics, and it now comes as no surprise to find a computer game based on the old fairy tale of Jack and the Beanstalk.

You know the one, Jack goes off to sell the family cow (the Good Life had its problems even then), but when he returns from market all he has with him is a handful of magic beans. His mother is understandably none too happy about this, since she was expecting some money rather than a collection of mouldy beans. So she throws them out into the garden in disgust. Only to find, that next morning... a 48K Spectrum with a magical display of graphics has appeared in their place.

The idea behind the game is quite simple. As Jack, you have to collect various objects and ascend the beanstalk until you reach the giant's house at the top of it. Once

there, before the giant wakes up and gets you, you must acquire anything vaguely useful that you can see and make off with it back home again.

The graphics are reasonably good, although Jack looks a bit like a refugee from Psst! On screen one there is a hammer sitting temptingly over on the right of the screen, but between you and it there runs a spider. One collision is disaster, and so possessing a magic skill known only to Thor you have to guide your character through mid-air.

Climbing up the beanstalk is no easy task, since the slightest slip-up sends you sailing back down to earth again with a distinctive bump as you lose another life.

At the higher reaches of the beanstalk, a collection of birds flutter about getting in the way, and a brush with them will sometimes (though not always) send you careering downwards again.

Kempston joystick and Currah microspeech compatible, this is a reasonable, if not brilliant, game. To anyone whose fingers are not amazingly agile, you're in for a Grimm time with this.



Killer Watt

Computer: Commodore 64

Price: £7.95

Supplier: Alligata Software, 178 West Street, Sheffield S1 4ET

Most of the names given to games bear no resemblance to the actual content of the game, and Killer Watt falls neatly in line with this concept. There are a few light bulbs to shoot at, but apart from that this game has as much in common with electricity as Wigan Athletic has with Liverpool.

You start off in charge of your trusty spacecraft deep underground in a cavernous collection of corridors and tunnels, populated by an intriguing set of monsters. Light bulbs, as we've already seen, are in there somewhere, and also much in evidence are flying men and flying fish, along with some mechanical birds who are capable of laying some devastating eggs.

The response to the joystick (you can use the keyboard if you want to) is suitably fast, and in some cases is a little too fast, but you get used to it in time. Much delicate tapping is required for the first few games.

You have five skill levels to choose from, and you can also vary the power of your force shields, which determines how many times you can bump into things.

The idea of the game is to explore this collection of tunnels

and corridors, and in superb single-pixel movement that is amazingly smooth, you set off in search of light bulbs, fish and flying men, and the quest for ever more points and the way out.

You have to be very careful on the joystick, and it takes some time to get anywhere near the exit. Annoyingly, if you lose a life near the end it's back to the beginning again, and it is extremely galling to watch all that scenery that you've so carefully negotiated your way past disappearing off the screen at frightening speed as you get deposited back at square one again.

Getting out at the end is something that we've never managed to do. Once you reach the exit and manage to manoeuvre around the last few obstacles (a very tight fit) you're told to fire at will. This we took to mean as firing like a lunatic at the doors to the exit, but this achieved precisely nothing.

There is also a character called Will in there somewhere, but firing at him didn't seem to do much good either. Since there's a bonus of 5000 points for getting out of the exit, can someone tell us how it's done?!

Apart from that, this is an excellent game that's well worth the money. It deserves a place on every cassette shelf.



Buzzard Bait

Computer: Dragon

Price: £9.95

Supplier: Tom Mix Software Ltd, 41 Truro Road, St Austell, Cornwall

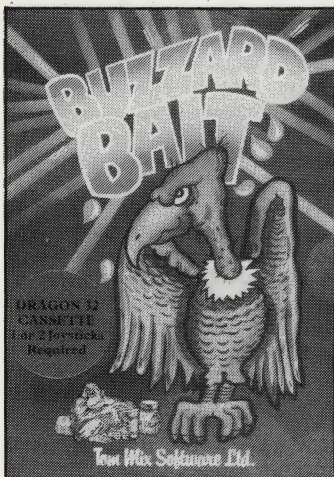
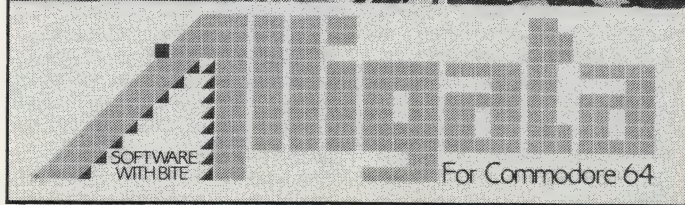
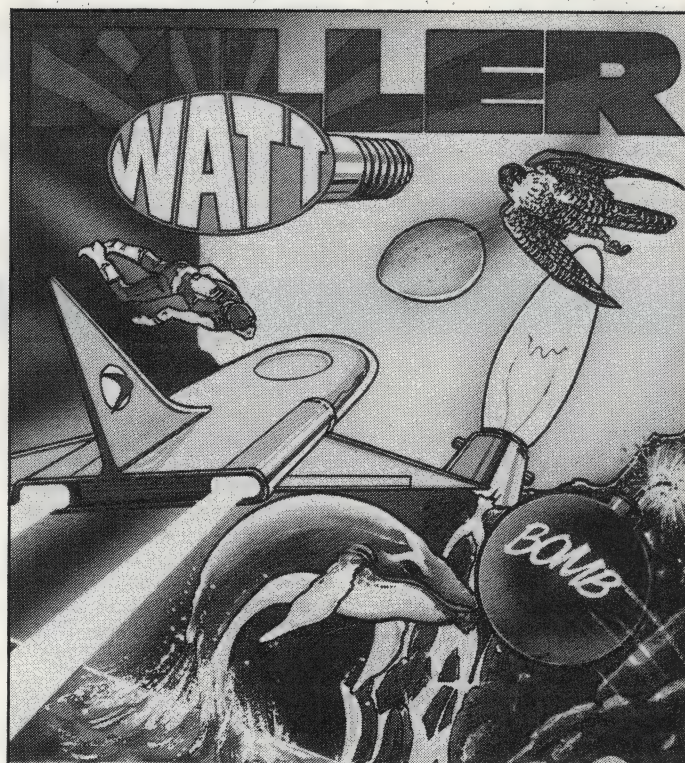
There is no doubt at all that people will want to play *Buzzard Bait* as it is by far one of the best Dragon games we've seen. Based on the arcade *Joust*, you can have one- or two-player games with the usual choice of three background colour screens: black, buff and green. A joystick is essential, and with it you control your flapping bird, complete with lance, in an attempt to joust against and defeat the other birds on the screen. You have to come down on the enemy birds from above to defeat them,

and if you do so they drop an egg which bounces around a while before finally settling. You gain points for getting to the egg, which hatches into a little man, but should you be unable to reach it in time the man will be transformed back into another jousting bird.

Buzzard Bait will test anyone's dexterity with the joystick, as you flap your wings by a continual pressing of the fire-button and you need very fine control indeed to be moving left and right, avoiding the enemy and at the same time trying to manoeuvre yourself above them, then descend on them. If you want to study the excellent graphics in detail then the 'P' key, as well as Pausing the game, can be continually pressed to advance the action a frame at a time.

There are continually changing waves to challenge you, easier ones with land across the bottom of the screen, harder ones where much of this is changed to flames meaning you have to keep flying, and we have succeeded so far in getting to Wave II, past the various egg waves, survival waves, and even the "unbeatable?" pterodactyl.

The two-player game has you both on the screen at the same time, is even greater fun than the one-player game, and if a better Dragon game appears this year then we'd like to see it.



Mystery of Munroe Manor

Computer: Commodore 64
Price: £8.50
Supplier: Severn Software, 15 High Street, Lydney, Gloucestershire GL15 5DP

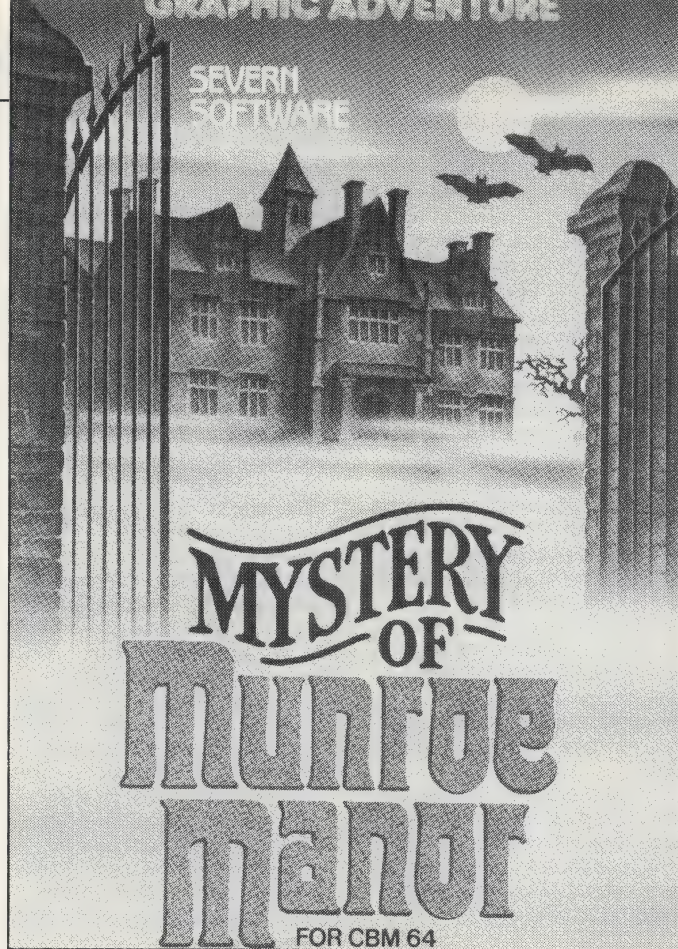
When you see a cassette that looks as if it contains enough tape to wrap around a football pitch, the obvious thing to do is set the program loading and go and make a cup of tea, do a spot of gardening, and half an hour later come back to see if the program has loaded.

Don't do that with this offering from Severn Software. Before the main program is loaded there is one of the best introductions to a game that we've ever seen in terms of graphical displays and atmospheric sound effects. And all done, not in high-resolution mode, but just using the graphics that you're given.

The story so far. Old man Barstow, master of Munroe Manor, was a bit of an eccentric who liked to travel around the world collecting various artifacts, usually valuable ones.

Then one day, after returning from yet another hop around the globe, he mysteriously rushes away from the waiting reporters on the dock side and retreats to his manor to become even more eccentric than usual, and something of a recluse. Few stories are heard of him, but then it is rumoured that he's disappeared, leaving all that lovely treasure lying around the manor. This is where you come in.

The introduction continues to show the gates to the manor, complete with a shadowy figure standing in one of the windows. As he walks off to the accompaniment of some moody Vincent Price organ playing, a door creaks open.



In you walk, only to have the door slammed shut behind you. The baying of hounds in the distance serves only to remind you of the rumours of ghosts and hidden traps in the manor. Now read on.

Twelve minutes pass, and the main program is loaded and running. This graphical adventure starts you off in the entrance hall of the old manor, complete with a mirror and a door. Looking in the mirror produces an eerie response, and walking around you soon find a number of other interesting locations. Since we're not in high-res graphics mode the pictures appear virtually instantaneously, and for once they

actually tell you something about the room that you're in. The text might not mention the drawers of the desk in the old study, but you can see them in the picture. They can be opened, and there's a couple of interesting things inside.

Your first problem will be getting up the old stairs, which have rotted away and left a large gap in them. Beyond that the problems come thick and fast, and with around seventy locations to explore, this should occupy you for a while. One of the more interesting graphical adventures for the 64.



Ad Astra

Computer: 48K Spectrum
Price: £5.95
Supplier: Gargoyle Games, 4 North Western Arcade Birmingham B2 5LH

Ad Astra, as we all should know, is the Latin way of saying 'to the stars', so you can hazard a reasonable guess about the contents of this game. Yes indeed, it's off to the depths of outer space to do battle with whatever meanies come along.

Following in the footsteps of games from other, better known, companies, Gargoyle Games give you an enormous number of options before you can start playing the game. One or two players, keyboard or joystick, hundreds of different combinations of keys to move your spaceship around the screen, and

all this before we've even fired a single phaser.

You have been sent to guard the shipping lanes between the far-flung Way stations that mark the boundaries of Terran (that's us) colonial space. You have to stay alive for as long as possible, and destroy as many enemy craft as you can, as well as trying to remember the current security codes which guarantee the safe passage of each Way station's defences.

Now, we're sure that this is really an excellent game, but our progress through the game was noticeable strictly by its lack of happening. At the start of each game some excellently designed space debris comes hurtling along towards you, and your ship has to bob and weave all over the screen to avoid it. After four or five asteroids have sailed harmlessly past into the wild blue yonder, on

come the enemy craft. According to the cassette inlay card there is at least five different types of enemy, but we never managed to stick around long enough to see more than a couple of them.

The reason is that although the enemy craft move extremely quickly, and you must move at a corresponding rate to get out of their way while still remembering to fire at them, their missiles move alarmingly slowly and are hard to pick up against a stellar background that looks remarkably like a lot of enemy missiles. Thus we found it very easy to crash into something that we didn't even know was there. A very well produced explosion announces your fate, but it would have been nice to have survived just a little bit longer.



Red Meanies

Computer: Dragon
Price: £7.95
Supplier: Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA

If we say this is a version of *Pac-Man* don't yawn and turn to the next review as it's actually a good game with a difference — Salamander has dumped you at ground level on the famous maze and has you running round trying to keep out of the way of the pursuing ghosts... sorry, the pursuing red meanies, which just happen to bear a slight resemblance to those well-known shapes. In addition to red meanies there are blue loonies, red cheeses and green cheeses in this multi-coloured game, though it's not one to play if you only have a black and white TV as the benign blue loonies are indistinguishable from the malignant red meanies in monochrome.

The story is that there are five red meanies in the maze with you, along with 63 red cheese and five green ones, which sound distinctly unappetising but they do have the startling effect, when you eat one,

Black Hawk

Computer: Commodore 64
Price: £5.95
Supplier: Creative Sparks, Thomson House, 29 Farnborough Road, Farnborough, Hampshire GU14 7NU

It's amazing the number of games that have you piloting 'the deadliest craft yet created', and Black Hawk is no exception. Black Hawk is the name of the craft that you are to fly your mission in, and that mission is to seek out and destroy the enemy airfields and missile launching sites. This is none too easy, since they're not too fussed about your presence either, and a continuous barrage of missiles, tanks, fighter planes and other assorted enemy are out to get you before you can get them.

As with all Creative Sparks games, the accompanying documentation is very good, and it certainly gives you something to read while waiting for the tape to load. Your ultimate objective is to destroy everything, culminating in the enemy runway which is to be found at the end of level 8. Since this involves completing seven previous missions successfully, the *Which Micro* enemy runway is still standing firm.

Choosing between a beginner screen or the standard one, the action soon gets under way. There are two main displays, which are swapped in and out depending on whether you're on the attack or the defence. When attacking, your



of turning meanies into loonies and enabling you to chase them for a while. Trying to eat red meanies is not recommended — not so much indigestion as loss of life, and you only have three.

When the game starts the screen shows you the number of red and green cheeses in the top left corner, lives remaining at top right, score, high score, and number and colour of the other creatures sharing your maze. The number of cheeses reduces as you chomp your way down those

mean corridors, and a 'beep' sounds to warn you if another creature is near — don't tangle with a meanie, just run, as there's nothing more dispiriting than getting down to just three or four more cheeses which you're frantically searching for, only to bump into a meanie and have to start all over again with a full maze.

The graphics are kept simple but this does help keep the game moving, and it does move at a brisk pace, response to the control keys being instant. There's no joystick option, and the keys used are the F for forward, the comma to turn left through 90° and the full stop to turn right. You can keep the F key depressed for continual movement. The game does get a little repetitive after a while, but then what arcade game doesn't? If you clear one screen you start all over again, but it's fun while it lasts, especially as the meanies do have that nasty habit of trying to turn you into a sandwich between two of them. You, by the way, are an Intergalactic Cheese-snuffler.



craft cannot be seen, although an indicator at the bottom of the screen shows its vertical position. This tells you where a guided missile will be launched from, and by moving the joystick around you can position your sights wherever you want them to be.

Releasing the fire button then causes a missile to home in on whatever hapless enemy you're after.

Defence mode comes in whenever one of the enemy manages to make it past your missile sights in attack mode. This is a more conventional 'space battle' type scenario, and simply involves moving left and right and trying to hit anything that moves. Both these modes come complete with some superb graphics that rival anything else currently on the market.

Depending on how well you do on your current mission in both modes, you may or may not be rewarded with some additional weaponry to help you out in later missions. It'll take you quite some time to sort out the best tactics for both defence and attack in order to achieve the highest possible ratings.

If you manage to complete all eight levels, you'll be a true super hero. Be warned: it isn't easy.

Another game that should sell well, and deserves to be bought in vast quantities. Great use of all the features of the 64, and it's good to see games of this quality appearing for the machine.



Sabre Wulf

Computer: 48K Spectrum

Price: £9.95

Supplier: Ultimate Play the Game, The Green, Ashby de la Zouch, Leicestershire LE6 5JU

Any new Ultimate product is eagerly awaited, although it is a little worrying to see it arrive with the disclaimer that due to the 'enormous complexity' of this arcade adventure 'it is almost impossible to guarantee continuous error free operation,' which is akin to *Which Micro* saying that due to the enormous complexity of putting together a monthly magazine, this issue may fall apart in your hands (*would we say that — Ed*).

But despite that warning, we had no problems, and the news is that with *Sabre Wulf* Ultimate's reputation for producing the best Spectrum software remains intact. The setting is a network of jungle paths, a vast and complicated network, and you must move your Sabre Man through these in search of four parts of a map — at least we think it's a map, as we only discovered this aspect of the game through accidentally stumbling across a map of some

kind after playing for a while. Ultimate might be great on graphics, but a few instructions wouldn't go amiss either for a game of this nature.

Sabre Man is armed with, believe it or not, a sabre, and this is effective against many of the jungle perils such as spiders, bats, parrots or scorpions. There are far too many to list in full, but graphically the game is as good as, if not better than, anything Ultimate have done before. Your man comes to grief, however, if he tries to skewer any of the larger animals, and a head-on encounter with a rhino, for instance, parts him from one of his five lives, as well it might. The natives are restless too, and these have to be avoided by running along the passages, though some help is available from the variously-coloured orchids that grow along the pathways, if you can pass through one when it's in full bloom.

The Blue Super High Energy Orchids, for example, enable you to pass through even a rhino with no ill-effect, although on the other hand there are the Purple De-Orientation Orchids, which reverse all the movement controls for a while. These controls are either keyboard, Kempston, Interface II or any Cursor Controlled Interface.

As usual, the graphics are so good that they're funny in places, like a cartoon, particularly where Sabre Man comes off second-best in any encounter and goes bouncing across the screen to wind up flat on his back (*sounds pretty good to me — Ed*).

There are one- or two-player options, a Hall of Fame, and a percentage rating at the end to tell you how much of the adventure you've completed. After several sessions we'd got no further than 6%, which gives some indication of the scale of this highly-recommended game. Ultimate does it again.



Aztec Challenge

Computer: Commodore 64

Price: £8.95 on cassette, £12.95 on disk

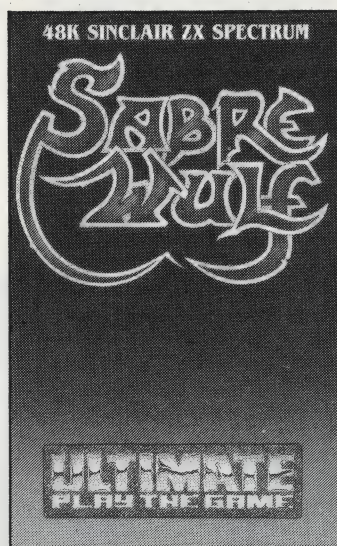
Supplier: Audiogenic, P.O. Box 88, Reading, Berkshire

In the never-ending search for original story lines, Audiogenic have done well to come up with this interesting idea, and they've done even better by turning it into a very good game.

We're travelling back in time once more, to the days when the Aztec empire was at its height. You, a hapless individual, have been selected to be a ritual sacrifice to the gods. There is a way out though, and that is to survive and complete an obstacle course known as the Aztec Challenge.

This is another way of saying that this game has got seven different screens to it, although when you've managed to get through the whole lot it's a bit disappointing to realise that you haven't seen the screen depicted on the back of the cassette box. If it appears anywhere during the game, it appears a long way after any levels we've managed to get to.

To give a brief rundown of each of these seven levels, the first one is possibly the most difficult of the lot. With an interesting background tune to accompany you, you must run all the way to an old temple by dodging a hail of spears being thrown in from the left and right of the screen. This is done on a random basis, and you've no way of knowing where



the spear will come from, or what height it will come at. You'll have to be very quick at leaping and ducking in order to get through this one.

Level Two is a lot easier, and just requires patience as you must race up the steps of the temple avoiding a continuous barrage of rocks falling down from above. On the third level you've got to run through part of the temple, dodging swords and other nasty devices from above and holes in the ground below. Next is a long run through various Mexican animals such as spiders, snakes and lizards, and if you're still alive Level Five is a simple trot across a room, with hidden arrows being fired at you from the shadows.

The next level is the longest and

one of the more difficult ones. In this you have to swim across a lake full of piranha fish, and let me tell you this is a mighty big lake.

Your reward for getting across this comes in the form of the seventh level, which has you running across a very long bridge which has a large number of breaks in it. Obviously, you've got to jump across these and avoid plunging to your doom on the rocks below.

An interesting, well thought out game, with a number of different challenges to meet. Good graphics and sound are maintained throughout, so book your seats now for the Aztec Challenge.



Pontoon/Three card brag/One armed bandit

Computer: Vic 20 with 8K expansion (for Brag only)
Price: £5.50
Supplier: Enigma Software, 208 Aigburth Road, Liverpool L17 9PE

This is one of those collections of programs that, at the end of playing all of them, only serves to make you think 'why did they bother'. Quite frankly, this is appalling stuff and we're sure that 99 per cent of *Which Micro* readers with a Vic could come up with something better.

Still, ours is not to reason why, ours is to review or die, so let's start with Pontoon. The game follows the traditional rules of Pontoon, and you are playing against the computer. Both you and the machine start with 5000 units of money, and the first action

after receiving your card (or first car, as the cassette inlay describes it) is to place your bet, up to a maximum of 999 units. However, it's possible to get away without betting anything at all, which seems to defeat the point of the game somewhat.

After betting or not, as the case may be, your second card appears and gives you the option to twist or stick, although you can only stick on a card total of 16 or more. You don't get to see any of the computer's cards until you stick, and if you go bust you don't get to see them at all. Very poor sound, with equally poor graphics, and all told a totally uninspiring game.

One armed bandit is, if anything, even worse than Pontoon. There has been no attempt to do anything as rudimentary as even using some user defined graphics, since the characters on the reels are all taken from the existing character set. The instruction card refers to 'Black zeroes', although everything looked uniformly white to use, and pi symbols, but again

these were only obvious by their non-appearance.

You have the options to hold or nudge (downwards only), and when the nudge feature first appeared we thought the machine had crashed, since there were no messages to nudge or continue with the game anywhere in sight. Only a tentative press at the space bar brought the nudge message up, only to see it disappear in a fraction of a second. After starting with one pound to gamble, and finishing with seven pounds twenty, we gave up and decided to take a look at the version of Brag.

Only we didn't, since the program wouldn't load. Judging by the standard of the other two this doesn't appear to be any great loss. Brag may redeem the whole tape, but somehow we doubt it.

Enigma live up to their name with this collection. Why they released it will remain an enigma to anyone who sees it.



Data Retrieval System

Computer: Dragon 32/64
Price: £14.95
Supplier: Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA

Salamander has come up with a simple-to-use but very impressive data storage and retrieval system, which, although it comes on tape, can also be used in conjunction with disk files using Dragon Data's DOS system. The price makes it an attractive proposition for small business use, and it's a long way beyond the "under-a-tenner" tape-only filing systems which are so limited as to leave you better off with pencil and paper.

Once criticism is that they haven't redesigned the Dragon's rather unattractive character set, so you are limited to the chunky 32 x 16 screen layout, but given that, you can design that initially blank screen however you like in order to cater for your own particular filing needs. The field headings are entered and printed in inverse video, and to test the system we began to set up a record of computer books, using the four headings of Author, Title, Publisher and Year, printed down the left-hand side. In fact you can have up to 26 character fields and ten numeric fields — though don't ask us how they all fit on the screen.

A sample designed file comes on the tape, a Gazetteer with seven headings: Country, Capital, Head of State, Population, Currency, Capital and Area, showing how *DRS* could be used for educational and reference purposes. It would have been even more helpful if the sample file actually had some data in it, to let you see how to use the search and edit facilities, though these are fully covered in the 16-page booklet.

The important information is that you can store a file of up to 22,000 characters on tape, so if you set aside 100 characters for each file you could have up to 220 records, with seven times as many if using disk. The search facilities are undoubtedly the most impressive feature, with numeric fields searchable for figures greater than, less than or equal to the specified amount, with character fields checkable for characters in specific positions, or for any character string anywhere within a field: all books with 'Dragon' in the title for instance. Alternatively you can simply count the entries in the field: how many books written by Ian Sinclair, for example. Or perhaps easier, how many books *not* written by Ian Sinclair. This can also be checked for, with all searching done instantly.



Devil's Island

Computer: 48K Spectrum
Price: £5.95
Supplier: Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan CF6 8LE

As Gilsoft and others are showing, use of *The Quill* doesn't automatically produce a series of conveyor-belt adventures, they can be as bad or as good as the author's imagination allows, and *Devil's Island* would be good no matter how it was written.

As you might guess from the title, this is a Papillon-type adventure in which you must escape from the infamous Devil's Island prison, and then attempt to reach the mainland of South America and freedom. You begin in your 'grim prison cell. A barred window is to the North and a rusting but strong cell door is to the West. I can also see an old cracked washbasin in the corner and a filthy-looking bed under the window.' If the author thought he could trick us into spending half an hour trying to batter down the strong cell door, he was mistaken. We were wise to that one, but not so wise about the tasty pie that you for some reason find in the corridor outside. We should know better by now than to eat things hastily. Pigs never prosper in adventures.

Devil's Island seemed to us to have just that right adventure blend: maddening and seemingly impossible at first, you can progress inch by inch if you persevere. Initially you seem to be able to go no further than three locations, your cell, the corridor outside, and a cookhouse where a guard is waiting to shoot you. It took us quite some time to figure

out how to deal with the guard, as throwing the pie had surprisingly little effect, but once we had we then discovered that there only seem to be a limited number of moves afterwards before the guard's body is discovered and it's resurrection time again.

The adventure is well-written, and the author, Colin Smith, proves adept at drawing your attention away from what you should be concentrating on to

have you battering your head against a brick wall trying to solve something the wrong way. Being in machine code, the responses are naturally quick, and with a SAVE routine along with the other standard features *The Quill* provides, we think *Devil's Island* will have you scratching your head for some time.



THE GOLD COLLECTION 48 K Spectrum



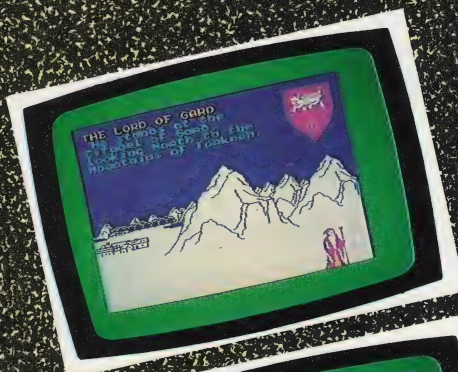
Devil's Island by Colin Smith

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COMMODORE 64



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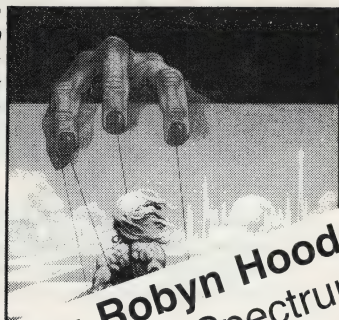
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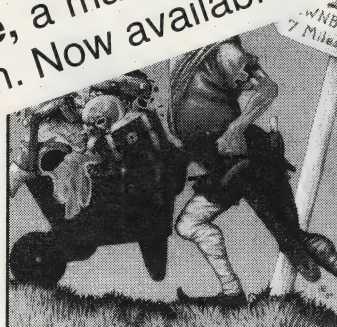
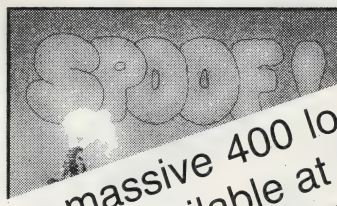
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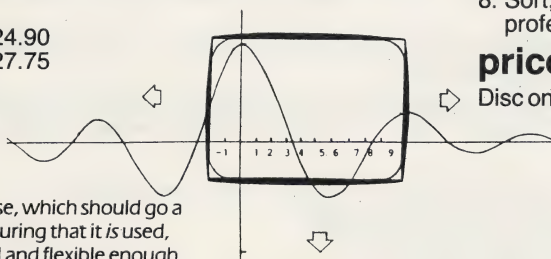
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Cartesian is fun to use, which should go a long way towards ensuring that it is used, and it is both powerful and flexible enough to be of real benefit to any serious student of mathematics.

—Hobby Electronics

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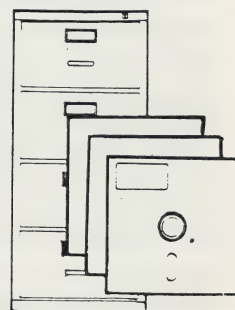
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Some time ago, we decided to add text printing facilities to the Dragon's Graphics Screens. Although it took 3 weeks of hard work we did it for all five PMODES. We made the characters redefinable, but we did not call them sprites, because they are not, they're just redefinable characters. Then we decided to add some sound effects and user definable sounds. After another week or so, we had done that as well.

Next, we thought we would give the Dragon some sprites. We required multi-coloured sprites of any reasonable size or shape and we wanted to be able to move them without obliterating whatever else might be on the screen. We quite fancied being able to control sprites from the keyboard or joystick with just a single command, and we thought it would be nice to be able to fire sprites with the joystick buttons. No sprite system worth its salt would ignore collisions, we thought, so we would have to have a collision detection as well. Also, we wanted the sprites to be fast, versatile and easy to use, with lots of functions so that the control programme would know where all the sprites were, and what they were doing. Another brainwave was to include an automatic maze running feature where all the sprites chase, (or run away from) a particular sprite, so that it would be easy to write THAT kind of programme. Then we thought we would like to have easy animation, preferably looked after automatically, by the sprite handling system. Finally, just to make the whole idea totally impractical, it would have to be driven entirely from Basic, without any tedious Peeking and Poking.

We did it, it took months, but we did it. The author of the two top selling Dragon games in a recent best sellers list, has described Sprite magic as the best piece of software he has ever seen.

Popular Computing Weekly said "Excellent" and "Superb". Dragon World said "Quite simply the best Dragon utility available on the market today". Personal Computer News said "Fantastic" and "if you've got a Dragon, what on earth are you doing without Sprite Magic".

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Price: £249
Use: Home/Office
RAM: 64K
Colour: Yes
Language: BASIC
Interface: Own
Supplier: Commodore
0753 79292

Commodore's contender in the up-market home micro field looks much more impressive than their previous machines, though at the time of writing we have not yet been able to subject it to full testing.

Your £249 buys an eight-bit, 64K machine using the 7501 processor, yet another Commodore derivative of the 6502. So far, same old story, but the Plus/4 represents a considerable advance on the 64 in the collection of serious home/business software which comes free with the machine.

Four applications, a word



processor, a spreadsheet, a business graphics package and a database manager are supplied in paged ROM — in other words, the four packages reside in memory

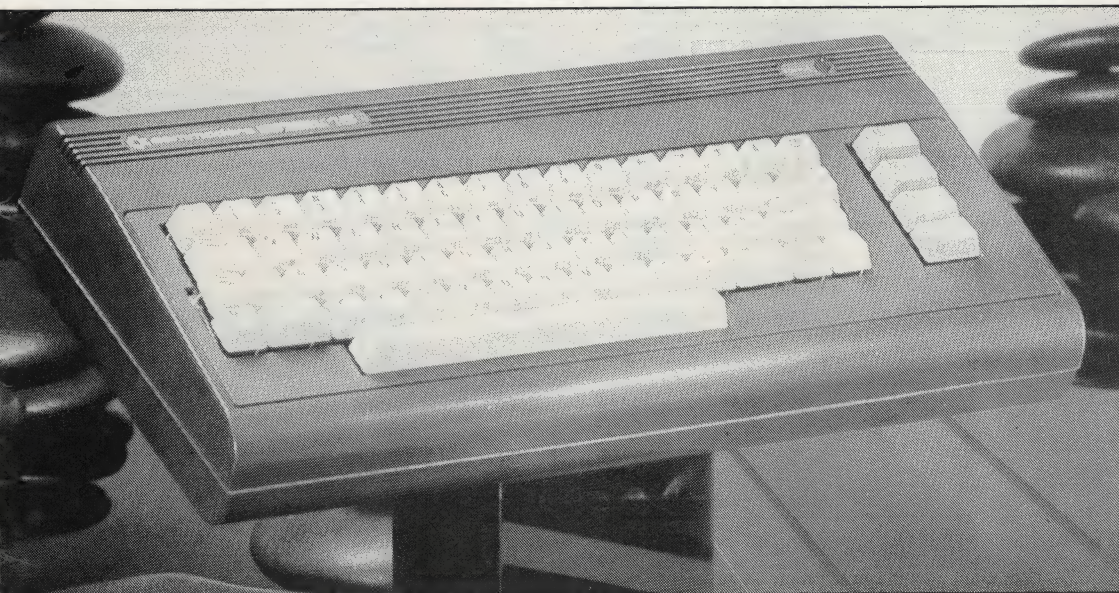
right from switch-on, and do not need to be loaded from cassette or disk before use.

These applications programs are able to share common data, making it possible to take part of a spreadsheet model and incorporate it into a written report, for example.

You will need a disk drive to use this software to the full, and Commodore has taken advantage of the announcement of the Plus/4 to unveil a new floppy disk unit, the SFS 481. This has a relatively low capacity of 170K, but it makes up for the major deficiency of the 1541 disk drive — its extreme slowness. The new unit is claimed to be dramatically faster.

Another surprise is the complete break in software compatibility with the popular 64. The BASIC interpreter is new, including many commands which have been standard for years from other manufacturers, but which Commodore has only just got around to providing. The 64's celebrated sprite graphics facility is missing, so it seems unlikely that the Plus/4 will replace the earlier machine as the games addict's favourite.

GUIDE



COMMODORE 16

Price: £130
Use: Home
RAM: 16K
Colour: Yes
Language: BASIC
Interface: Own
Supplier: Commodore
0753 79292

The long-awaited replacement for the Vic 20 comes as a special starter pack with the computer, the Commodore-only cassette recorder, four programs and the popular *Introduction to BASIC* all included in the price.

The computer itself is a considerable improvement over the Vic, with the same BASIC as the more expensive Plus/4 adding a degree of user-friendliness which Commodore computers have lacked for far too long.

The new commands in BASIC 3.5 are mainly in the areas of colour, graphics and sound, so that for the first time it is possible to write BASIC programs which use high-resolution graphics without descending to the level of unintelligible multiple POKE statements. The sound facilities of

Commodore's home micros have always been very good as long as you knew how to use them, but now it will be much easier to get the results you want.

The machine looks similar to the Vic and 64, with a reasonable quality typewriter-style keyboard giving it the 'real computer' feel which attracted so many Vic 20 buyers. The keyboard is slightly remodelled to make it easier to use, and one feature about which Commodore seems very excited is the addition of a help key. This is claimed to highlight programming errors, but until we get our hands on the system we reserve judgement.

Machine	List price	Typical price	Use	RAM	ROM	Interface	Max no. cols. on screen at one time
Amstrad	£329 col £229 green	£329 £229	Home/ business	64K	32K	Parallel	27
Aquarius	£49	£49	Home	4K	8K	Own	
Atari 600XL	£160	£160	Home	16K	24K	RS-232C	128
Atari 800XL	£250	£250	Home	64K	24K	RS-232C	128
Acorn Electron	£199	£199	Home/ education	32K	32K	Own (plus 1)	8
BBC Model B	£399	£399	Home/ education	32K	32K	RS-423	8
CGL M5	£150	£150	Home	20K	16K	Own	16
Colour Genie		£168	Home	32K	16K	RS-232C	8
Commodore 64	£229	£199	Home/ business	64K	20K	RS-232C	16
Commodore Vic 20	£140	£140*	Home	5K	8K	Own	8
Dragon 32	£169	£140	Home	32K	16K	Parallel	8
Dragon 64	£229	£175	Home	64K	16K	Parallel & RS-232	8
Lynx 48K	£225	£199	Home	48K	16K	Serial	8
Lynx 96K		£299	Home	96K	20K	Serial*	8
Memotech MTX500	£315	£275	Home	32K	32K	Parallel	16
Oric I 16K		£80	Home	16K	16K	Parallel cassette	8
Oric I 48K		£140	Home	48K	16K	Parallel	8
Oric Atmos	£170	£170	Home	48K	16K	Centronics exp port, Hi-Fi RGB Monitor UHF TV cassette	8
Sharp MZ700	£250	£240	Home/ business	64K	4K	Own	
Sinclair QL	£399		Home/ business	128K	32K cartridge	RS-232C	
Sinclair Spectrum 16K	£100	£100	Home	16K	16K	Own	2
Sinclair Spectrum 48K	£130	£130	Home	48K	16K	Own	2
Sinclair ZX81		£45***	Home	1K	8K	Own	
Spectravideo SV318	£186	£186**	Home	16K	32K	Own	16
Tandy MC10	£69.95	£69.95	Home	4K exp 20K	32K	RS-232C	8
Tatung Einstein	£499		Home/ office	64K + 16K video	8K	RS-23 & centronics & others	16
TRS-80 Colour 16K	£160	£140	Home	16K	32K	RS-232C	8
TRS-80 Colour 32K	£250	£200	Home	32K	32K	RS-232C	8

* with starter pack ** cassette £39 *** special offer "starter pack" includes 16K

Max no cols	Max text display	Max graph resolution	Language supplied	Sound channels	On board speaker?	Operating system	Review date	Supplier
27	80	640×200	BASIC	3	Yes	CP/M or BASIC	July 84	Amstrad Consumer Electronics PLC 0277 228888
			BASIC	3	Yes	BASIC		
256	40×24	320×192	BASIC	4	No	BASIC	Dec 83	Atari 01 900 33344 Atari helpline 0753-24561
256	40×24	320×192	BASIC	4	No	BASIC		Atari 01 900 0511
8	40×25	256×160 640×256	BASIC	1 music 1 noise	Yes	BASIC	Sept/Oct 83	Acorn Computers 0223 210111
8	40×25*	640×256	BASIC	2	Yes	BASIC	May/June 83 March 83	Acorn Computers 0223 210111
	32×24	256×192	BASIC	3		BASIC	July 83	Computer Games 01-508 5600
16	40×24	320×192	BASIC	3		BASIC	Dec 82	Lowe Electronic 0629 4995
16	40×25	520×300	BASIC	3	No	BASIC	March 83 June 84	Commodore 0753 79292
8	33×23	500×220	BASIC	3	No	BASIC	Sept/Oct 82 May 83	Commodore 0753 79292
8	32×16	256×192	BASIC	TV	No	Microsoft BASIC	Sept/Oct 82 April 83	Dragon Data 0656 744700
8	32×16	256×192	BASIC	TV	No	Microsoft BASIC	Jan 84	Dragon Data 0656 744700
8	40×24	256×252	BASIC	1	Yes	Lynx BASIC	Dec 82	Camputers 0223 313358
8	40×24	256×252	BASIC	1	Yes	BASIC	April 83	Camputers 0223 313358
16	40×28	256×191	BASIC	3	No	BASIC	Dec 83	Memotech 0993 2977
8	40×28	200×240	BASIC	3	Yes	BASIC	Feb/May 83	Oric Products International 0990 27641
8	40×28	240×200	BASIC	3	Yes	BASIC	Oct 83	Oric Products International 0990 27641
8	40×28	240×200	BASIC	3	Yes	Microsoft BASIC	April 84	Oric Products International 0990 27641
8 full col 8 backgrnd	40×25	80×50	Super-BASIC	1	Yes	BASIC	Sept 83	Sharp 061 295 2333
4 8	85×25	512×256 256×256	BASIC		Yes	QDOS	Mar/May 84	Sinclair Research 0276 685311
8	32×24	256×176	BASIC	1	Yes		July/Aug	Sinclair Research 0276 685311
8	32×24	256×176	BASIC	1	Yes		Feb 83	Sinclair Research 0276 685311
	32×24		BASIC		No		May/June 82 Apr/May/Oct 83	Sinclair Research 0276 685311
16	32×16	256×192	BASIC	3	No	MSX BASIC	Dec 83	Spectravideo 01-330 0101
8	32×16	256×192	BASIC	1			Oct 83	Tandy 0922 648181
8	40×24 32×24	256×192	BASIC	3 tone & 1 noise	Yes	XTAL DOS	July 84	Tatung Bridgnorth, Shrops WV25 6BQ
8	32×16	256×192	BASIC	1		BASIC	Nov 82	Tandy 0922 648181
8	32×16	256×192	BASIC	1				Tandy 0922 648181

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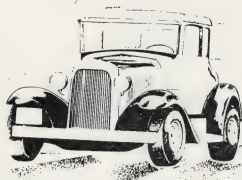
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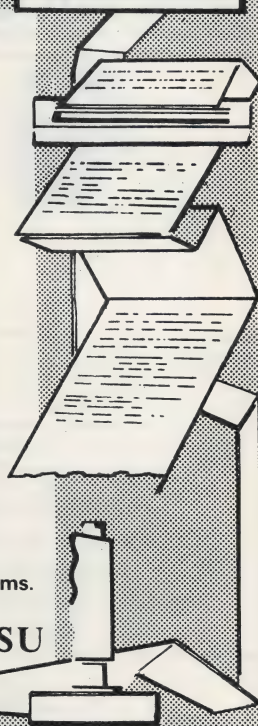
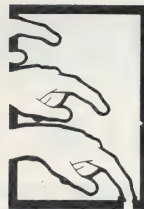
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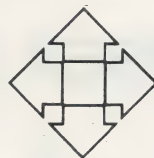
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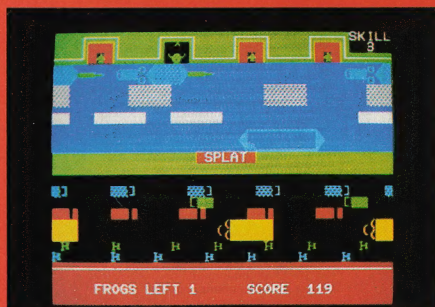
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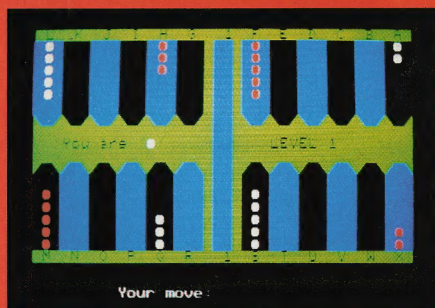
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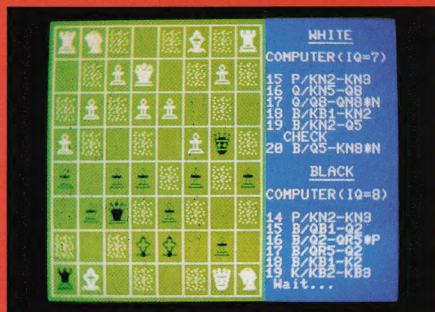
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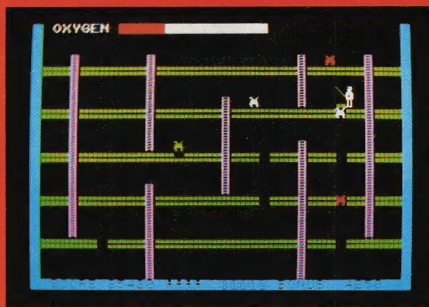
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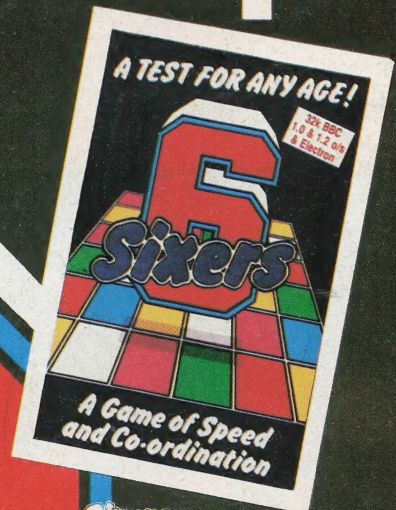


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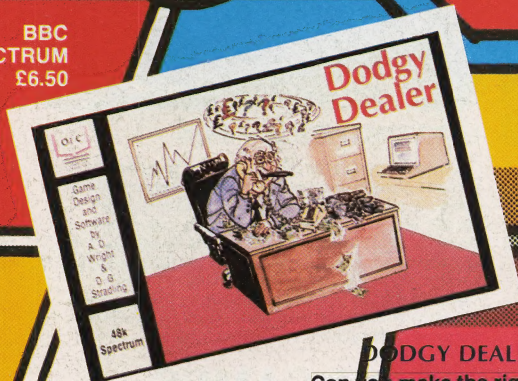
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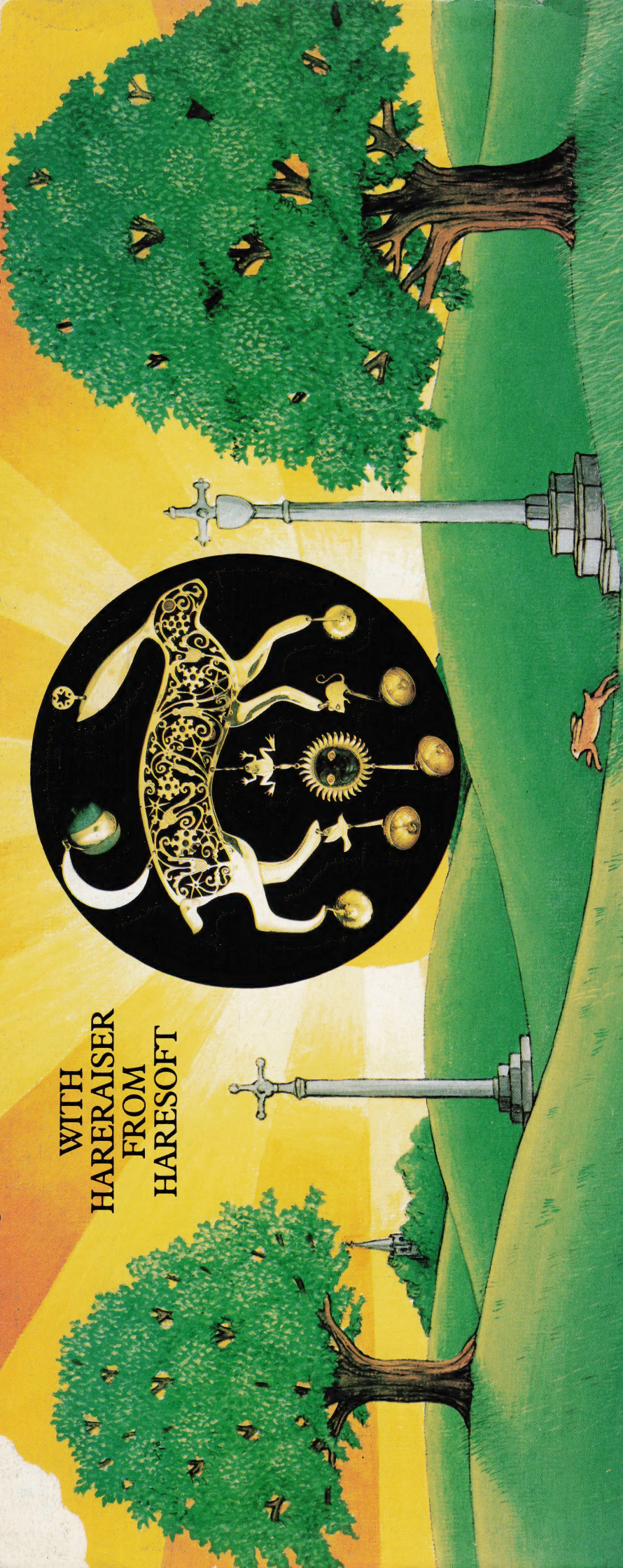
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