

POPULAR Computing WEEKLY

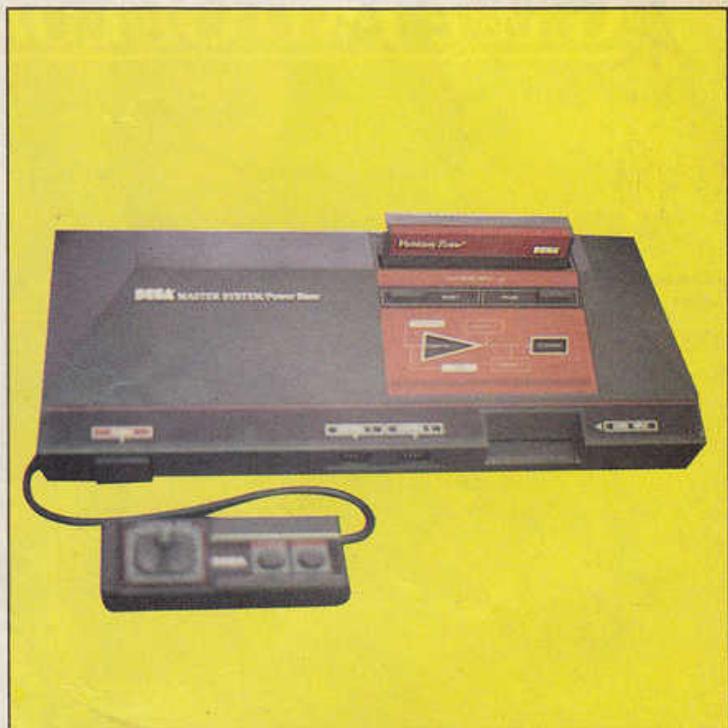
Mastertronic's Sega system deal - details of software

Full story on page 6

New boss appointed
at Commodore UK
Amstrad's PC1640
in UK next year

Hisoft's Devpac 2
Hard discs - who
needs them?

Stiffli & Co
In the Popular
Hall of Fame



Sega Master System

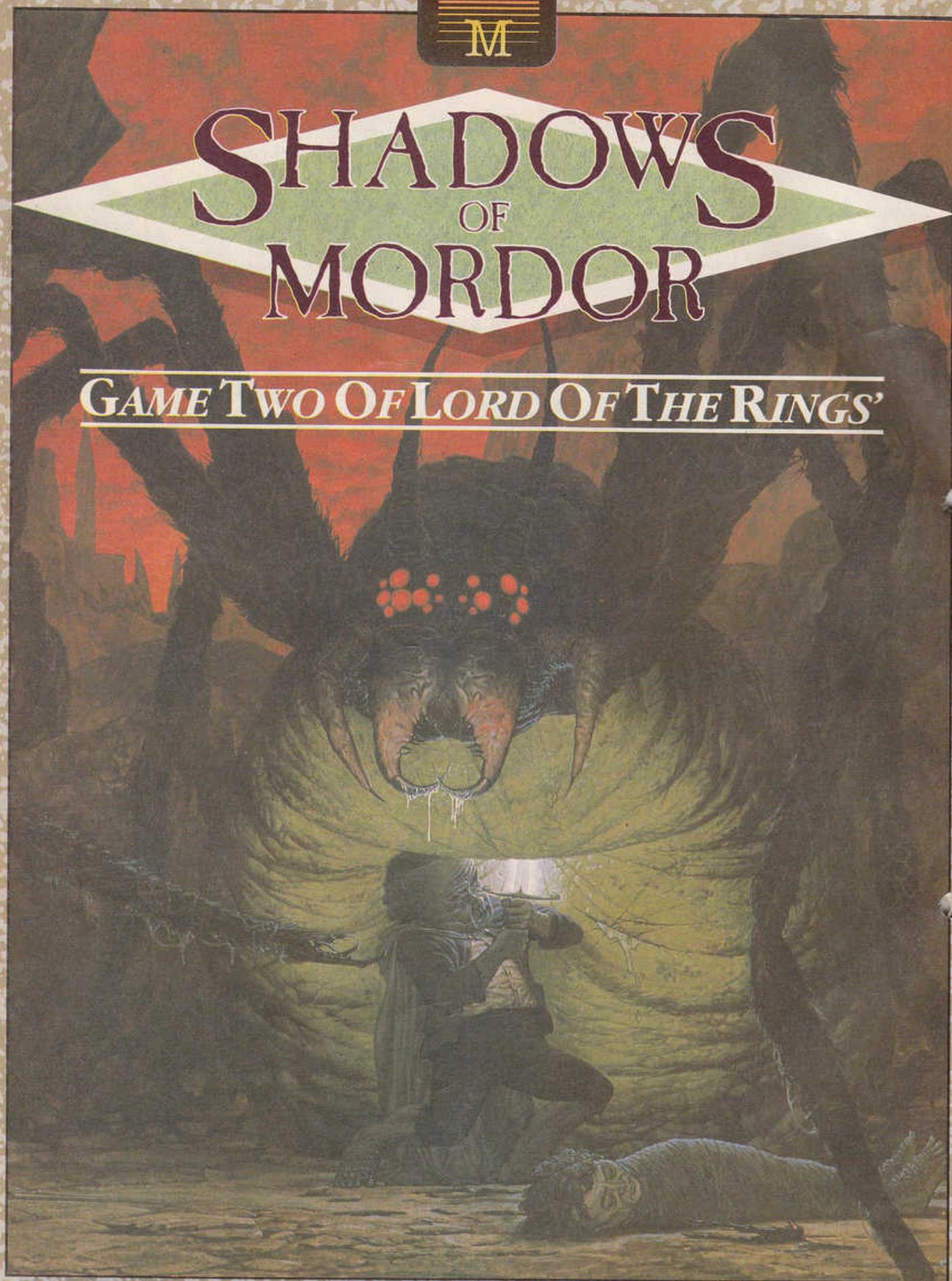


A Binary Vision Game



SHADOWS OF MORDOR

GAME TWO OF LORD OF THE RINGS'



MELBOURNE HOUSE

AVAILABLE FOR: AMSTRAD CPC, CBM CASSETTE £8.95 – SPECTRUM £7.95 – CBM DISK £14.95

June 12-18

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Computing
WEEKLY

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Plus *Khandal 2* for the Amstrad CPC, the first part of the follow-up to the arcade adventure *Khandal*, part two of the QL font designer, and *VLabel*, a labelling program for the ST.

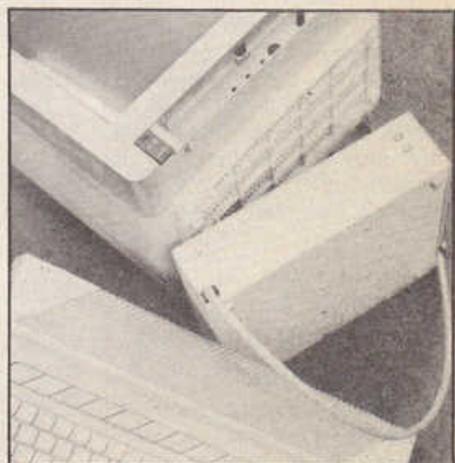
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Top: The Hybrid Music System.
Above: Eidersoft's Atari ST hard disc.
Below: Killed Until Dead



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ABC

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A hard case to crack

Blank CF2 discs, as used by Amstrad CPCs and PCWs are now available individually for £2.95 each.

Boots of Bexleyheath sells Maxell discs, but for some reason they're in plastic bags, not cases.

John Lewis in Oxford Street, London, sells Amsoft discs in hard plastic cases. They're probably also available from other branches of these stores in most places.

Does anybody know where I can buy the plastic cases separately?

I'd also like to mention Reach Out, the new South East London Newspaper by the unemployed for the unemployed. Would anyone like to send us some Amstrad CPC software for review? The address is Reach Out, c/o Room 306, Erith College, Belvedere, Kent.

Paul Brown
Sidcup

Over and out

Marcus Marr's problem with using printer control codes with *Fast Basic* on the ST (Letters, May 29) can be overcome by using the OUT command.

The following short program demonstrates this for an Epson:

```
LPRINT "Hello"
OUT 0,27,45,1: REM Sets underline
LPRINT "Underlined"
OUT 0,287,52: REM Sets italic
LPRINT "Italic"
OUT 0,27,45,0: REM Cancels underline
OUT 0,27,53: REM Cancels italic
LPRINT "Back to normal"
```

Laurence Myers
Gloucester

The price of fun

I've been reading about the computer industry for quite a while now and the one thing that mystifies me is the cost of games.

There are, of course, budget games, but they seem to lack something which would make them as good as full price titles.

I admit that there are some good titles, but they seem a little simplistic. Classics like *Spellbound* have mediocre graphics/sound with windimation being a quick way round using a parser.

Codemasters has produced some good games but they are similar: *Red Max*, *BMX Simulator* and an earlier Darling creation *The Last V8* all have the same controls which seems a bit odd.

Now to the other extreme. The average full price game is about £9 which is a £7 jump. Can this price be justified? The strong answer must be no. In fact, charging nigh on a tenner for a computer game makes no sense at all.

The average 11 year old gets £1-£2 pocket money a week, which means saving up for a month or more for a full price game.

Is a full price game four to five times better in quality than a budget game? Yes, in some cases.

Take the current best selling budget game, *BMX Simulator*. It has nice graphics, a great soundtrack and two player option and good gameplay.

The top selling full price game of this year so far is *Gauntlet*, which has hi res title screens, unique gameplay, two player option, good music, 512 rooms, eight-way scrolling and bonus screens.

Gauntlet is certainly four to five times better, but this doesn't mean the price should be four to five times higher. My personal opinion is that a fiver would be more realistic.

Simon Harrison
St Albans

There is much talk among the software companies at the moment about bringing non-budget software prices down to around £5-£7, although this is unlikely to happen to any great extent until next year.

Xen 3 tapes and discs

Thank you for publishing my Xen 3 program for Amstrad CPC micros (*Popular*, May 22). I would like to add that if readers do not want to type it in I will provide it on tape or disc (with documentation) for £3.00 and £5.50 respectively. The original Xen and Xen Plus are also included. The address to write to is 41 Fountains Drive, Acklam, Middlesbrough, Cleveland TS5 7LW.

Simon T Goodwin
Middlesbrough

The home computer wars

When will Commodore admit defeat to Atari?

To be honest, I think Tramiel is out to kill them off. As for Commodore itself, it needs a dose of Sugar (as in Amstrad).

Don't get me wrong. I've been a devoted C64 owner since paying £350 back in the Middle Ages, and as for an Amiga, I'd just love to have one. But I can't justify the price, let alone against the 520ST.

Commodore has either to drop out of the home market, or (most unlikely) enforce a pricing policy which is second to Amstrad's, which is what Atari has already done.

S V J Perchard
Bristol

Help for TI994/A users

As a regular reader of your excellent journal, I have noticed that Texas Instruments TI994/A users are not all aware of the existence of the International Texas Instruments User Group.

This organisation exists to serve the entire spectrum of user's needs in both the hardware and software fields. It can supply all types of non-commercial software including Forth, C, and Pilot.

Hardware upgrades are available including Ramdiscs, and soon to be implemented is an Eprom module programming service. Regardless of whether they have just the basic console or whether they have an expanded system, the ITUG is there to help. Anyone interested in further details can write to P G Q Brooks, at 96 Banbury Road, Oxford OX2 6JT, or telephone 0865 510822 at any time.

N Bosworth
Southampton

Whose Top 20 is it anyway?

As the happy owner of an Amstrad 6128 I like to take advantage of fast loading programs and files from disc (after all, that was why I changed from the 464).

You have seen the adverts which say, "from Boots, WH Smith and all good computer shops", which implies that if a shop has not got it, then it is not a good computer shop.

I have to report that Kingston

Upon Thames, Wimbledon, Slough and Hounslow are not areas with good computer shops selling Amstrad disc games - although, to be fair, in Kingston, both Boots and WH Smith had some. In this Amstrad disc desert, Commodore and Spectrum rule (not OK).

Even if a shop can specially order a game on disc for me, I might as well order it from a mail order source by telephone with a credit card at a discount price.

How realistic can Top 20 software be, if, for example a shop's display is limited to the Top 20? A real 'chicken and egg' situation for browsers.

If shops are not supported, choice will worsen with even fewer chances to try before you buy.

If newsagents can order papers on a sale or return basis why cannot the software houses do the same for games?

After all, if the software houses have faith in their product, why not risk a little more to achieve for their products the exposure and sales they no doubt feel they deserve?

C J Palmer
London SW19

Part of Boots' supply from wholesalers is indeed done on a sale or return basis. However, sale or return is not generally popular with the wholesalers/distributors, which have far more say over which products go into which shop than the software houses themselves.

Singlestep success

After four years of dedication to Basic, I decided that 1987 was going to be the year I would master machine code.

Just as on the previous occasions I had tried, the going started to get really tough. That is, until I bought a copy of Singlestep, by R Wilkinson, on offer in Programming Spotlight, February 12.

Since the day it arrived, my understanding of machine code has increased in leaps and bounds.

Please pass on my thanks to Mr Wilkinson for producing such a professional piece of code.

M Sleight
Doncaster

Wafa support?

I own a Rotronics Wafadrive and as far as I know there is

no support group in existence to help with queries and supplies of much needed Wafas.

If readers with Wafadrives would be willing to contact me at 19 Churchfield Road, Acton, London W3 7LL. I will attempt to co-ordinate a nationwide user group.

Additionally, if any suppliers of Wafas could give written quotations of their stocks and cost per Wafa, I would be grateful and will pass this information on to members.

Tony Merrigan
London W3

End of the debate?

In the recent debate, in your Letters page, concerning the relative merits of the Atari ST and the Commodore Amiga A5000, the availability of software has been discussed. I have not, however, seen any mention of the relative cost of software.

The ST software is usually cheaper than the equivalent A500 software as is amply borne out by your offer for 'C' compilers (*Popular*, May 29). In my opinion this clinches the debate about software in favour of the ST.

The relative merits of the hardware and operating systems will certainly continue to be debated, but it is the software which really counts to the user. After all if the software is not available, and at a reasonable price, you cannot use the hardware to its full potential.

Jon Meredith
London SE25

New Spectrum magazine

Your readers may be interested to hear about Eprom, a dedicated Spectrum based amateur magazine. Issue one is out now, and has been very well received by all its readers.

Eprom features an action packed collection of reviews, hints 'n' tips, maps, interviews, articles, strips, great art work plus loads more. Anyone wishing to obtain a copy should send a PO/cheque for 80p (inc p&p) to Eprom at 328, The Maltings, Penwortham, Preston, Lancs PR1 9FD. Issue two of Eprom will be out at the end of June, at the lower price of 70p (inc p&p), so it must be worth a look.

T Worrall
Editor, Eprom



Hang on! Aren't we all supposed to be on the same side?

Stop all that fighting!

If you are a keen programmer, then obviously you will appreciate the merits of the Memotech, if what you want is to play a good range of games then Spectrums and C64s are great machines for a low budget, and the ST is good for those with more money who don't mind waiting a while for the software base to build up. The Amiga may be better in terms of graphics but the difference is hardly enough to start a fight and both are fine for more serious business uses.

To try to make comparisons across the 8/16 bit boundary is pointless. Of course ST games are 'better' than those for the Spectrum or the C64, but what do you expect? And anyway, they are not (in my humble opinion) that much better, not yet anyway. (OK, I've seen *Gold Runner*, it's very, very good, but not, say, twice as good, as equivalent 8-bit games). I've gone on long enough, can we now assume that the arguments are over?

Incidentally, I own an ST... and a Spectrum and a PC compatible, and a Newbrain and I love them all.

Mark Beale
Sussex

We're sorry but *Popular Computing Weekly* cannot guarantee to reply to all letters requesting a personal answer. It helps us enormously if readers are prepared to have general queries answered on these pages, so, if possible, please do not send SAEs.

PS. Ten to one there will be a letter next week along the lines of "Mr Beale has a point but why did he not mention xxx computer?"

Not so biased

I enjoyed John Brissenden's item commenting on the new rivalry between Atari's 520STFM and Commodore's Amiga A500.

It did not seem biased to either machine, and before I had even received my copy of *Popular* I had long since decided to purchase the 520STFM.

The following week, however, two people writing in the Letters section appeared to be suffering from tunnel vision.

As far as the capabilities of the A500, which Geoff Hatto thinks are better than the 520STFM, go, one look at the value for money ratio of each machine system will prove the STFM the landslide victor.

Also, W Plummer should try reading a few advertisements - he obviously looks no further than Silica Shop. Nobody will pay £400 when they need only pay £318 (Computer Express, Herts). The cheapest price I've seen for the A500 is £440.

I saw both machines side by side, and I strongly disagree with all those Commodore owners that the Amiga is a "sensible" machine and "not expensive", because Commodore computers are some of the most user unfriendly around (I know - I own one) and the value for money factor.

D A Simpson
BFPO 42

(Letter edited for length)

Correction

Following our review of the Reaktor game *Challenge of the Gobots* (May 29) Ariolasoft has asked us to point out that the "software book" is on the reverse of all the games tapes. It's the music cassette which is only available in a limited edition. Furthermore, if the music sounds suspiciously like Robert Schroeder's *Space Detective*, it has every right to do so; the music is by none other than Robert Schroeder himself. Whoops!

Black goes back

In Game One of our readers' versus *Colossus* chess tournament, the readers have responded as *Colossus* expected at move 19, and developed their bishop, moving it from c8 to f5. *Colossus* has replied by again driving the black queen away. (See diagram for details).

The next move

Which move would you, playing black, make next?

Send your suggested readers' move to either Inter-Mediate (*Popular Chess*), Freepost, Sawbridgeworth, Herts CM21 9YA (no stamp needed), or *Popular Chess*, Unit 2, The Maltings, Sawbridgeworth, Herts CM21 0PG (with a stamp). Please note that Freepost is slower than the normal service, so if you want to save stamp money, get your entry off promptly.

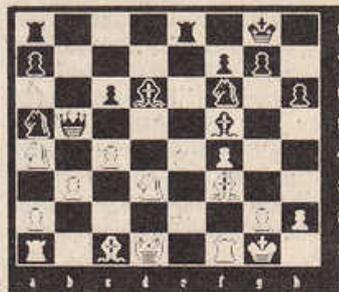
Only one vote per person please, and all entries must reach either address by Wednesday, June 17.

The move which gets the most votes will be entered into the game. Results and *Colossus's* response will be published in two weeks time. Next week, we return to Game Two, where the Readers are playing white.

Game One

The moves so far:

- | | |
|-----------------|------------------------|
| 1 Pe2-e4 | Pc7-c5 |
| 2 Ng1-f3 | Nb8-c6 |
| 3 Bf1-c4 | Ng8-f6 |
| 4 Nf3-g5 | Pd7-d5 |
| 5 Pe4xd5 | Nc6-a5 |
| 6 Bc4-b5+ | Pc7-c6 |
| 7 Pd5xc6 | Pb7xc6 |
| 8 Bb5-e2 | Ph7-h6 |
| 9 Ng5-f3 | Pe5-e4 |
| 10 Nf3-e5 | Bf8-d6 |
| 11 Pd2-d4 | Pe4-d3
(en passant) |
| 12 Ne5xd3 | Qd8-c7 |
| 13 Nb1-c3 | Ke8-g8 o-o |
| 14 Pf2-f4 | Oc7-b6 |
| 15 Nc3-a4 | Qb6-d4 |
| 16 Pc2-c3 | Qd4-d5 |
| 17 Ke1-g1 (o-o) | Rf8-e8 |
| 18 Be2-f3 | Qd5-b5 |
| 19 Pb2-b3 | Bc8-f5 |
| 20 Pc3-c4 | ? |



'Upmarket' PC1640: Amstrad's last chance in United States?

AMSTRAD last week announced full details of its PC1640 range, the upmarket successors to the PC1512, which will be launched in the UK next year.

The machine received its launch at the Comdex exhibition in Atlanta (see *Popular Computing Weekly* June 5).

Observers were expecting the machine to be based on the Intel 80286 processor. But all

the machines will be 8086-based. Indeed, it is now doubtful whether the company will have an 80286 box scheduled within the foreseeable future.

Amstrad is also clearly making a last, major stab at the US market with the new machines, with a UK and European launch not due until the New Year.

"The breadth of product now offered by the combination of the PC1512 and the upcoming

PC1640 models allows us to approach all sections of the marketplace," said Vernon Moore, president of Amstrad's US distributor Vidco.

He added that the new machines would be sold through more specialist dealers than the chainstore retailers used for the PC1512.

All this points to the market position the new machines will occupy here, following their UK

launch.

The PC1640 is clearly aimed at a larger business user than the PC1512, and one ramification of this will be pricing.

"We have not yet set our pricing structure for the PC1640 in Europe, but initial indications are that this model will be significantly more expensive than the PC1512 range," said Amstrad marketing director Malcolm Miller.

Mastertronic takes Sega risks

MASTERTRONIC'S Geoff Heath promises a bright future for the Sega games console, for which the company recently acquired UK distribution rights.

"We've had enquiries from multiples, big chains, supermarkets, independent computer stores, CTN's (confectioners, tobacconists and newsagents), mail order," he said.

Exact details of availability still have to be worked out, but Heath did confirm software details. Games will cost between £14.99 and £24.99.

Twelve titles out of the existing 30 will be released initially. So far, only four have been finalised - *Choplifter*, *Outrun*, *Space Harrier* and *Zaxxon*.

He added that he was surprised by the amount of interest expressed in the machine so far, and impressed by the quality of Sega's existing and forthcoming software.

There are now three parties pushing games consoles in the UK:

- Mastertronic, which signed

the Sega deal two weeks ago, and takes over from Ariolasoft.

- Atari, which has the XE system, with orders rumoured to be worth in the region of £220,000 and rising.

- Mattel, which recently signed a distribution deal for the Nintendo unit (see separate story).

All three will be fighting hard to get the lion's share of what Geoff Heath sees as perhaps the only growth area in the UK home market this year.

"The computer market is now fairly solid, and in terms of hardware, the only new computer is the Plus 3. And that is only a development of the earlier Spectrums.

"Apart from that there's nothing new. 1988-89 should see the explosion of the 16-bit market - but in the meantime, the only hardware growth area is the games console."

He added that 16-bit machines were still too expensive for a lot of people, who would therefore go with a console until the price dropped.

Mattel scores own goal

- Mastertronic has sped to the rescue of racing driver Andrew Ratcliffe.

Ratcliffe, 33, was due to drive his 230mph British built Tiga in this weekend's 24-hour Le Mans race. But his sponsors pulled out last Friday morning.

"I was left without any money or any hope of driving at Le Mans," said Ratcliffe.

"But I'd seen Mastertronic's games in the stores, and thought it would be a perfect match. So I rang them up, and within five minutes Alan Sharam had rung back to say yes."

Ratcliffe couldn't reveal how much money was involved. "Let's just say we're talking telephone numbers - overseas telephone numbers with extension numbers on the back!"

The race takes place this weekend, and runs from 4pm on Saturday to 4pm on Sunday. Ratcliffe will also be appearing at September's PCW Show, so we can expect the Mastertronic connection to continue for some time.

MATTEL has had its claims about retailers' plans for the Nintendo games console denied by retailers.

Mattel had announced that many large retailers were due to stock the unit, including Argos, Toys 'R' Us, Woolworths and Dixons (see *Popular Computing Weekly*, May 29).

The story was also covered by industry newspaper *Computer Trade Weekly* last week. But when they found out, a number of retailers - including Woolworths and Dixons - contacted CTW to make vigorous denials of Mattel's claims.

A Mattel spokeswoman admitted that the problem was due to an error.

"All I can say is, where we thought things were confirmed, they weren't confirmed. That is the state of play, and until such time as things are confirmed, we can't say one way or another," she said.

"It certainly will never, ever happen again."

Commodore finally picks new UK boss

COMMODORE UK has ended its three month hiatus following the departure of general manager Chris Kaday by finally appointing his successor.

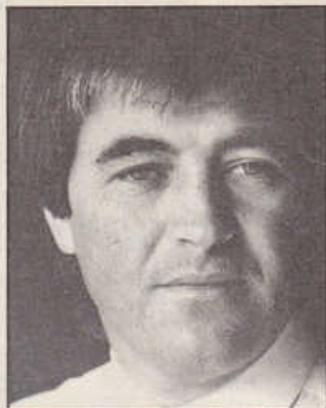
Steve Franklin will take up his position on July 1, moving from Granada Business Centres, where he is sales and marketing director.

There are two big questions hanging over the appointment. First, to what extent will Franklin be a puppet of Commodore UK's masters at Commodore Europe in Frankfurt?

Power has become increasingly centralised with CBM with Frankfurt chief Ernest Tarien reporting to chief executive Irving Gould in the US.

In the current set up, Commodore UK is a minor operation run almost wholly from Frankfurt.

It is doubtful that the situation will change dramatically once Franklin takes up the helm at



Steve Franklin

Maidenhead.

Second, what will be his brief? Has Franklin been drafted as an axeman, to carry on where Kaday left off? The UK operation has been slimmed down considerably over the past year, culminating last month in the closure of Commodore Electronics.

Apple II & PCs get new joystick

CHEETAH has launched a new joystick for the PC and compatibles which can also be used with the Apple II and IIe.

The PC Powerplay has three fire buttons, dual axis sensitivity controls, and comes with a 12 month warranty.

The PC Powerplay costs £24.95. Details from Cheetah Marketing at Norbury House, Norbury Road, Fairwater, Cardiff CF5 3AS, telephone (0222) 555525.



PC Powerplay

SOFTWARE HOTLINES

American software veers from the dire (try asking US Gold why it hasn't published Epyx's *Barbie Doll* dress kit over here yet - it's had the licence for decades) to the tremendous.

From **Microillusions**, California, via **Haba Marketing**, Feltham, Middlesex, comes the latter in the form of *The Faery Tale Adventure* (sounds almost as cutesy as the *Barbie Doll* game).

Faery Tale is a graphic adventure for the Amiga, and the software scene for the Amiga is looking suddenly rosy if there's more like this on the way.

It's a tale of three brothers - Julian, Philip and Kevin. Julian's a bit of a swashbuckler, Philip's a charmer and Kevin is frankly a wimp.

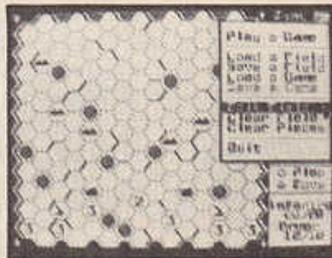
You take their parts as you travel through 17,000 screens of all types of terrain imaginable, doing all those adventurous things, killing monsters, collecting keys, meeting enchanted princesses, slaying a few more monsters... party night for butchers, really.

No-one at Sunshine Towers has worked out exactly what the object of the quest is yet, but we're sure it's something pretty exciting.

The hook of *Faery Tale* is its gameplay and atmosphere generated by the graphics and music. The music is continuous and varied - melodic choral chants for those mellow times in between wholesale slaughter, stirring battle themes for the fighting scenes.

The graphics show you the land and action from a slanted bird's eye view, which is brave of the programmers because the top down angle has produced some ghastly unrecognisable stuff in the past.

Given the Amiga's resolution, capabilities, 20 million colours,



etc, it succeeds. The effect of the animation is that the three brothers float and lollop rather than striding briskly into daring deeds, which makes Julian look the world's most laid back warrior, and Kevin even more effeminate than he was to start with.

It's one of the most appealing games we've had in the office for a while, and we think there could be an ST version on its way, so there's hope for other micro owners yet.

More from the US and the board games of Steve Jackson in the micro version of *Ogre*, pictured here.

This comes courtesy of **Origins**, which is also bringing Jackson's *Autoduel* to the UK next month.

In *Ogre*, we're light years away from the world of *Faery Tale*. This is battle in the 21st century with tactical nuclear weapons, board game style, with the help of *Ogre*, a juggernaut of a tank with enough firepower to keep any Geneva talks going until the next Ice Age.

You can either play against the computer (which also gets the *Ogre* on its side), or another person. Out in September for Commodore 64, Atari (8-bits and STs) and Amiga.

The latest news from the **Firebird** stable is that *Elite* is currently being programmed for the PC and compatible machines.

The word is that the programmers are trying for solid fill graphics rather than the wire-framed ones on the 8-bit machines, and if that's achieved on the PCs, it'll be a sneeze to get filled graphics on to the ST version. Sounds worth waiting for.

DIARY
DATES

JUNE

12-14 June

Commodore Show

Novotel, Hammersmith
Details: First public showing of A500 and A2000 Amigas
Price: £3 adult, £2 children
Organiser: Database Exhibitions,
 061-456 2991

30 June-2 July

PC User Show

Olympia, London
Details: Hardware and software for all users of IBM PCs and compatibles
Price: £5
Organiser: EMAP International Exhibitions
 01-608 1161

JULY

10-12 July

Amstrad Computer Show

Alexandra Palace Pavilion, London
Details: Displays and demonstrations of all latest hardware, software and peripherals for Amstrad computers
Price: £3 adult, £2 children, £1 discount for advance booking
Organiser: Database Exhibitions,
 061-456 8835

SEPTEMBER

23-27 September

Personal Computer World Show

Olympia, London
Details: Latest hardware, software and peripherals for business and leisure computing
Price: £3, £2 - (parties over 10)
Organiser: Montbuild
 01-486 1951

Prices, dates and venues of shows can vary, and you are therefore strongly advised to check with the show organiser before attending. *Popular Computing Weekly* cannot accept responsibility for any alterations to show arrangements made by the organiser.

Commodore to slog it out with Atari at 10th PCW show

FIRST details emerged last week of some of the major exhibitors at September's *Personal Computer World* show - and there are a few surprises in store.

Arch-rivals Atari and Commodore both have their own 'village' - Atari's has 30 separate stands, with a recording studio and satellite weather receiving system. The Commodore village, in the Addison suite, will be open to everybody, unlike last year. The company will of course be promoting heavily the

new Amigas.

So far Amstrad seems to have the next largest stand, and is more than likely to be showing the new PC1640 (see separate story).

Ironically, the adjacent stand has been booked by Cambridge Computer, whose boss Sir Clive Sinclair sold out Sinclair Research to neighbour Alan Sugar in April 1986.

Sinclair revealed that there will be no new products on show this time round - just the long awaited Z88 portable

(again).

Acorn will also have a major new development on show, in the shape of its Risc-based machines.

A large stand has been booked by EOA. It will be the first time the company has exhibited here since setting up a UK subsidiary of parent company Electronic Arts.

Further details, and announcements about just what the companies will be exhibiting, are expected shortly.

Three Amigas Microprose picks peripherals boss

ANCO will be demonstrating three new games for the Amiga at the Commodore Show this week.

The three are *Phalanx*, *Demolition* and *Space Battle*, to be followed by the end of July by *Emerald Mines*, *Cruncher Factory*, *Challenger* and *Karate King*.

"We see a considerable growth in the 16-bit market in the next couple of years and especially of the Amiga as the games machine of the decade," said managing director Anil Gupta.

"Therefore the bulk of our efforts will be directed towards the Amiga, although there are a number of releases for the Atari ST and the IBM PC."

Phalanx, *Demolition* and *Space Battle* will cost £9.95.

Further information from Anco, 35 West Hill, Dartford, Kent DA1 2EL, telephone (0322) 92513/8.

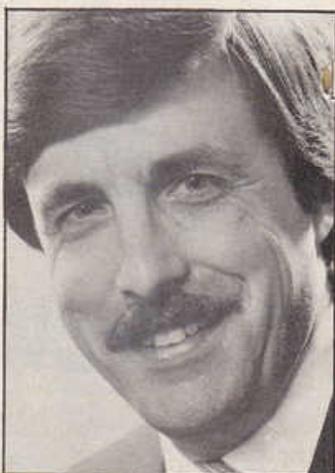
MICROPROSE is extending its hardware operation with the appointment of John Sage as product manager for the Suncom range of joysticks and other accessories.

Microprose recently announced a sales, advertising and promotion contract with the Chicago-based manufacturer, which makes monitor and printer stands and diskette storage cases, in addition to joysticks.

Sage took up his appointment on June 1, and moved from Leisuresoft, where he had responsibility for its Power Play range of joysticks.

"Previously only part of the Suncom range has been available within the UK although it has had stronger representation in Europe," he said.

"Now we will be promoting the complete range with the first major showing taking place at the PCW show this September."



John Sage

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NEWS ON
10 & 12**

Piranha

THE *Big* SLEAZE



THE BIG SLEAZE

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BONUS

The long awaited electronic mag SCEPTICAL 3 is included free with the game.

DELTA 4

NEXT
WEEKSPECIAL
supplement

Sharp to launch sub-£1000 laptop PC in September

Communications

News from the world of communications, including an update on Spectre and Microtext comms products for the Spectrum, Miracle's QL modem and Stradcom, an internal modem and sophisticated software for PC clones.

Spectrum Plus 3 firmware

More on the Spectrum Plus 3; how the disc operating system works and Plus 3 Basic.

The Psion Organiser

Programs report - where the Psion organiser hand-held computer has found its devotees, and a look at two new software packages for the machine - *Comms Link* and *Pocket Spreadsheet*.

Airball - new from Microdeal

You want 3D style perspective? You want glorious colours? You want smooth animation? You want to cheer up your ST no end? Take a look at *Airball*, from Microdeal.

First steps in machine code

Kenn Garrock continues his series, with an explanation of mnemonics and using assembler programs.

SHARP launched a new IBM compatible portable PC at last week's Comdex show in Atlanta, Georgia. Its UK price should be under £1000 when it reaches UK dealers in September.

The PC-4501 - which makes its UK debut at the *PC User* show at the end of the month - is the entry-level model in a range of new additions to Sharp's PC line-up.

It is a battery-powered machine with a backlit Super-twist LCD screen. Standard Ram is 256K, expandable to 1.6Mb.

The 4501 has a single 3½ inch floppy drive with 720K capacity, and a second floppy drive can be added internally. A twin floppy machine, the 4502, will be available in October.

MSDOS 2.1K is the bundled



Sharp's PC-4501

operating system, and the 3½ inch drive will enhance the machine's IBM compatibility.

"It's definitely aimed at a newish market," said national sales manager Tony Hall, commenting on the sub-£1000 price tag.

"And as far as the twin-floppy

model's concerned, you know whose market we're aiming at there!"

The PC-4501 and 4502 are two of several new computer-related products which Sharp is releasing between now and the New Year, including printers, scanners and XT-lap-tops.

Peripherals for yer C64

YORK Electronic Research (YER) has announced an RS232 interface for the Commodore 64.

The product enables users to hook up to a wide range of peripherals such as printers and modems.

It features a cable, 4000 word manual including troubleshooting guide and utility software including a terminal emulator.

The support software comes on tape or disc, and the product costs £29.99 inclusive.

Also from YER is a fast editor/assembler for the C64. It enables code to be repeatedly edited, assembled and executed without waiting for file accesses.

Source files can be chained together, so that programs of



YER RS232

up to 38k may be assembled in one go. The editor/assembler costs £12.99 inclusive.

Both products are available

from York Electronic Research, The Fishergate Centre, York YO1 4AB, telephone (0904) 610722.

ST Election special (yawn)

ELECTION night saw several radio stations and newspapers using an ST election forecasting program to project the results for real.

The Election Program is a dedicated database and statistics program containing majority sizes, opinion poll results, turnout, from the 1983 General Election.

There are, in addition, factors which can take account of tactical voting in favour of any of the four main parties, so that results can be calculated in terms of one particular constituency, a region, the country as a whole, or percentage swing.

The full-colour program was commissioned by Radio Piccadilly for its election night coverage, and a number of regional radio and television stations and newspapers have expressed interest.

Some papers have also been using printouts produced with the program.

"The latest projection gives a hung parliament with the Tories as the largest single party," said Mike Reynolds-Jones, managing director of distributor Software Express, last week.

He added that the projection was changing daily - one forecast before the election suggested the Ulster Unionists could hold the balance of



A politician

power.

The Election Program costs £29.95 from Software Express,

514-516 Alum Rock Road, Alum Rock, Birmingham B8 3HX, telephone (021) 328 2585.

Activision's new Sierras ready for delivery

ACTIVISION has now sealed its distribution agreement with the U.S. software house, Sierra on Line.

The first two titles to be released under the new arrangement are U.S. chart hits *Kings Quest III* and *Space Quest*.

Kings Quest III is the third in

the popular American *Kings Quest* adventure series, and will be available in the UK at the end of June. The price should be around £24.99 for the Atari ST and £29.99 for the Apple II series, Amiga and IBM PC versions.

Space Quest, programmed by the same people who con-

jured up the *Kings Quest* series, is a humorous action and adventure space game with the usual destroy enemy star ship type plot.

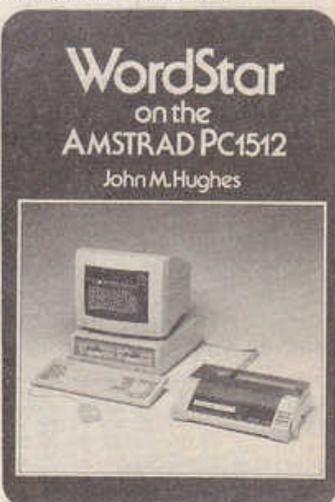
This game will be released in the UK at the end of July at the same prices as *Kings Quest*.

For further information, contact Activision on 01-431 1101.

PC1512 books blitz

SIGMA Press has published two new books for the Amstrad PC1512.

WordStar on the Amstrad PC1512 is written by John Hughes, author of the popular *Mastering your Amstrad PCW 8256/8512*. This book is aimed at those just starting out in computing, and details the whys and wherefores of how your Amstrad works with WordStar. The book also includes several chapters on similarities with and differences from other versions of WordStar.



WordStar

The second book, by Paul Davies and Nigel Backhurst, is for both experienced users and newcomers to the MS-DOS/PC-DOS operating systems. *Exploiting MS-DOS on the Amstrad PC1512 and all IBM Compatibles* covers all aspects of MS-DOS usage from getting to grips with the terminology and initial tasks to enhancements such as tape streamers, additional disc drives and CD-ROM.

WordStar costs £10.95, and *Exploiting MS-DOS* will set you back £12.95. Both books are marketed and distributed by John Wiley and Sons, and further information can be obtained from Sigma on 0243-770355.

THE ASSEMBLER'S DREAM

Tony Kendle reviews *Devpac 2*, the latest and most eagerly awaited of the "new wave" assembly language development systems. But does it live up to expectations?

Regular readers will be aware that there is a veritable renaissance underway in the field of assembly language development systems. Suddenly the old reliable standards, familiar in zillions of extremely average programs that have been churned out by almost every software company you could name, have been left behind.

The first of the 'new wave' was *Laser Genius*, written by Oasis for the Spectrum, Commodore 64 and Amstrad CPC. More recently there was *Maxam II* by Arnor for the CPC 6128 and Amstrad PCW. However, the one that has been most eagerly awaited by programmers everywhere has to be the upgrade of the evergreen *Devpac*, the tool that has bred a generation of Z80 machine code experts from the earliest days of the Spectrum.

There can be no disputing that HiSoft is the master of almost every different programming language available on home computers, a sort of British Borland. More

than anyone it can claim to know what programmers need, and will find useful, because it has had years of feedback from its customers.

The result of its work, *Devpac 2*, is a programmer's joy, powerful, streamlined and easy to use. It is unquestionably the best thing available on most CP/M computers - Tatung Finstein and MSX owners in particular take note, this is the assembler package for those machines.

On the Amstrad range there is more competition from *Maxam II*, and it was the Amstrad version of *Devpac 2* which was sent for review, as much as anything because the PCW, with its fast memory drive is getting a reputation as an excellent program development tool.

Maxam scores through having its own inbuilt file and disc copy and disc formatting routines which make it a complete self-contained package, although as we will see later this also causes problems. *Devpac* comes with a less comprehensive suite of

HiSoft disc utilities (including a file conversion routine for CPC AMSDOS *Devpac* files) which allow much more flexible file copying and erasing, etc, than can be achieved with the standard commands. The original *Devpac80* files are also included for anyone who wants to gain familiarity with the new modules one by one.

The *Maxam* editor has the merit of being developed from the superb full featured word processor *Protext*, and therefore is very much better than anything seen before in assembler packages. *Devpac's* new editor has less features, but conversely the ones that are there are more closely integrated with the other parts of the development package such as a menu driven system that will call up the assembler and monitor and assemble the current edited file, or one stored on disc.

The assembler can return direct to the editor once assembly is completed or aborted - it may not seem much but such small points of logistics can take on inflated proportions when you are mid-way through an enormous programming project, and this feature is actually very rare.

Best of all is the ability of the program to remember where errors were found on the first or second assembly pass, and return the user direct to the offending line in the source file with suggestions for what is wrong.

Devpac's editor works with a wide selection of *Wordstar* compatible controls. For those who cannot abide *Wordstar* these control keys can be re-defined, but as it stands it will appeal to a myriad of die-hard programmers whose fingers are irredeemably locked into configurations such as *Control-KD*. Like *Maxam*, files much larger than can fit in the spare memory can be edited and assembled by using the disc as virtual memory.

The *Devpac* assembler largely conforms to the usual Zilog standards but also has been designed to work with files produced by the Microsoft M80 assembler. The internal format of the files it produces are much more standard than *Maxam's*.

Notable features include conditional assembly, a wide range of arithmetical and logical operators, multiple line comments

```
TEST.GEN      LINE:22  COL:1  +GF  INSERT
```

```
*List on
```

```
*H A Simple Program
```

```
;Some equates
```

```
BDOS      equ      5'
STRING_PRINT equ     9
```

```
;The code, automatically ORGed at #100
```

```
ld      sp, (BDOS+1)
ld      de, Message      ;print a message
ld      c, STRING_PRINT
call   BDOS              ;by calling the CP/M BDOS
rst     0                ;return to calling program or CP/M
```

```
;Any old message
```

```
Message  defm  "HiSoft Devpac80 Version 2!$"
```

```
FREE:47452 $■
```

```
$
```

```
Drive is A:
```

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HARD AND FAST

Eidersoft is one of three companies currently producing hard disc drives for the ST. Their Triangel 20Mb Turbo Drive, to use its full name, is a real step up for ST owners, as Mark Hutchinson discovered.

The 1Mb floppies available for the Atari ST can store a lot of files and, after a few years, you will probably find that you have collected several dozen discs. The problem then arises of finding a particular file amongst the collection. Using a language such as Modula-2, which covers two discs, and trying to find that elusive file to compile with it can become time consuming. One answer is to invest in a hard drive.

Eidersoft, aided and abetted by Computer Concepts, is one of three producers of hard drives for the ST (the others being Atari itself and Supra).

Strangely, even with Eidersoft's liaison with Computer Concepts, the *Fast Basic* cartridge icon cannot be displayed on the desktop. Computer Concepts came to the rescue with FASTART.PRG (part of its bundled software), so the cartridge and drive will work together.

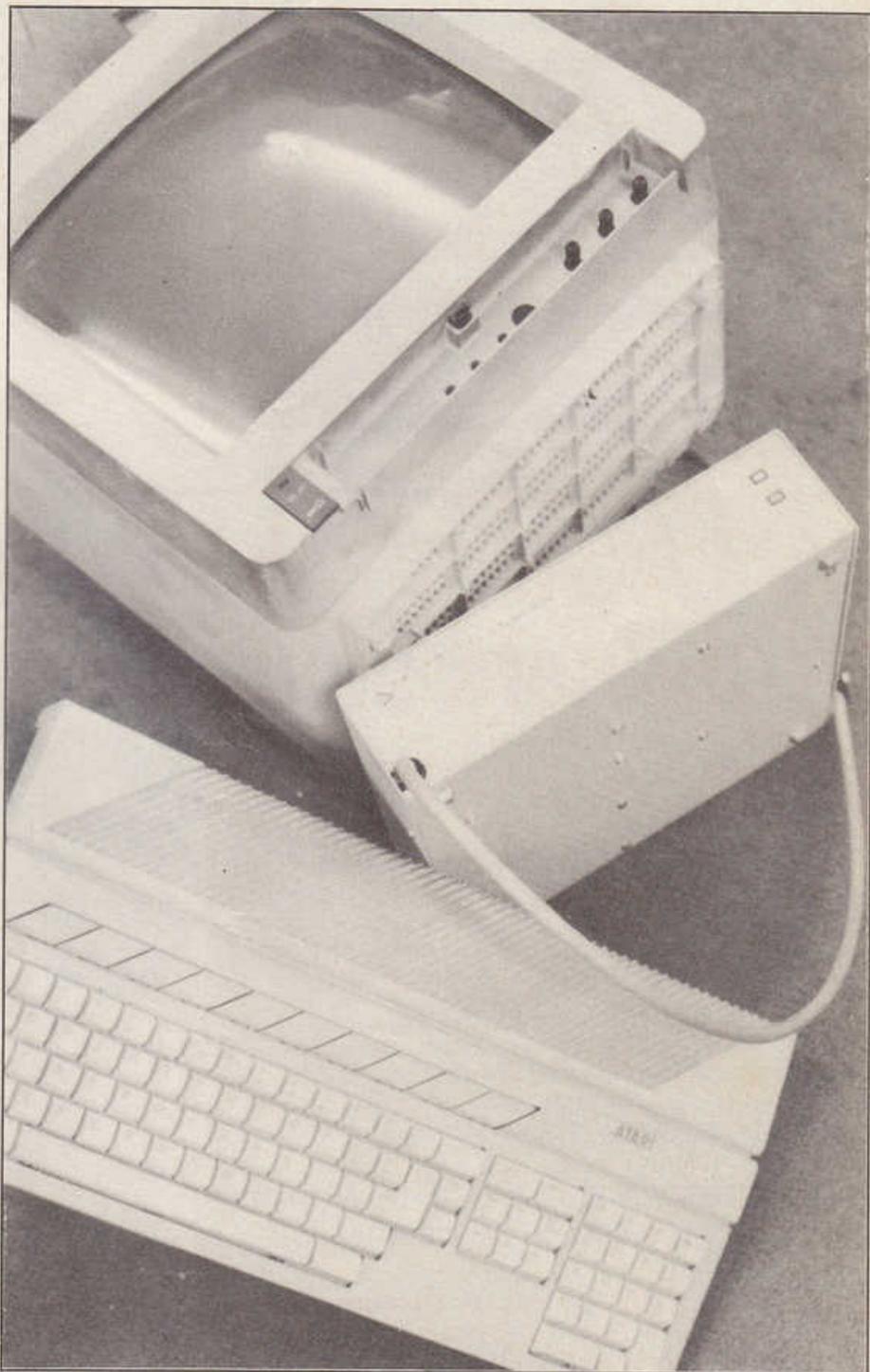
The drive is a grey metal box, about 11 x 11 x 3 inches. The power cable and switch are at the rear and the LEDs and data cable at the front. This can make it awkward to position the unit. I would prefer both cables at the rear and the switch at the front. I would also have liked an additional six inches of data cable.

Turbo drives can be daisy chained using the SCSI interface from Eidersoft. The company now has a second version of the hard disc, with an inbuilt 1Mb floppy, which can be obtained for £872.85.

The drive takes about seven seconds to come up to speed and, apart from the fan, is very quiet. The instructions come in an A5, 24 page ring bound booklet. It has plenty of illustrations, and strangely, for UK producers, a sense of humour. I was sent two discs, one containing the turbo boot programs and the other *Flash-Bak* and *Flash-Cache*. The included *Flash-Bak* program will not work with other drives, but the commercially available version will. I recently received the latest update, version 1.7. I also found that the boot program will not work with the Atari drive (new model).

The first thing I did was to try out the drive to see if any goodies had been left there. No such luck. I went on to format the disc and check for bad sectors. None, which is a great start. Next thing was to partition the disc.

A hard drive of 20 Mb takes a long time to access a program, even with a cache (an area set aside to quickly access often used



Turn your ST upside down with a hard disc drive (centre)

Continued on page 17 ►

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◀ continued from page 15

files), so it is a handy option to section (partition) the drive into separate logical units. The partition scheme gives nine options of two, three or four drives.

I had worked out before the drive arrived which material I was going to store on it, which made life easy when it came to partitioning; in fact I used the standard 4x5Mb units.

This configuration is easily changed after a back up so there is no need to panic during this option.

I found the drive more reliable than the Atari (old version) yet it seemed slower than the Supra drive. However, I have not rested the Supra drive, but seen it accessing about 20 *Neochrome* pictures and this may have been all that was on the disc. I have over 200 pictures, all in a condensed form, plus drawing programs and associated files on a logical unit, thus access time would be slower.

The use of folders has always been limited on floppies, but really comes into its own when used on a hard drive. Unfortunately, the current version of TOS limits the computer to accessing 40 folders. This means that, although you can have as many folders as you wish, the ST can only record the use of 40 folders, even if they are now closed.

HARD AND FAST RULES

The limitation is caused by the inability of the system to clear out the memory used by the folder access routine. However, *Flash-Cache* will allow you to extend the folder-use memory to around 400. If you suddenly find that you have lost directories or have a sudden system crash, then the folder routine is at fault, not your drive. I have experienced this, and all I can say is that panic is a mild variation of what I felt.

System reboot settled the fault, if not my nerves! One point of interest, if you use a cold start give the ST time to settle otherwise no icons are loaded and the boot drive is not accessed.

One of the nice things to come along with the drive was a program called *Autoboot*. This allows you to set up an Auto folder on the hard drive where you can store necessary programs, eg, spooler, time set, etc. The program will then load and run the programs in the order they are stored.

Many years ago, I started out on an 8-bit system using tape. I remember the astonishment when I first used a floppy drive. I experienced this feeling again when I tried out the Turbo drive. For speed and ease of use a hard drive is ideal, and the Eidersoft Turbo drive lives up to expectations.

Product *Triangle 20Mb Turbo Drive*
Micro Atari ST **Price** £688.85 inclusive
Supplier Eidersoft, The Office, Hall Farm, N Ockendon, Upminster, Essex RM14 3QH.

Why a hard disc?

Every computer owner has a wish list of improvements they'd like for their machine.

If you're a Spectrum or Commodore 64 owner you might have your eye on an ST or an Amiga, and it may be hard to imagine those machines being flawed. But talk to owners of those machines and you'll find they have wish lists of their own.

Most users would head up their list with enhanced colour and graphics, or perhaps more memory, or better sound because those things are obvious and tangible. But if you really use your system, probably the most significant addition is a hard disc drive.

Anyone who has experienced the wondrous changes that accompany a move from tape to floppy disc will have an inkling of what a move from floppy to hard disc entails. Except that the improvements are an order of magnitude greater.

Essentially, a hard disc offers enhanced performance in two areas: speed, and storage capacity. But these features in turn allow other changes for the better.

What differentiates the hard disc from its floppy counterpart is physical construction:

- The floppy disc is made of flexible plastic, coated with a thin layer of magnetic particles. The hard disc is usually made of a light metal alloy, such as aluminium.

- Because floppy discs are capable of holding only a few hundred kilobytes of data, they are designed to be removable. Hard discs are usually enclosed in sealed units.

- Since the hard disc can be permanently calibrated, the disc works to much finer tolerances. This means it can be spun very quickly.

- Furthermore, spinning a floppy disc at high speed causes the disc itself to flutter with the risk of the disc smashing into the read/write head. Since the hard disc is rigid, this fluttering is eliminated. Hard discs generally spin at speeds greater than 3,600 rpm.

- The faster speed means that the drive can read and write data much more quickly.

- Finally, the speed improvement also means that far more information can be held on the disc.

In meaningful terms, all of this means that programs and data will load many times faster than from floppy discs (roughly five to 20 times faster), and one hard disc can hold from five to more than 100 megabytes of data, or the equivalent of around 15 to 30 floppy discs.

As attractive as these advantages are, hard discs also offer improvements in another way. Because they are very fast, software can use them as virtual memory, shuffling data from real memory to disc quickly and relatively painlessly.

So, just as a Ram disc can reduce a pressing need for an extra floppy disc drive, so a hard disc can virtually eliminate the need for extra memory over and above the minimum requirement for a program and a reasonable amount of data.

However, there are prices to pay for this power, and not just in financial terms.

Above all is the fact that hard discs are fragile things. The read/write head travels above the disc at a distance measured in thousandths of an inch – less than the thickness of a human hair. While the disc is spinning at thousands of revs per minute, the slightest fluctuation in the head can cause it to nose dive into the disc, eliminating masses of data and doing the head itself no good at all.

This means that you can't shove the drive to one side while it's in operation, and even the passing of the Number 39 bus can be cause for tension.

Second, important data – as with all discs – should be backed up regularly. With a 360K floppy this is not a problem. With 20Mb of data, it can be a time-consuming affair, but one that shouldn't be avoided.

Finally, the dread question of software protection. As with buying a disc drive for a tape-based system, so with a hard disc for a floppy-based system: the usefulness of the hard disc is obviously greatly reduced if you can't get your favourite programs on there.

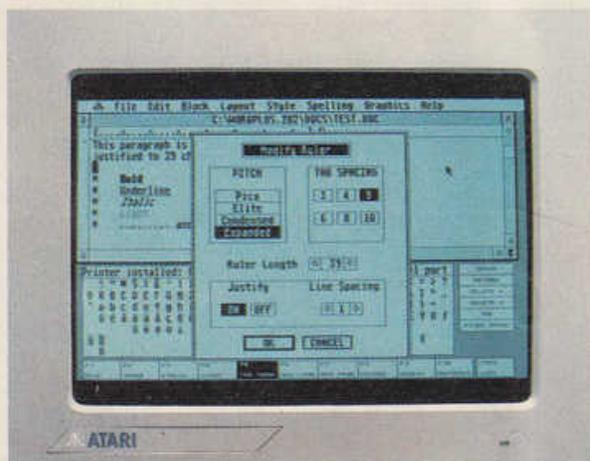
But protection schemes can thwart you, even if you're in possession of an effective disc copier (some protection methods defy all copying software, and some copiers won't work with a hard disc).

The answer to this is in the hands of the software companies. Unprotected software is obviously favourite, followed by external protection, like dongles or entering keywords from a vast manual. Another possibility is the key disc system, where you can work from the copy but at the start of each session you must insert the original floppy disc.

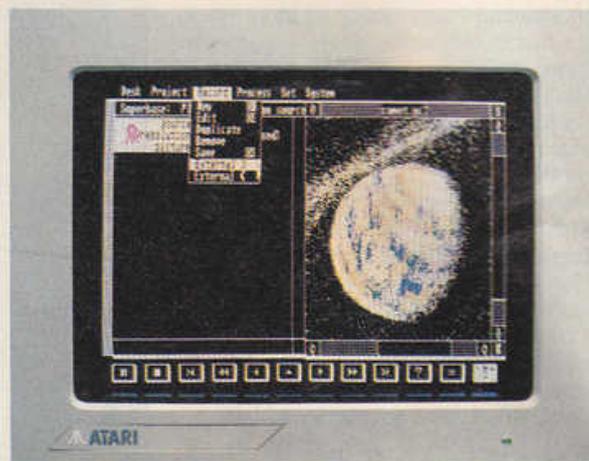
If software houses insist on integral protection methods, it is up to them to provide a hard disc installation program.

As hard discs become more common, a process of natural selection will work against obstructive software companies. Until then you should choose your software with care.

Taxmen, bank managers and accountants are easy to defeat.



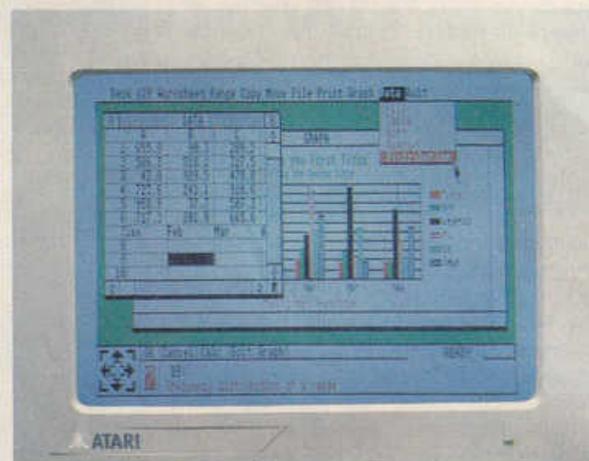
1st Word Plus – G.S.T. Professional word processor featuring U.K. spellings and integration of graphics including 1st Mail for full control of form letters etc.



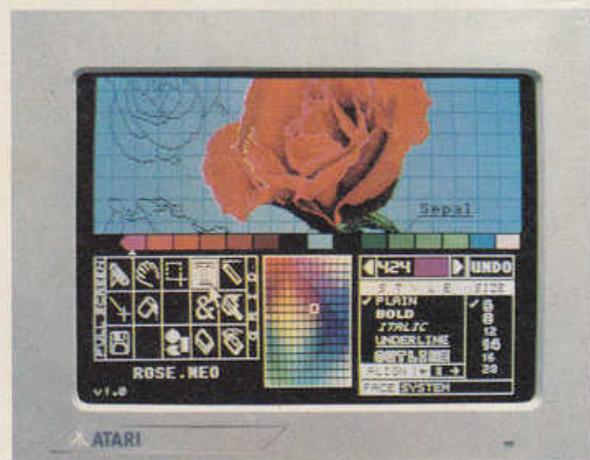
Superbase Personal – Precision Software. All the features of GEM combined with full relational database power. Easy to set up, flexible, plus unique picture index facility.



Fleet Street Publisher – Mirrorsoft. The complete desk-top publishing package. Gives you page make-up combining text and graphics for sophisticated, professional looking documents.



VIP GEM – Silica Distribution. VIP Professional is an integrated spreadsheet, database, and graphics package. GEM environment plus Lotus 1-2-3 compatibility.



Neochrome – Atari. A powerful, sophisticated painting program for unsurpassed graphics. Work boldly on full screen canvas or in minute detail using Neochrome's magnifier.



Fastcom – Atari. A professional communications software package giving access to most major databases worldwide. (Integrated ASCII/Viewdata package).

These other fiends may be a bit trickier.



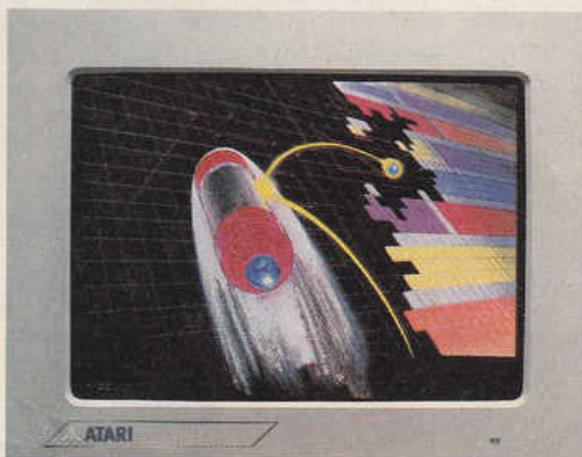
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In fact, whatever you're looking for in a computer, you'll find it in the Atari 520 ST.



ATARI 520 ST
WORKS HARD · PLAYS HARD

Playing the numbers game

In this, the second part of Kenn Garroch's introduction to machine code, he explains the principles of binary numbering and basic machine code operations

The idea behind microprocessors is that they can perform functions that would take a great deal of time and effort with dedicated electronic circuits. To this end, they have a number of data handling commands simply for the logical manipulation of data.

All computers work with binary numbers due to the simplicity of designing an electronic circuit to handle on and off as one and zero. All microprocessor commands therefore manipulate binary numbers, usually in the form of bits, nibbles, bytes, and words, ie in the format of one, four, eight and 16 bits respectively. There is also the BCD (Binary Coded Decimal) format which most modern processors can handle with almost as much ease as the other formats.

Internal registers

The instructions that handle these numbers are pretty much the same on all processors. In fact, processors generally have the same core of instructions, it's the knobs and whistles that make them different. All processors have load and store commands to move data from memory to internal registers and back, eg,

LDA \$OF12 ;6502 instruction to load the accumulator from memory location F12 (hex) or 3858 decimal.

LDA,(SOF12) ;is a Z80 instruction that does the same thing.

The only difference between the two processors, as far as load and save go, are the addressing modes available (see last week). These differences can sometimes be major but the ideas are the same.

Another common feature of microprocessors is their ability to manipulate data. In general, they all do it the same way. They

can AND, OR, rotate, shift, add, and subtract. Again, the differences lie mainly in the way in which the information is accessed, ie, the addressing modes.

Truth table

The AND operation is defined for two bits a and b as:

a	b	a AND b
0	0	0
0	1	0
1	0	0
1	1	1

"All computers work with binary numbers due to the simplicity of designing an electronic circuit to handle on and off as one and zero"

This is what is known as a truth table. It gives all the possible combinations of values of a and b, and the result of the operation on each combination. So looking at the AND truth table, the only time a 1 is produced is when both a and b are 1. Otherwise, the result of the AND is 0.

The OR operation is:

a	b	a OR b
0	0	0
0	1	1
1	0	1
1	1	1

Here, whenever one of the inputs is 1, the output is 1. Expanding things a little, the processor takes a binary number, usually eight bits, and performs the operation on another binary number, leaving the result in the accumulator (for most processors).

So the instruction AND # 15, when the accumulator holds 195, works by taking each bit and performing the AND operation on the corresponding bit in the operand. Therefore:

11000011 is the 195 in the accumulator
00001111 is the 15 to be ANDed
00000011 is the result in the accumulator after the operation.

This example demonstrates one of the major uses of AND which is masking. If the accumulator were holding two BCD numbers, to get at the lower one, simply ANDing with 15 sets all of the top four bits to zero, and leaves the bottom four alone. Check the AND truth table to see how this works.

Masking

AND can also be used to turn specific bits off, ie set them to zero. 255 AND 247 makes bit 4 (bits always counted from 0 to 7) zero, ie, it masks it out.

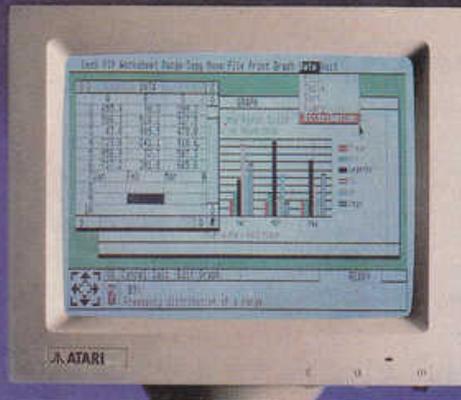
The OR instruction can be used to perform the opposite and turn bits on 240 OR 2 gives 242 since (1 OR 0 gives 1).

11110000 240 (FO in hex which is more compact)
OR 00000010 2
=11110010 242 (F2 in hex, note the easy conversion from binary simply split into sets of 4 and assign hex digits to them)

The AND instruction can also be used as

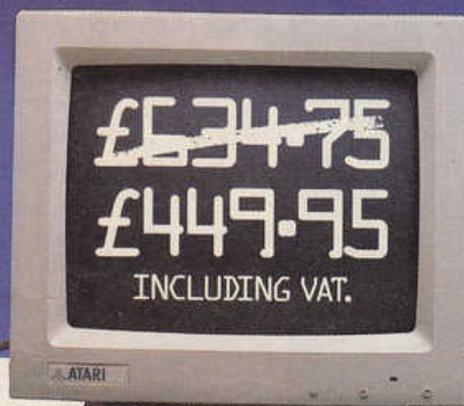
continued on page 22 ►

To help you defeat
the taxman



and destroy the
aliens,

we've massacred
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*Offer includes mono monitor. The 520STM plugs into a standard colour TV.

◀ continued from page 20

a test to see if certain bits are set within a byte. This is where the processor condition flags come in handy. The zero or Z flag is set (to one) when the result of an operation is zero, and reset (to zero) when the result is non-zero, eg to find if a byte has bit 2 set AND with 4 and branch, jump, call on whatever the Z flag says. In 6502 this would be:

```
AND #2 ;test bit 4 note that bits are
        numbered b7b6b5b4b3b2b1b0
BEQ label ;branch somewhere if the result
        is zero ie Z=1
```

The carry flag

Addition and subtraction are just as easy and the use of the carry flag allows numbers to be as large as necessary. Some processors have simple add commands that ignore the current status of the carry, others, like the 6502, use the carry all the time.

The carry flag is set to one when the number in the accumulator is too big to fit, ie,

Binary and hex

Binary is a method of representing numbers to base two. Normal decimal numbers are to base ten and work as: 123 is $(1 \cdot 100) + (2 \cdot 10) + (3 \cdot 1)$ or $(1 \cdot 10^2) + (2 \cdot 10^1) + (3 \cdot 10^0)$

and each digit is one of ten symbols ie 0123456789.

Similarly, binary is to base two so: 1011 is $(1 \cdot 8) + (0 \cdot 4) + (1 \cdot 2) + (1 \cdot 1)$ or $(1 \cdot 2^3) + (0 \cdot 2^2) + (1 \cdot 2^1) + (1 \cdot 2^0)$

and each digit can be one of two symbols, ie 01

Hexadecimal is to base 16 so: A32F is $(10 \cdot 4096) + (3 \cdot 256) + (2 \cdot 16) + (15 \cdot 1)$ or $(10 \cdot 16^3) + (3 \cdot 16^2) + (2 \cdot 16^1) + (15 \cdot 16^0)$

Here there are 16 symbols needed for each digit so A-F are used for the extra 6 ie 0123456789ABCDEF

The other number system sometimes used with computers is octal which is to base 8 so:

3172 is $(3 \cdot 512) + (1 \cdot 64) + (7 \cdot 8) + (2 \cdot 1)$ or $(3 \cdot 8^3) + (1 \cdot 8^2) + (7 \cdot 8^1) + (2 \cdot 8^0)$

and the symbols for each digit are 01234567

BCD (Binary Coded Decimal) is a method of coding decimals so that they fit, two to a byte. This is straightforward since 0-9 fits within 4 bits (0-15). The processor automatically performs the carry from the low nibble to the high nibble after a BCD operation that produces more than 9. For example 12 in BCD is represented as;

```
00010010 binary = 00010010 or 12
Adding 9 in BCD mode gives
00010010 12
+00001001 9
=00100001 21
```

it is more than 8 bits. The ninth bit is stored in the carry.

Higher byte

So adding 253 and 12 produces 265 - in binary:

```
11111101 253 or FD in hex
00001100 12 or OC in hex
00001001 which gives 9 plus the carry
        set - here C=28 or 256
```

To represent this as a two byte number

```
n2 .D2 2
r .DS 2
ADD2 LD HL,n1 ;address of LSBt n1
        into HL
        LD A,(n2) ;LSBt of n2 into
        Accumulator
        ADD A,(HL) ;Add the LSBt on n1
        using address in HL
        LD (r),A ;Store LSBt result at
        r
        INC HL ;HL points to next
        byte of n1
        LD A,(n2+1) ;get next byte of n2
        to A
```

between 0 and 65535 just add 0 and the carry into the higher byte (presuming its zero) giving:

```
0000000100001001 or 265 (0109 in hex)
```

The use of extra bytes is known as multiple precision and allows processors to manipulate very very large numbers. For instance, a 4 byte number (32 bits) allows values in the range $0-2^{32}-1$ (bigger than my calculator will represent correctly). So a 2 byte multiple precision add in 6502 is:

```
n1 .DS 2 ;DS is the define space
        command
n2 .DS 2 ;the 4 following it sets
        aside 4 bytes
r .DS 2 ;32 bit numbers are
        placed in n1 and n2
ADD2 LDA n1 ;get least significant
        byte (LSBt)
        CLC ;set carry flag to zero
        ADC n2 ;add LSBt of n2 plus the
        carry (=0 now)
        STA r ;put the result of the
        add in LSBt of r
        LDA n1+1 ;get next byte of n1
        ADC n2+1 ;add next byte of n2
        plus carry
        STA r+1 ;store this
        RTS ;return to main program
```

In this routine, the carry flag is initially set to zero, since the 6502 add command always adds the two values plus the carry (as one or zero).

Immense numbers

At the second add, adding the carry is good since it automatically works out results over 256 from the previous add. The above example can be extended as far as you like to cope with truly immense numbers.

The Z80 version is:

```
n1 .DS 2 ;set aside memory space for the
        numbers
```

Playing the numbers game

```
ADC A,(HL) ;Add n1 plus carry
LD (r+1),A ;store at r+1
RET ;end
```

This is as close to the 6502 method as possible. In fact it is easier to use the 16 bit register pairs on the Z80 to provide the neater method:

```
ADD2 LD HL,(n1) ;Get two byte num-
        ber n1 to HL
        LD BC,(n2) ;same for n2 into BC
        ADD HL,BC ;16 bit addition ig-
        nore carry
        LD (r),HL ;store result (HL) at
        two bytes starting
        at r
        RET ;end
```

“The thing to remember when programming different processors is to have a good look through their manuals beforehand”

This is shorter and hence faster. For multiple precision, the Z80 is better moving up in double bytes or words (16 bits) since there is an ADC HL, rp (where rp is a register pair BC DE, etc). The thing to remember when programming different processors is to have a good look through their manuals beforehand. Some things are easier, some are harder but they can always be done.

Kenn Garroch continues this series next week.

Khandal 2

Ian Grainger

Khandal returns in the sequel to Khandal, called *Khandal 2* staggeringly enough. Okay, this is going to be a two listing, four week effort so get your

camping bags out now.

The plot: After collecting the scroll of eternal life in *Khandal 1* and reciting the spell, Khandal himself was teleported to a

parallel universe called Kluto because of a coffee stain on the parchment. Your task now is to collect the teleport pass and present it to the teleport officer.

```

10 REM Khandal II (return of a legend)
20 REM Written by Ian Grainger
30 REM Copyright 1987
40 :
50 CLEAR:SYMBOL AFTER 32
60 MEMORY &7FFF:LOAD "!data",&9000
70 GOSUB 1650
80 GOSUB 1740
90 GOSUB 940
100 GOSUB 1990:oni=-1
110 WHILE !=1
120 GOSUB 1070:LOCATE 1,12:PRINT STRING$(25,32):LOCATE 1,13:PRINT STRING$(25,32):icon=13:pa=3:col=1:GOSUB 3440
130 room=12:dir=1:anim=1:wk=1:carry=0
140 icon=0:scr=&C1AC:dat=&921B
150 lum=0:heat=0:door=0:shad=0:dead=0
160 starv=100:score=0
170 WHILE dead=0
180 REM Main Loop
190 CLS#2:fst=0:exit=0:starv=starv-1:GOSUB 2770
200 PAPER 0:PEN 1:LOCATE 9,10:PRINT STRING$(12,131)
210 left=VAL(LEFT$(rm$(room),1))
220 right=VAL(RIGHT$(rm$(room),1))
230 up=VAL(MID$(rm$(room),2,2))
240 down=VAL(MID$(rm$(room),4,2))
250 IF up+down THEN GOSUB 810
260 PAPER 0:PEN 1
270 IF left THEN LOCATE 6,10:PRINT STRING$(3,131)
280 IF right THEN LOCATE 21,10:PRINT STRING$(3,131)
290 GOSUB 2770
300 lscr=&C000:IF left=0 THEN lscr=&C1A0
310 rscr=&FFFF:IF right=0 THEN rscr=&C1B3
320 GOSUB 2770
330 ctr=0:FOR f=1 TO 5
340 IF ch((f-1)*5+3)=room THEN ctr=f:CALL &8000,ch((ctr-1)*5+1),ch((ctr-1)*5+4),ch((ctr-1)*5+5),ch((ctr-1)*5+2)
350 NEXT
360 GOSUB 2770
370 GOSUB 720
380 obj=objrm(room)
390 IF obj>0 AND obj<100 THEN col=3:GOSUB B 3390
400 IF starv=98 THEN mess$="khandal is very strong and healthy.":CLS#1:GOSUB 2610
410 IF starv=50 THEN mess$="you are very
strong.":CLS#1:GOSUB 2610
420 IF starv=70 THEN mess$="khandal is getting weak.":CLS#1:GOSUB 2610
430 IF starv<60 THEN mess$="khandal is exhausted.":CLS#1:GOSUB 2610:dead=1
440 IF dead=1 THEN exit=1
450 IF room=7 AND shad=0 THEN CLS#1:dead=1:mess$="ahh glasshopper, the light is so blite in here. khandal's eyes have been burned out, and he has died of pain.":GOSUB 2610
460 IF room=16 AND lum=0 THEN CLS#1:dead=1:mess$="you silly billy! it is too dark to see a thing. you reach for a light switch but put your finger into a 100.000V power supply. you die in e/vi seconds!":GOSUB 2610
470 IF room=19 AND heat=0 THEN CLS#1:dead=1:mess$="brr...f..f..f..freezing in here. arghh, you have frozen to a space age snowman.":GOSUB 2610
480 WHILE exit=0
490 REM Keyboard Scan
500 press=0
510 IF INKEY(34)<>-1 AND scr>lscr THEN GOSUB 780:scr=scr-2:dat=spwk(2,anim):anim=anim+wk:GOSUB 720:press=1:GOSUB 2770
520 IF INKEY(27)<>-1 AND scr<rscr AND press=0 THEN GOSUB 780:scr=scr+2:dat=spwk(1,anim):anim=anim+wk:GOSUB 720:press=1:GOSUB 2770
530 IF anim<1 OR anim>3 THEN wk=-wk:anim=2
540 IF press=0 THEN GOSUB 2770
550 IF INKEY(67)<>-1 AND oni=1 AND icon>0 THEN icon=icon-1
560 IF INKEY(69)<>-1 AND oni=1 AND icon<3 THEN icon=icon+1
570 IF icon=3 AND carry=0 THEN icon=2
580 IF scr<&C19B THEN GOSUB 780:room=room-1:exit=1:scr=&C1B9
590 IF scr>&C1B9 THEN GOSUB 780:room=room+1:exit=1:scr=&C19B
600 IF INKEY(47)<>-1 THEN ON (icon+1) GOSUB 2860,2950,3130,3290
610 IF INKEY(18)<>-1 AND up+down>0 AND scr>&C1A8 AND scr<&C1AC THEN GOSUB 3470
620 IF dead=1 THEN exit=1
630 WEND
640 WEND
650 IF magic=1 THEN CLS#1:mess$="magic knight pushes a button in the floor and you are sent off to your home in milton k
eynes.":GOSUB 2610:GOSUB 1870
660 mess$="you scored "+STR$(score)+"%":GOSUB 2610
670 mess$="press space to play":GOSUB 2610
680 WHILE INKEY(47)=-1:GOSUB 2770:WEND:CLS#1
690 IF oni=-1 THEN GOSUB 2770
700 oni=1:WEND
710 END
720 REM Print Sprite
730 POKE &803D,&7E:POKE &803F,&12
740 CALL &8000,scr,4,32,&96B0
750 POKE &803D,&1A:POKE &803E,&77
760 CALL &8000,scr,4,32,dat
770 RETURN
780 REM Remove Sprite
790 CALL &8000,scr,4,32,&96B0
800 RETURN
810 REM Print door
820 GOSUB 2770
830 PAPER 0:PEN 1:LOCATE 13,5
840 PRINT CHR$(176)STRING$(2,177)CHR$(178)
850 FOR f=1 TO 3
860 LOCATE 13,f+5
870 PRINT CHR$(179)STRING$(2,32)CHR$(179+f)
880 NEXT
890 LOCATE 13,9
900 PRINT CHR$(183)STRING$(2,32)CHR$(184)
910 IF up=1 OR down=1 THEN FOR f=1 TO 4:LOCATE 14,f+5:PRINT STRING$(2,143):NEXT
920 GOSUB 2770
930 RETURN
940 REM Initialise
950 ENV 1,1,15,2,5,-3,4
960 ENV 2,1,15,1,4,-2,7,-1,4
970 ENV 3,1,15,1,15,-1,2
980 ENV 4,7,2,1,14,-1,4
990 ENV 5,7,-1,1
1000 ENV 6,5,2,1
1010 ENV 7,15,-1,5
1020 ENV 8,50,-1,40
1030 ENT 1,1,-100,1,5,25,3
1040 ENT 2,1,-75,1,4,25,3
1050 DIM in(9,4),tune(2,249),ic(12),ob$(3,12),ch(25),rm$(25),obrm(25),spwk(2,3)
1060 :
1070 REM Renew all variables
1080 RESTORE 3530

```

continued on page 24 ►

PROGRAMMING: AMSTRAD CPC

◀ continued from page 23

```
1090 FOR f=1 TO 9
1100 FOR n=1 TO 4
1110 READ in(f,n)
1120 NEXT n,f
1130 RESTORE 3730
1140 FOR f=1 TO 2
1150 FOR n=1 TO 249
1160 READ tune(f,n)
1170 NEXT n,f
1180 RESTORE 4990
1190 FOR f=1 TO 12
1200 READ ic(f)
1210 NEXT
1220 RESTORE 4680
1230 FOR f=1 TO 3
1240 FOR n=1 TO 12
1250 READ ob$(f,n)
1260 NEXT n,f
1270 RESTORE 5020
1280 FOR f=1 TO 25
1290 READ ch(f)
1300 NEXT
1310 RESTORE 5050
1320 FOR f=1 TO 25
1330 READ a
1340 nm$(f)=BIN$(a,6)
1350 NEXT
1360 RESTORE 5080
1370 FOR f=1 TO 25
1380 READ obrm(f)
1390 NEXT
```

```
1400 RESTORE 5110
1410 FOR f=1 TO 2
1420 FOR n=1 TO 3
1430 READ spwk(f,n)
1440 NEXT n,f
1450 RESTORE 5150
1460 FOR f=1 TO 5
1470 READ ch$(f)
1480 NEXT
1490 RETURN
1500 REM Play away!
1510 REM channel 1 (melody)
1520 en=5:IF tune(1,note)=0 THEN en=0
1530 SOUND 49,tune(1,note)*2+1,20,0,en
1540 REM channel 2 (drums)
1550 d=tune(2,note)
1560 SOUND 42,in(d,1),10,0,in(d,2),in(d,3),in(d,4)
1570 REM channel 3 (backing)
1580 en=6:IF tune(1,note)=0 THEN en=0
1590 SOUND 28,tune(1,note),10,0,en
1600 SOUND 4,tune(1,note)*efct,10,0,en
1610 note=note+1
1620 IF note=250 THEN note=1:efct=(efct+1) MOD 3
1630 RETURN
1640 REM Machine code loader
1650 RESTORE 3590:add=&B000:li=3600
1660 FOR f=1 TO 12:READ a#:c=0
1670 FOR n=1 TO LEN(a#) STEP 2
1680 b#=MID$(a#,n,2):c=c+VAL("%"+b#)
```

```
1690 POKE add,VAL("%"+b#):add=add+1
1700 NEXT:READ a#
1710 IF c<>VAL("%"+a#) THEN PRINT"DATA ERROR in line";li:PRINT CHR$(7):END

1720 li=li+10:NEXT
1730 RETURN
1740 REM Get new character set
1750 RESTORE 4340
1760 s=48:l=10:GOSUB 1820
1770 s=65:l=26:GOSUB 1820
1780 s=240:l=12:GOSUB 1820
1790 s=186:l=52:GOSUB 1820
1800 s=176:l=9:GOSUB 1820
1810 RETURN
1820 FOR ch=s TO (s+1)-1
1830 READ a,b,c,d,e,f,g,h
1840 SYMBOL ch,a,b,c,d,e,f,g,h
1850 NEXT
1860 RETURN
1870 REM Finish game
1880 FOR f=1 TO 300
1890 da=INT(RND*1000)
1900 CALL &B000,scr,4,32,&9000+da
1910 NEXT
1920 CALL &B000,scr,4,32,&921B
1930 FOR f=1 TO 32
1940 CALL &B000,scr,4,f,&7000
1950 NEXT
1960 CLS#1
```

PROGRAMMING: SPECTRUM

Popular Election

Duncan Evans

More of the listing in a minute. First the rest of the instructions.

Defence:

1 - Unilateral disarmament.

2 - Multi-lateral disarmament.
3 - Keep Polaris, scrap Trident.
4 - Scrap Polaris, order Trident.

Health:

1 - Ban private medicine altogether.
2 - Large increase in NHS spending.
3 - Moderate funding for NHS.
4 - Make cutbacks and save money.
5 - Demolish NHS. Private clinics only.

A party's standing in the polls is based on the populations like or dislike of their policies and also the level of goodwill felt towards the party. This figure starts out at

50, sort of average. It can plummet to -100 which means the populace hate your guts personally, and soar to 150 which means they love you. Many of the incidents on the board affect this rating, especially owning newspapers and appearing on TV.

If you're paying attention you'll realise that there's a slight overlap between listings two and one. Listing two is the right one where these clashes occur. There are also a couple of bugs about but I'll have the corrections ready by the time we get to the last piece of code, which should be next week. See you then.

```
1000)LET week=0:LET part
y=1
1050 FOR z=1 TO 3
1100 GO SUB panel: GO SUB dicey
1110 PRINT AT 10,7;"You rolled ";dice
1120 GO SUB 8000+(b(party)*10)
1125 INK 0
1130 LET b(party)=b(party)+dice: IF b(party)>16 THEN LET b(party)=1
1140 IF b(party)>6 THEN GO TO 1190
1150 PRINT AT 17,b(party)*5-4;
1190 IF b(party)<7 OR b(party)>8 THEN GO TO 1210
1200 IF b(party)=8 THEN PRINT AT 5,26;
1205 IF b(party)=7 THEN PRINT AT 11,26;
```

```
1210 IF b(party)<9 OR b(party)>14 THEN GO TO 1230
1220 PRINT AT 0,71-(b(party)*5);
1230 IF b(party)=15 THEN PRINT AT 5,1;
1240 IF b(party)=16 THEN PRINT AT 11,1;
1250 IF party=1 THEN PRINT PAPER 1; INK 7; FLASH 1;"TORY"
1260 IF party=2 THEN PRINT PAPER 2; INK 6; FLASH 1;"LAB"
1270 IF party=3 THEN PRINT FLASH 1; PAPER 6; INK 2;"ALL"
1290 PAUSE 25: GO SUB panel
1300 REM GO SUB 16 board sectors
1310 GO SUB 3000+(b(party)*100)
1320 PAUSE 150: BEEP .2,3
```

```
1330 LET party=party+1
1340 IF party<4 THEN GO TO 1100
1350 LET party=1: GO SUB poll: NEXT z
1360 LET week=week+1
1370 LET party=4: GO SUB panel
1380 PRINT AT 9,6;"in week ";week;" : "
1390 PRINT AT 10,6;"Tories ";toryp;"%"
1400 PRINT AT 11,6;"Labour ";labp;"%"
1410 PRINT AT 12,6;"Alliance ";allp;"%"
1420 PRINT AT 15,6;"Press any key"
1430 LET a%=INKEY$: IF a%="" THEN GO TO 1430
1440 LET party=1: IF week<6 THEN GO TO 1050
1490 REM ELECTION TIME !
```

PROGRAMMING: SPECTRUM

```

1500 PAPER 3: CLS : BORDER 0: INK 7
1510 PAPER 0: FOR f=1 TO 20: PRINT AT f,
1;" " " : NEXT f
1520 PRINT AT 20,23; PAPER 5; INK 0;"
";AT 21,23; PAPER 1;" " ; PAPER 2
;" " ; PAPER 6;" "
1530 PRINT AT 1,1; FLASH 1;" ELECTION
NIGHT " : FOR f=0 TO 19: PRINT AT f,23
;" " : NEXT f
1540 LET seat=650
1545 PRINT AT 4,1;"VOTES CAST -";AT 6,1;
"CONSERVATIVE ";AT 8,1;"LABOUR";AT 10,1;
"ALLIANCE"
1550 LET tory=0: LET lab=0: LET all=0
1560 IF RND*100<(tory AND seat)>0 THEN L
ET seat=seat-1: LET tory=tory+1
1570 IF RND*100<(lab AND seat)>0 THEN LE
T seat=seat-1: LET lab=lab+1
1580 IF RND*100<(all AND seat)>0 THEN LE
T seat=seat-1: LET all=all+1
1600 LET count=INT (tory/32.5)
1610 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,23; PAPER 1;" " : NEXT f: PRINT
AT 20,23; PAPER 5; INK 0;INT (100*tory/
650);"%"
1620 LET count=INT (lab/32.5)
1630 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,26; PAPER 2;" " : NEXT f: PRINT
AT 20,26; PAPER 5; INK 0;INT (100*lab/6
50);"%"
1640 LET count=INT (all/32.5)
1650 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,29; PAPER 6;" " : NEXT f: PRINT
AT 20,29; PAPER 5; INK 0;INT (100*all/6
50);"%"
1660 PRINT AT 6,14;tory;AT 8,14;lab;AT 1
0,14;all
1670 IF seat>0 THEN GO TO 1560
1680 IF tory>lab AND tory>all THEN PRIN
T AT 16,1; PAPER 1; INK 6; FLASH 1;"CONS
ERVATIVE VICTORY " : STOP
1690 IF lab>tory AND lab>all THEN PRINT
AT 16,1; PAPER 2; INK 6; FLASH 1;"A LAB
OUR VICTORY !!!!!" : STOP
1700 PRINT AT 16,1; PAPER 6; INK 2; FLAS
H 1;"AN ALLIANCE VICTORY !" : STOP
1750 REM dicey
1760 LET dice=INT (RND*6+1): RETURN
1765 REM pcheck
1770 FOR y=1 TO 3: IF p(y)<-100 THEN LE
T p(y)=-100
1780 IF p(y)>150 THEN LET p(y)=150
1790 NEXT y: RETURN
1800 REM Data for cd
1801 DATA 45
1802 DATA 25
1803 DATA 15
1804 DATA 10
1805 DATA 5
1811 DATA 55
1812 DATA 30
1813 DATA 15
1821 DATA 50
1822 DATA 30
1823 DATA 15
1824 DATA 5

```

```

1831 DATA 45
1832 DATA 25
1833 DATA 15
1834 DATA 10
1835 DATA 5
1900 REM gosub get
1910 LET a$=INKEY$: IF a$<"1" OR a$>"5"
THEN GO TO 1910
1920 LET a=VAL a$: RETURN
2000 REM Poll display
2010 PAPER 7: INK 0: FOR f=6 TO 15: PKIN
T AT f,21;" " : NEXT f
2020 LET tory=u(e(1))+n(c(1))+f(d(1))+p(
1)
2030 LET lab=u(e(2))+n(c(2))+f(d(2))+p(2
)
2040 LET all=u(e(3))+n(c(3))+f(d(3))+p(3
)
2050 LET toryp=INT (tory*100/(tory+lab+a
11))
2060 LET labp=INT (lab*100/(tory+lab+all
))
2070 LET allp=INT (all*100/(tory+lab+all
))
2080 LET count=INT (toryp/10)
2090 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,21; PAPER 1;" " : NEXT f
2100 LET count=INT (labp/10)
2110 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,22; PAPER 2;" " : NEXT f
2120 LET count=INT (allp/10)
2130 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,23; PAPER 6;" " : NEXT f
2140 RETURN
3000 REM Board options and decisions
3100 LET m(party)=m(party)+15
3110 PRINT AT 9,6;"You're at";AT 10,6;"C
entral Office";AT 12,6;"15k goes into";A
T 13,6;"election fund"
3120 RETURN
3200 PRINT AT 8,6;"Do you want to";AT 9,
6;"spend #5k on";10,6;"personal PR ?"
3210 IF g(party)=0 THEN GO TO 3240
3220 LET a$=INKEY$: IF a$<"y" AND a$<"
n" THEN GO TO 3220
3230 IF a$="n" THEN PRINT AT 12,9;"NO !
" : RETURN
3240 PRINT AT 12,9;"YES !" : PAUSE 25
3250 IF m(party)<5 THEN PRINT AT 14,6;"
NOT ENOUGH";AT 15,6;"MONEY !" : RETURN
3260 LET m(party)=m(party)-5
3270 LET p(party)=p(party)+5+INT (RND*6)
3280 GO SUB pcheck: RETURN
3300 PRINT AT 10,6;"Sunday respite";AT 1
2,6;"No exposure": RETURN
3400 PRINT FLASH 1;AT 8,6;"!! DISASTER
!!"
3410 PRINT AT 10,6;"Party Chairman";AT 1
1,6;"gay affair";AT 12,6;"shock horror"
3420 LET p(party)=p(party)-30-INT (RND*1
5)
3430 GO SUB pcheck: RETURN
3500 PRINT AT 8,6;"Discover what";AT 9,6
;"the nation";AT 10,6;"favours in -"
3510 PRINT AT 12,6;"(1) Education";AT 13
,6;"(2) Economy";AT 14,6;"(3) Defense";A

```

```

T 15,6;"(4) Health"
3515 IF g(party)=0 THEN GO TO 3570
3520 LET a$=INKEY$: IF a$<"1" OR a$>"4"
THEN GO TO 3520
3525 GO SUB panel: IF a$>"1" THEN GO TO
3540
3530 PRINT AT 9,6;"Massive - ";u(1);"%"
;AT 10,6;"Large - ";u(2);"%" ;AT 11,6;
"Moderate - ";u(3);"%" ;AT 12,6;"Small
- ";u(4);"%" ;AT 13,6;"Squeeze - ";u(5)
;"%"
3540 IF a$<"2" THEN GO TO 3550
3545 PRINT AT 9,6;"Huge - ";n(1);"%"
;AT 10,6;"Moderate - ";n(2);"%" ;AT 11,6;
"Stringent- ";n(3);"%"
3550 IF a$<"3" THEN GO TO 3560
3555 PRINT AT 9,6;"Unilat - ";f(1);"%"
;AT 10,6;"Multilat - ";f(2);"%" ;AT 11,6;
"Polaris - ";f(3);"%" ;AT 12,6;"Trident
- ";f(4);"%"
3560 IF a$<"4" THEN GO TO 3570
3565 PRINT AT 9,6;"All NHS - ";l(1);"%"
;AT 10,6;"Large NHS - ";l(2);"%" ;AT 11,
6;"Modrt NHS - ";l(3);"%" ;AT 12,6;"Cut N
HS - ";l(4);"%" ;AT 13,6;"No NHS - "
;l(5);"%"
3570 BEEP 1,3: RETURN
3600 PRINT AT 10,6;"A mysterious";AT 11,
6;"benfactor";AT 12,6;"gives #30K !"
3610 LET m(party)=m(party)+30: RETURN
3700 PRINT AT 9,6;"How much money";AT 10
,6;"to spend on";AT 11,6;"canvassing ?"
3710 IF m(party)<5 THEN PRINT AT 12,8;"
NONE !" : RETURN
3720 IF g(party)=1 THEN INPUT "#";a: IF
a=m(party) THEN LET a=m(party)
3730 IF g(party)=0 THEN LET a=INT (m(pa
rty)/2)
3740 LET m(party)=m(party)-a
3750 LET p(party)=p(party)+INT (RND*1.5*
a): GO SUB pcheck: RETURN
3800 PRINT AT 9,6;"TV Debate !";AT 10,6;
"Do you attend?"
3810 IF g(party)=0 THEN GO TO 3830
3820 LET a$=INKEY$: IF a$<"y" AND a$<"
n" THEN GO TO 3820
3825 IF a$="n" THEN PRINT AT 12,10;"NO"
: RETURN
3830 BEEP .2,5: BEEP .3,15: BEEP .2,9: L
ET a=INT (RND*3)+1
3840 IF a=1 THEN PRINT AT 12,6;"TORY WI
N !" : LET p(1)=p(1)+10: LET p(2)=p(2)-5:
LET p(3)=p(3)-5
3850 IF a=2 THEN PRINT AT 12,6;"LABOUR
WIN !" : LET p(2)=p(2)+10: LET p(1)=p(1)-
5: LET p(3)=p(3)-5
3860 IF a=3 THEN PRINT AT 12,6;"ALLIANC
E WIN !" : LET p(3)=p(3)+10: LET p(1)=p(1)
-5: LET p(2)=p(2)-5
3870 GO SUB pcheck: RETURN
3900 PRINT AT 9,6;"Good write ups";AT 10
,6;"in the press"
3910 LET p(party)=p(party)+INT (RND*12):
GO SUB pcheck: RETURN

```

PROGRAMMING: QL

Font Designer

Steve Turner

This week features the second half of Steve Turner's Font Designer program. All the instructions were given

in last week's issue but if you missed out, back orders can be ordered through Ann Marie Allan at the Popular offices, 12-13 Little Newport Street, London WC2H 7PP.

```

1250 pos=10:FOR x=3 TO 0 STEP -1
1260 FOR y=1 TO 0 STEP -1
1270 CSIZE #3,x,y:CURSOR #3,pos,100:PRINT #3,CHR$(cde);
1280 pos=pos+20
1290 END FOR y:END FOR x
1300 END DEFINE
1310 :
1320 :
1330 REMark * DRAW A BOX (CURSOR) IN THE GRID
1340 DEFINE PROCEDURE box
1350 OVER -1:BLOCK 0,8,xpos,ypos,7:OVER 0:cond=cond+255
1360 END DEFINE
1370 :
1380 :
1390 REMark * PRINT CHARACTER ON SCREEN IN A POSITION DEFINED BY IT'S CODE
1400 DEFINE PROCEDURE p.char (x)
1410 line=INT((x-32)/18):col=(x-32)-(line*18)*24:line=line+10:CURSOR #3,col,line:
PRINT #3,CHR$(x):CSIZE #3,2,0:CURSOR #3,col+9,line:PRINT #3,CHR$(x):CSIZE#3,0,0
1420 END DEFINE
1430 :
1440 :
1450 REMark * FIND VALUE OF EXISTING BYTE IN FONT FROM CODE OF CHAR.
1460 DEFINE FUNCTION VAL
1470 IF cde<127 THEN cpos=(cde-128)*9:cpos=cpos+char_start+911:ELSE cpos=(cde-
32)*9:cpos=cpos+char_start+11
1480 temp=2*(7-(xpos/8)):RETURN PEEK((cpos+(ypos/8)))
1490 END DEFINE
1500 :
1510 :
1520 REMark * DRAW CHARACTER GRID
1530 DEFINE PROCEDURE grid
1540 CLS
1550 FOR x=8 TO 63 STEP 8:BLOCK 1,72,x,1,4
1560 FOR y=8 TO 71 STEP 8:BLOCK 63,1,1,y,4
1570 END DEFINE
1580 :
1590 :
1600 REMark * LOAD EXISTING FONT IF NECESSARY
1610 DEFINE PROCEDURE OLD
1620 CSIZE #2,3,0:CLS#2
1630 INPUT #2;"Load an existing set ? (Y/N) "a$
1640 IF a$="Y" THEN GO TO 1630:ELSE in=CODE(a$)
1650 SELECT ON in
1660 -89,121
1670 CLS#2:INPUT #2;" Enter Device Filename "a$
1680 LBYTES a$,char_start
1690 -78,110
1700 FOR x=char_start TO char_start+1996:STEP 4:POKE,L x,0
1710 -REMAINDER
1720 GO TO 1620
1730 END SELECT

```

```

1740 CSIZE #2,0,0:CLS#2
1750 END DEFINE
1760 :
1770 :
1780 REMark *****
1790 REMark * STANDARD UTILITY SET *
1800 REMark *****
1810 REMark * MAKE 'LOADED' PROG AUTORUN
1820 DEFINE PROCEDURE autorun
1830 LOCAL a$,B$,start:PRINT"\ PROGRAM AUTO RUNNER\\"
1840 INPUT 'ENTER' 'THE' 'COMPLETE' 'FILENAME' 'OF' 'THE' 'PROGRAM' 'a$
1850 OPEN #15,a$
1860 REPEAT ALOOP
1870 IF EOF(#15) THEN EXIT ALOOP
1880 B$=INKEY#(#15):PRINT #2,B$;
1890 END REPEAT ALOOP
1900 PRINT #15,'RUN' 'CLOSE #15:CLS:CLS#2:CLS#0:PRINT #0,'AUTORUN COMPLETE'
1910 END DEFINE
1920 :
1930 :
1940 REMark * DEFAULT SCREEN FOR PROG DEVELOPMENT
1950 DEFINE PROCEDURE start
1960 MODE 4
1970 OPEN #3,acr_512x256a00:PAPER #3,0:CLS #3
1980 CLOSE #3
1990 WINDOW #1,235,256-48,20,0:colour (1)
2000 WINDOW #2,235,256-48,256,0:colour(2)
2010 WINDOW #0,470,48,20,256-48:colour(0)
2020 CLS #0
2030 END DEFINE start
2040 :
2050 :
2060 REMark * SET BLACK WINDOW AND RED BORDER
2070 DEFINE PROCEDURE colour(chan)
2080 PAPER #chan,0
2090 INK #chan,7
2100 BORDER #chan,1,2
2110 END DEFINE
2120 :
2130 :
2140 REMark * SAVE TO M'DRIVE 1 OR 2
2150 DEFINE PROCEDURE totape
2160 LOCAL a$,a1$a2$
2170 start:FLASH 1:PRINT:PRINT 'Drive 1 or 2'
2180 FLASH 0
2190 INPUT #a$:CLS:PRINT 'DRIVE 'a$'\ 'a$'\ 'Prog name?':INPUT #a1$
2200 IF a$<>'1' AND a$<>'2' THEN GO TO 2150
2210 CLS
2220 a2$="adv"&a$&" "a1$
2230 DELETE a2$:SAVE a2$
2240 END DEFINE totape

```

PROGRAMMING: C64

Micromon

P A Fairclough

At last, the concluding instalment of Micromon, the machine code monitor/utility. There follows a chart giving

some of the more interesting address locations used.

Address	Function.	Address	Function.
Useful address locations.		SC420	Interpret address.
		SC442	Interpret character - converts it to a displayable form.
\$0002	Program counter lo.	SC46C	Memory input.
\$0003	Program counter hi.	SC48B	Character memory input.
\$0004	Status Register.	SC4C9	Assemble routine (the big one).
\$0005	Accumulator.	SC63B	Breakpoint routine.
\$0006	X register.	SC658	Routine to handle J command in Walk.
\$0007	Y register.	SC676	NMI handler. Used by Go, Quick and Walk.
\$0008	Stack Pointer.	SC722	Quick routine.
\$0009 - \$0046	General Purpose locations.	SC726	Walk routine.
SC000	Monitor entry point.	SC72a	Go routine.
SC045	BRK handler routine.	SC7B3	Number routine.
SC097	Routine to get a command.	SC842	Out routine.
SC0E2	Routine to output a carriage return.	SC855	Print routine.
SC0E7	Routine to output a character.	SC93C	Kill breakpoint routine.
SC166	Routine to display one of the messages.	SC94D	Display registers routine.
SC19C	Compare/Transfer routine.	SC972	Output a binary number.
SC239	Fill routine.	SC985	Change registers routine.
SC278	Hunt routine.	SC9FB	IRQ handler.
SC2D0	Disassemble routine.	SCA1C	Check for instant commands.
SC311	Disassemble a single address.	SCBA6	Scrolls the screen down by one line.
SC3FE	Interpret routine.	SCCFE	Exchange bases routine.
		SCDBC	Tape handler routine (Save, Load & Verify).
		SCFB6 - SCFFF	Vectors to text, IRQ, BRK and NMI.

```

10467 DATA08,40,09,10,22,44,33,D0,458
10468 DATA08,40,09,62,13,78,A9,00,487
10469 DATA21,81,82,00,00,59,4D,91,603
10470 DATA92,86,4A,85,9D,2C,29,2C,773
10471 DATA23,28,24,59,00,58,24,24,360
10472 DATA00,1C,8A,1C,23,5D,8B,1B,488
10473 DATAA1,9D,8A,1D,23,9D,8B,1D,845
10474 DATAA1,00,29,19,AE,69,A8,19,699

```

```

10475 DATA23,24,53,1B,23,24,53,19,360
10476 DATAA1,00,1A,5B,5B,A5,69,24,675
10477 DATA24,AE,AE,A8,AD,29,00,7C,890
10478 DATA00,15,9C,6D,9C,A5,69,29,753
10479 DATA53,84,13,34,11,A5,69,23,608
10480 DATAA0,D8,62,5A,48,26,62,94,920
10481 DATA88,54,44,C8,54,68,44,E8,976
10482 DATA94,00,B4,08,84,74,B4,28,804

```

10483	DATA6E, 74, F4, CC, 4A, 72, F2, A4, 1268	10499	DATA08, 08, 1D, 18, 41, 42, 43, 44, 335
10484	DATA8A, 00, AA, A2, A2, 74, 74, 74, 980	10500	DATA45, 46, 47, 48, 49, 4B, 4C, 4D, 583
10485	DATA72, 44, 68, B2, 32, B2, 00, 22, 726	10501	DATA4E, 4F, 50, 51, 52, 53, 54, 56, 653
10486	DATA00, 1A, 1A, 26, 26, 72, 72, 88, 492	10502	DATA57, 58, 2C, 3A, 3B, 27, C9, C4, 772
10487	DATAC8, C4, CA, 26, 48, 44, 44, A2, 1006	10503	DATA3B, C6, 9C, C1, D0, C2, FC, CC, 1464
10488	DATAC8, 0D, 0D, 48, 45, 58, 20, 3D, 548	10504	DATA39, C2, 2A, C7, 58, C2, FE, C3, 1223
10489	DATA20, 24, 0D, 44, 45, 43, 20, 3D, 378	10505	DATA3C, C9, BC, CD, FE, C3, B3, C7, 1481
10490	DATA20, 0D, 42, 49, 4E, 20, 3D, 20, 387	10506	DATA42, C8, 55, C8, 22, C7, 4D, C9, 1062
10491	DATA25, 0D, 43, 48, 52, 20, 3D, 20, 396	10507	DATABC, CD, 9C, C1, BC, CD, 26, C7, 1372
10492	DATA22, 0D, 20, 20, 20, 50, 43, 20, 322	10508	DATAC1, C9, C9, C4, 6C, C4, 85, C9, 1429
10493	DATA20, 4E, 56, 2D, 42, 44, 49, 5A, 538	10509	DATABB, C4, FB, C9, 76, C6, 45, C0, 1364
10494	DATA43, 20, 41, 43, 20, 58, 52, 20, 465	10510	DATA1C, CA, 58, C6, 41, CF, 4A, CF, 1069
10495	DATA59, 52, 20, 53, 50, 0D, 4D, 49, 529	10511	DATA51, CF, 59, CF, 61, CF, 7E, CF, 1221
10496	DATA43, 52, 4F, 4D, 4F, 4E, 20, 56, 580		
10497	DATA33, 20, 28, 43, 29, 20, 27, 38, 358		
10498	DATA37, 20, 50, 41, 46, 0D, 09, 07, 331		READY.

PROGRAMMING: ATARI ST

VLabel

David Gristwood

When a disc is first formatted an optional label consisting of eleven characters, can be written to the disc. This name is that one which appears

when Show Info is used from the desktop. The problem is that once a disc has been formatted you cannot change the label, unless you use VLabel of course.

The volume label is stored on the disc in the same way as a file or directory entry. However, it contains a special attribute which marks it as a volume label, so that it does not appear on a normal directory search.

VLabel checks that a disc is present by

first reading the BIOS Parameter Block (BPB), which contains information describing the layout and use of all the sectors on the disc. The root directory, which is where the volume label is stored, starts immediately after the second copy of the File Allocation Table (FAT). On both the 360K and 720K disc the root directory occupies sectors 11 to 17.

The second part of the listing follows next week.

```

v
v
/* Program : VLABEL.C for Atari ST.
/* Function : Change/add (disk) volume label.
/* Written : 4 May 1987.
/* Author : David Gristwood
/* Version : 1.0
/* Amended :
/* Copyright (C) David Gristwood and
/* Byline Software Limited, 1987.
*/

#include "h\stdio.h"
#include "h\osbind.h"
#include "h\gemlib.h"

#define ON 1 /* boolean true */
#define OFF 0 /* boolean false */

#define ESC 27 /* ASCII escape */

#define SECTOR_SIZE 1024 /* max sector size */

#define RWABS_READ 0 /* rwabs() read flag */
#define RWABS_WRITE 1 /* rwabs() write flag */

#define SQ_VIRGIN 0xE5 /* virgin marker */
#define RM_LABEL 0x08 /* label attribute */

typedef unsigned char byte;
typedef int boolean;

typedef struct
{
    short recsiz; /* sector size (bytes) */
    short clisz; /* cluster size (sectors) */
    short cliszb; /* cluster size (bytes) */
    short rdlenn; /* root directory length (sectors) */
    short fsiz; /* FAT size (sectors) */
    short fatrec; /* sector # of second FAT */
    short datrec; /* sector # of first data cluster */
    short numcl; /* # of data clusters on disk */
    short bflags; /* flags */
} BPB;

BPB *bpb; /* active BPB */

short contrl[12];
short intin[128];
short ptain[128];
short intout[128];
short ptsoutp[128];

short handle;
short phys_handle;

short work_out[57];
short work_in[12];

/* main ()
/* Read BPB of disk in default drive. If
/* new volume label specified, search root
/* directory for old entry, and replace.
*/
main()
{
    int drive, sect, slot, rd_start;
    short dummy;
    char rw_b[SECTOR_SIZE], name[80];

    /* start */
    gem_startup();

    /* print copyright message */
    v_hide_c(handle);
    v_clrwk(handle);

    vst_height(handle, 18, &dummy, &dummy, &dummy, &dummy);
    vst_effects(handle, 2);
    v_gtext(handle, 250, 75, "Volume LABEL");
    v_gtext(handle, 75, 125, "Copyright (C) David Gristwood and");
    v_gtext(handle, 230, 150, "Byline Software Limited, 1987.");

    vst_height(handle, 16, &dummy, &dummy, &dummy, &dummy);
    vst_effects(handle, 2);
    v_gtext(handle, 240, 330, "'RETURN' to exit");

    /* get BIOS parameter block */
    drive = 0; /* default drive - 0 = A, 1 = B, etc. */

    v_show_c(handle, 0); /* show incase of disk I/O error */
    if ((bpb = (BPB *) Getbpb(drive)) == NULL) /* bios(7, drive) */
        error("unable to get BPB");
    v_hide_c(handle); /* hide again */

    if (bpb->recsiz > SECTOR_SIZE)
        error("sector size too big");

    /* get new volume label */
    printat(20, 14);
    printcurs(ON);

    printf("Enter volume label : ");
    if (gets(name) == NULL)
        error("gets failed");

    printcurs(OFF);

    /* has user specified a new volume label ? */
    if (name[0] != 0)
    {
        /* change / add label */
        name[11] = 0; /* terminate to max length of 11 chars */
        /* search for label */
    }
}

```

Scroll Clear

Paul Hutchison

This routine for the Amstrad CPC clears the screen by scrolling the entire display off the top of the screen. Use *Call &AB00*.

```

10 MEMORY &AAFF
20 A=43776
30 READ B$:IF B$="-1" THEN END
40 POKE A,VAL("&"+B$)
50 A=A+1
60 GOTO 30
70 DATA 00,3E,19,32,00,AB,06,01
80 DATA 3E,00,CD,4D,BC,3A,00,AB
90 DATA 3D,C8,32,00,AB,C3,06,AB,-1
    
```

Type

Alastair Scott

This Amstrad CPC routine provides the missing CP/M command, Type. The syntax is *Type, filename*.

While the Ascii file being listed to the screen, pressing *Tab* will pause the listing.

```

100 'TYPE command
110 'by Alastair Scott
120 MODE 1:MEMORY &7FFF
130 FOR a=&8000 TO &8052
140 READ b$:POKE a,VAL("&"+b$):c=c+PEEK(a)
150 NEXT:IF c<>9787 THEN PRINT CHR$(7)"ERROR
    IN DATA!":END
160 CALL &8000:PRINT":TYPE,<filename>
    command initialised.":PRINT:END
170 DATA 01,09,80,21,53,80,C3,D1,BC,0E,80,C3
180 DATA 13,80,54,59,50,C5,00,3D,20,38,DD,6E
190 DATA 00,DD,66,01,46,23,5E,23,56,EB,11,57
200 DATA 80,CD,77,BC,30,24,CB,67,28,20,CD,FF
210 DATA BB,CD,4E,BB,CD,80,BC,30,12,CD,5A,BB
220 DATA AF,CD,1B,BB,FE,FC,28,07,FE,09,CC,18
230 DATA BB,18,E9,C3,7A,BC,3E,07,C3,5A,BB,00
    
```

Slow Text

Malcolm Sargent

This BBC routine will make all output to the screen scroll up slowly giving you a chance to examine it before it whizzes past.

```

10 REM SLOW PRINT BY M. SARGENT
20 SPEED=10
30 JUMP =(!&20E AND &FFFF)
40 ?&70=SPEED
50A=&B00
60FOR P=0 TO 3 STEP 3
70P%=A
80[OPT P
90PHP:PHA:TXA:PHA:TYA:PHA
100LDA &70:BEQ salo
110TAX:LDY#0
120.LOOP NOP:DEY
130BNE LOOP:DEX
140BNE LOOP
150.salo PLA:TAY:PLA:TAX:PLA:PLP
160JMP JUMP
170]
180NEXT
190?&20E=A MOD 256
200?&20F=A DIV 256
    
```

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with Kenn Garroch

C for confusion

E J Searle, of Exeter, writes:

Q Some six months ago I decided, after purchasing an Atari 520 STM, that I would attempt to learn the C language in the hope that it would give me more access to the power of the Atari.

I purchased a GST C compiler on grounds of cheapness and having read a review in your magazine which said that it was ideal for beginners. Since then I have been trying to access the libraries, ie, AES, VDI, SUPER & TOS LIB. I wrote to GST but all it suggested was that I should purchase its Fractal generator which includes full C access including Gem library access. I also enquired whether updates to the compiler were provided but I didn't get an answer. Can you help?

A The GST C compiler appears to use run time libraries, ie, the libraries contain preassembled code. The drawback with this is that you cannot root around inside the library files themselves to see what the various functions do.

However, the library functions should be documented in the form of what they do, what arguments should be passed to them, and what they return.

For more details about what the functions do, a book such as *The Concise Atari 68000 Programmer's Reference Guide* by Katherine Peel, published by Glentop Publishers, Standfast House, Bath Place, High Street, Barnet, Herts, 01-441 4130, or *The Anatomy of the Atari ST No. 2* by K Gertis, L Englisch, and R Bruckmann, published by First Publishing, 20B Horseshoe

Park, Horseshoe Road, Pangbourne, Berks, 07357 5244, contains the C bindings for the functions.

For example:

```
scrn=logbase();
```

Where *scrn* is a long *int*, gets the logical screen base address. All you have to do is include the XBIOS library in the C program. This is done with the *include* command although you will have to check how to use *include*, as you may already be using it for *stdio.h* and *stdio.lib*.

A magazine such as *Popular's* sister magazine *ST Update* will also be of use since it contains example C programs as did *Popular's* own series on C a few weeks back. Not having used GST C, I don't know the full details about how to access GEM, AES, etc. However, you might try the following demo:

```
include GEMVDI.LIB
/*use the gem vdi library name included
with GST C */
int contr[12];
int intin[128];
int ptsin[128];
int intout[128];
int ptsout[128];
main()
{
  int handle,pxyarray[12],work_in[11],
  work_out[57];
  int x,y,term;
  for (i=0; i<10; i++)
    work_in[i]=1;
  work_in[10]=0;
  v_opnvwk(work_in,&handle,work_out);
  /* open workstation */
  pxyarray[0]=12000;
  pxyarray[1]=12000;
  pxyarray[2]=12000;
  pxyarray[3]=20000;
  pxyarray[4]=16000;
  pxyarray[5]=20000;
  pxyarray[6]=16000;
  pxyarray[7]=12000;
  pxyarray[8]=12000;
  pxyarray[9]=12000;
  /* set up poly line array of vertices you
  may have to reduce these */
  v_pline(handle,5,pxyarray);
  /* draw a polyline */
  vrq_locator(handle,16000,16000,
  &x,&y,&term);
  /* pause for button or keypress */
  v_cisvwk(handle);
  /* close workstation */
}
```

Spectrum crashes

Les Rothera, of Leeds, writes:

Q My set-up is a Spectrum Plus, Interface 1, two microdrives, Alphacom 32 printer, Tasman B Interface, Silver Reed 1/F44 Interface, Silver Reed EX44 Daisy-wheel typewriter/Printer, and a Taxan K-12 Monochrome monitor.

Using Tasword III for wordprocessing etc. I find that having got everything ready to boot to the EX44, when I do go to print, a couple of lines will be printed and then the system locks up. Sometimes I can get a complete run through the print sequence without any bother, and at other times it is a stop-go situation all the way through.

I have had the Spectrum Plus, Interface 1, Microdrives, and Tasman B interface checked out locally and pronounced fit and well. The Silver Reed and its 1/F44 interface were checked out some twelve months ago and also given a clean bill of health.

I am at my wits' end as to what to do next. Can you supply an answer to my problem?

A There are a couple of possibilities, but from your description it sounds like a crash.

The Spectrum Plus could well be suffering from a power failure, or possibly is being overloaded. Try waggling the power plug on the Spectrum. If this is loose, it will give the crash you describe. Make sure that you waggle the whole length of the cables including the plugs at both ends. If this has no effect then try the interfaces where they connect to each other.

Alternatively, vibration from the printer may be the cause of the problem, so try moving this to a different position (say the floor) where it cannot affect the rest of the equipment. Presumably it has worked before and so will work again.

If there is an overload problem, try running the printer with as little other equipment attached to your Spectrum as possible, such as only the printer and its interface, and see what happens. If things work correctly, add more of your gadgets until problems occur. This should give you a pointer to the problem and its solution.

If all else fails you will have to resort to carting the whole lot to your local Mr. Fixit and have him check out the whole kit and kaboodle. The individual parts of your hardware may be fine but when put together, there may be a problem that doesn't appear on the individual pieces.

Hair tearing on Spectrum

John E Wells, of London E7, writes:

Q Though a middle-aged computer moron, I may be able to help Sean of Westmeath (Peek & Poke, May 15).

I suspect that my setup is similar to his - except that I have an issue three Spectrum.

One of the problems with the Opus is the dreaded 'i/o error' which tells you nothing except that it doesn't work.

After much hair tearing and changing the stepping Rom to little effect, I have found a system that, so far, has generally proven effective, though why I know not.

Simply format a disc. I keep a spare disc handy, formatted or not, since the act of formatting seems to 'kick start' the Opus, and the error report disappears: `FORMAT "m";1;"Hail Mary"` ENTER

I kid you not.

A Some say sticking your tongue out of the corner of your mouth works just as well - and for some it does. Try anything is the rule in this sort of situation.

Isolation ward

John Mitchell, of Wishaw, Scotland, writes:

Q I am retired and have a DAI computer for a hobby. I wish to experiment and control stepper motors via the computer's RS232 or DCE outlets.

Please can you help me with clear information or a source of information on how to completely isolate my computer from any external circuit mistakes while experimenting?

I am keen to experiment but I do not want to do any damage as a result of my ignorance.

A I am no expert on the DAI but I presume that one of the outlets you mention is able to put out controllable signals between 0 and 5 volts as

continued on page 30 ▶

PEEK & POKE

◀ continued from page 29

on and off. If this is the case, an opto-isolator will isolate the computer from any voltage surges that might arise during the course of your experiments.

To isolate the computer, you will have to attach the isolation circuits directly to the machine. However, these are pretty straightforward and so should not cause any problems.

An opto-isolator is a chip containing a light emitting diode (LED) and a photo-transistor. When the diode is off, the tran-

The only problem with using this circuit to connect to a stepper motor is that the photo-transistor is only capable of conducting about 100mA before it melts - a stepper motor would probably require more power than this.

The solution is to use the photo-transistor to drive another, higher power, transistor as in the second diagram. Here, the situation is a little different from the first circuit since the resistor for the photo-transistor is connected from the

tor which is R_m . The value of this depends on the amount of current that power transistor can conduct. Again, the formula $V=RI$ is used. If the power transistor is capable of 500mA then the value of R_m is:

$$R_m = \text{Power supply voltage} / \text{Collector to emitter current}$$

$$R_m = 5/0.5 = 10\Omega$$

Also make sure that the resistor and external power supply can handle this amount of current. The current that flows through the transistor from collector to emitter, following the arrow, is known as the collector emitter or CE current (sometimes shown as I_c). Check the maximum power consumption of the motor before deciding on the transistor.

When you know which I_c you need, get the cheapest NPN transistor with I_c that fits the bill. With transistors, switching speed (the time taken to go from on to off) is what you pay for and in this situation, the switching speed is quite slow so, you don't need to get anything too flash.

The only part of the circuit that is connected to your com-

puter is the LED, everything else is separate, including the power supply for the stepper motor, photo-transistor, etc.

The only drawback of the book is that programs are written in BBC Basic and 6502 machine code. You will have to convert the programs to use them.

The other half

Ron James, of Ribbleton, Preston, Lancs, writes:

Q Having been involved in radio communications for many years with simplex (single frequency) walkie talkies and duplex (double frequency) walkie talkies, I am trying to formulate in my mind where the 'half duplex' used in computer terminology fits in with my understanding of radio communications. It is a term I had never come across until becoming involved with computers.

A As far as I can see, half duplex is more or less the same as simplex. With full duplex, there are two frequencies, allowing both communicators to transmit and receive at the same time. With computer communications, full duplex is the same as with radio except that the transmission speeds are taken into account, ie, the baud rate (changes in state per second or sometimes bits per second).

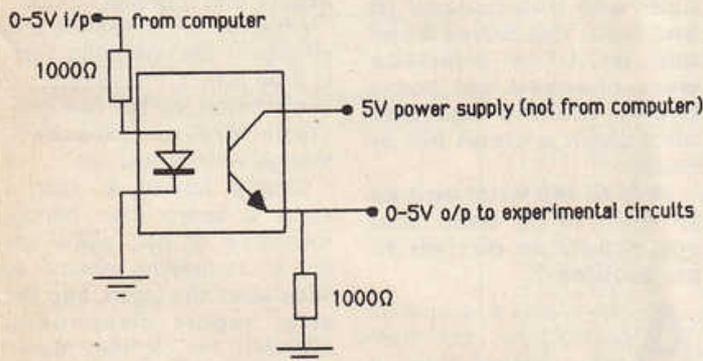
The difference arises when you look at the medium through which the computers are communicating, ie, telephone lines.

Here, unlike radio communications, there is a set bandwidth in which all signals have to fit. For normal BT lines, the limitations are such that normal full duplex is limited to 1200/75 baud (transmit and receive). Unless you use a special phase shifting equalising modem, these two speeds are the limit.

To get higher speeds on both transmitter and receiver, half duplex is used. Here, only one communicator talks at once allowing speeds such as 1200/1200 baud to be used. Since these are both the same speed, this is effectively simplex.

The phrase 'half duplex' covers situations where the speeds are different but there is only one transmitter at a time, eg, it is possible to have 300/1200 half duplex, or 300/75 half duplex.

Diagram one



sistor is off and no current flows between the collector and the emitter (the lead with the arrow on it is the emitter - the arrow pointing out means NPN). When the diode is turned on, the transistor comes on, and current can flow from the collector to the emitter.

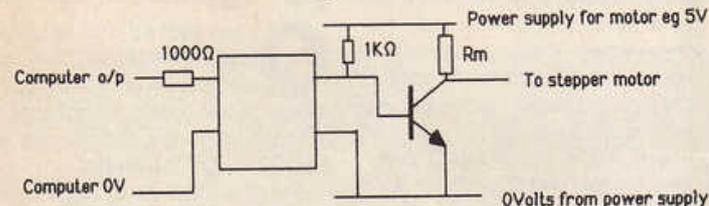
It is necessary to include resistors in the external circuit to limit the amount of current flowing through the device. For the LED, a resistor with a value of

power supply line to the collector (the one without the arrow).

Now, when the LED is off, the photo-transistor is not conducting and the output is connected to the power supply line via the resistor giving a high output. This output is fed to the input of the power transistor, which is turned on pulling the output to the stepper motor down to the 0V line, giving a zero volts output.

Turning the LED on causes

Diagram two



about 1000Ω gives a current of 5mA which is enough to turn it on. Incidentally, the current is worked out with the formula:

$$V=RxI \quad \text{where } V \text{ is the voltage, } R \text{ the resistance, and } I \text{ the current.}$$

In the first diagram, the output circuit is wired so that when the LED is off, ie, 0V input, the output transistor is off and consequently, the output is 0V. When input voltage goes to 5V, the LED comes on, the photo-transistor conducts, and effectively connects the resistor to the 5V power line, pulling the output voltage up to 5V.

the photo-transistor to conduct pulling the voltage input to the power transistor down. This turns off the power transistor and makes the output to the stepper motor equal to the power supply voltage.

The power transistor also needs a current limiting transis-

Parts for the opto-isolator diagram 2

- Opto isolator WL 35Q
- 1000Ω resistor M1k
- Power transistor Ic 15A MJ2955
- R_m 1Ω P1Ω - gives 5 Amps output current approx

puter is the LED, everything else is separate, including the power supply for the stepper motor, photo-transistor, etc.

The maximum voltage that the opto-isolator can stand before it breaks is about 1500V which is more than you are likely to use so whatever you experiment with (as long as its not high energy physics) should not be able to harm the DAI.

I don't know of any books specifically for the DAI. However, there is quite a good book for the BBC micro which will give you a lot of information on the hardware side. Try *Interfacing and Robotics on the BBC Micro* by Ray Bradley from Mircopress, Castle House, 27 Lon-

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem Peek it to Kenn Garroch and every week he will Poke back as many answers as he can. The address is Peek & Poke, PCW, 12-13 Little Newport Street, London WC2H 7PP.



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Don't make your programs too long, please - it's best if we can print the full listing in one week, and a four part listing is probably the largest we can accept. If they're very short, then so much the better, they'll fit neatly into our Bytes and Pieces page.

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We're also particularly interested in articles about programming, which should be sent to Christina Erskine. If you think you could explain technical

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Mark Jenkins welcomes correspondence of a musical nature for Soundcheck, Martin Bryant is interested in any queries or views regarding computer chess, and our communications correspondents will be happy to answer questions about modems and networks (mark your envelope 'Comms').

Any technical or programming problems you're encountering can be addressed to Kenn Garroch. Kenn tries to help as many people as possible in Peek and Poke, but cannot undertake to give personal replies.

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better if you write or telephone first to discuss your ideas with us. Your articles should be typed or word processed, preferably in double spacing, using one side of the paper only.

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Ample new software on the BBC

The BBC Micro/Master series has been churning forth musical software since the Hybrid Music 500 system was upgraded. Here, Mark Jenkins reviews some of the new products.

Mr F G Smith of Newcastle-upon-Tyne has written in explaining that he's a confirmed Commodore 64 fan but recently got hold of an Atari 130XE outfit very cheaply in a Lasky's clear-out sale. He has several music add-ons for the 64 and would like some similar units for the XE.

As far as I know, the only products available at the moment come from 2-Bit Systems, who have a drum sampler and a useful Midi control system. The most professional packages come from Hybrid Arts in the States, but these aren't being imported at the moment, although you could ask Syndromic Music (the importer of Hybrid's 16-bit packages) for more information.

2-Bit markets *Midi Master*, which comes complete with a very simple Midi interface (just a multi-pin connector leading to DIN in and out plugs) and offers an eight-track polyphonic sequencer plus sound editors for the Casio CZ-101 and Yamaha DX-100 synths.

The system is available on tape or disc for £27.50 including p&p. If any other companies have 8-bit music products perhaps they'd like to send them in for review.

Now on to the BBC Micro/Master series, which is putting on a spurt in musical terms following the upgrading of Hybrid Technology's Music 500 system to the Music 5000 specification, their release of the Music 4000 keyboard, and Peartree's introduction of the Music 7000 system.

The Music 5000 (£161 or £69 as an upgrade) boasts many software changes over the original 500 system and is compatible with the Music 4000 keyboard (£169 with software). Music 5000 has 16 voice channels (although the sounds themselves are generated in software) and many preset sound parameters which can be combined to create new voices.

The language used, Ample, allows you to define any set of parameters or any pattern of notes under a single name using the command MAKE. Ample is in some ways similar to Forth so is quite capable of creating computer games and text adventures with music as well.

It's now possible to create music in real time using the real-time sequencer page and to mix it (controlling stereo pan, volume and tone of each sound) using the mixer page. You can still compose using Ample though, and in fact you can convert Ample files into real time music, real time music into conventional musical notation on the screen, and notated music entered from the computer keyboard into Ample.



The Hybrid music system

The sounds are similar to those from a reasonably expensive Casio keyboard with the added advantage of various stack and detuning modes to make terms such as BigModg seem entirely justified.

The new Music 4000 keyboard is similar to the Symphony released a few years ago, and in fact it's possible to upgrade a Symphony to use it with the Music 5000 for £47. A multicore cable connects keyboard to micro and a footswitch carries out various functions.

The four-octave, full-sized keyboard isn't velocity-sensitive but responds pretty well to all playing techniques. Performance parameters such as microtonal or reversed scales are set on the screen and you can program in a chord or a whole sequence of notes to be played with a single finger.

In Split mode each key produces a different sound, repeated in each octave; this is ideal for playing a 'kit' of drum sounds while you're programming a piece, and in fact the drum sounds available are surprisingly powerful. At the moment it's difficult to link up an external drum machine

without some fiddling with the RS432 port, so the drum kit has to be good.

Music 5000 is multi-tasking so you can make a lot of changes while the music is playing, although this doesn't include loading a new "module" from the program disc. Overall the 5000 system is a very flexible and impressive alternative to the sort of extended Midi system some users may find attractive.

It's equally well suited to educational purposes, serious composing, part-time dabbling and composing for games. It will be a more serious proposition for the ambitious when Midi and better drum synchronisation are added using the Music 2000 interface to be shown at the Acorn User show.

Peartree's Music 7000 has little connection with what Hybrid is doing now; it's basically an old Music 500 with a version of Ample on cassette (Hybrid refused permission to market it on Proms) and separate software offering a modified mixing desk page, a sound shaper

page for creative synthesis (rather more visual than the Music 5000 approach), the ability to print out the music stave (Music 5000 can do this too if you have a print Rom), lightpen and mouse compatibility, and so on.

An existing Music 500 (now being given away free with the Master series micros by some dealers) can be updated to a Music 7000 for £39.95, or you can buy both hardware and software for £79.95, although deliveries aren't expected until after the Acorn User show at the end of July.

Hybrid Technology, Unit 3, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP, 0223 316910.

Peartree Computers, Peartree House, No. 1 Blackstone Road, Stukeley Meadows Industrial Estate, Huntingdon, Cambs PE16 6EF, 0480 50595.

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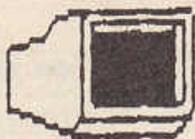
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NEW RELEASES

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Amstrad PCW

Program *Guild of Thieves* **Type** Text/Graphic Adventure **Price** £24.95 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Follow-up to adventuring's gift to the universe, *The Pawn*. Back in Kerovnia, you must strip an island bare of all its valuables in order to prove to the guild of thieves that you are worthy of its membership.

Guild uses the same sophisticat-

ed parser as *The Pawn*; however, while the graphics on the Amiga and Atari ST versions are distinctly nifty, and those on the Commodore 64 pretty damn good, the PCW version's graphics (and this is after you make allowances for monochrome, etc) are a disappointment. Rather blurred and fuzzy.

Of course, if you're a purist who thinks graphics are an irrelevance in adventures, then the delights of the plot and the parser will keep you happy for months.

Program *Witch Hunt* **Type** Text

Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.



See Amstrad CPC for comment.

Program *Psi-5 Trading Company* **Type** Arcade Adventure **Price** £19.99 **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

Welcome conversion of one of US Gold's more intelligent releases.

Amstrad CPC

Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

Classic Quests is a new label from Supersoft. *Witch Hunt* its debut product. You play Filbur Apse in this text only adventure; your only attribute is your obnoxious personality and your quest is to retrieve it after a wizard turns you into someone nice.

If this sounds somewhat off-beat for the traditional text adventure genre, rest assured that witches, wizards and spells are all there in abundance.

Program *Destructo* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8-10 Paul Street, London EC2A 2JH.

Program *Bump Set Spike* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC2A 2JH.

Program *Throne of Fire* **Type** Arcade Adventure **Price** £8.95 (tape) **Supplier** Melbourne House, 8-10 Paul Street, London EC2A 2JH.

About time, too.

Program *Enterprise* **Type** Arcade Adventure **Price** £8.95 (tape) **Sup-**

plier Melbourne House, 8-10 Paul Street, London EC2A 2JH.

Program *Bubbler* **Type** Arcade Adventure **Price** £9.99 (tape) **Supplier** Ultimate/US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Kat Trap* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

Program *Nemesis the Warlock* **Type** Arcade **Price** £8.95 (tape) **Supplier** Martech Software, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE.



Apple II

Program *Guild of Thieves* **Type** Text Adventure **Price** £19.99 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Program *Silicon Dreams* **Type** Adventure Compilation **Price** £19.95 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Level 9's classic (ie. very old, but still very good) trilogy, comprising *Snowball*, *Return to Eden* and *Worm in Paradise*. Be warned, though, there's one of those Rainbird novel-las in the package.

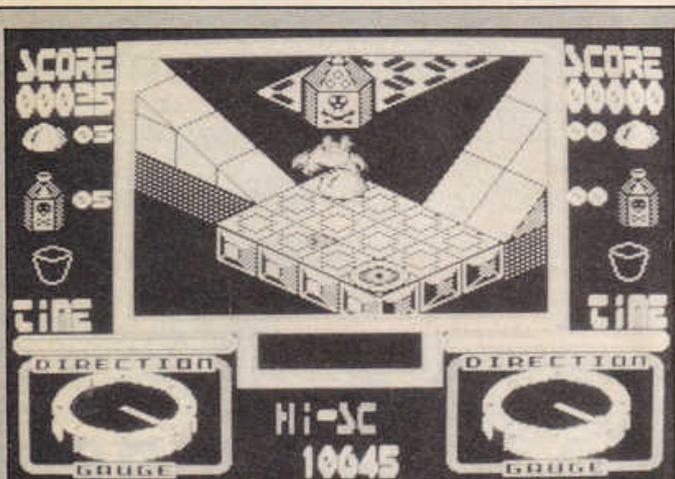
Atari XL/XE

Program *Invasion* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8-10 Paul Street, London EC2A 2JH.

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continued on page 43 ►



The industry's most enigmatic gamesters are back with yet another in their endless series of 3-D Spectrum arcade adventures; but is it any improvement on the last few disappointments?

Ultimate's *Bubbler* is, in fact, something of a departure. While it retains many of the typical Ultimate features, it goes for a much more complex playing area than the usual maze of tricky chambers. Bubbles seem to be in vogue these days, what with Softek's *Bobby Bearing*, Firebird's *Parabola* and Microdeal's *Airball* - perhaps it's because they're easy to design.

Whatever, the plot of *Bubbler* is pretty straightforward stuff; collect poison bottles, corks and mystery bubbles in order to trap the monsters threatening your city, and free it from the spell of an evil sorcerer - or something like that.

On each side of the screen are the counters and icons so beloved of Ultimate, while at the bottom are two direction gauges. These feature rotating arrows which indicate your current direction of movement; pretty helpful when you're a featureless blob.

Your ability to fire bubbles of goop will help you fight off the scuttling crabs, spinning aliens, flying saucers and other horrors which assail you on your quest. All these are pretty standard Ultimate fare. More interesting is the background, which is an eight-way scrolling network of slopes, planes, pipes, platforms and spikes, adding up to one of the most complex playing areas in any Spectrum game.

The masking as sprites disappear behind objects is clever too. While *Bubbler* looks good and seems agreeably complex, there isn't much in it which hasn't been seen before, both in Ultimate games and in several imitators - some of them cheaper than £8.99.

Chris Jenkins

Hall of Fame

Program *Stiffli* & Co Type Graphic
 Adventure Micro Commodore
 64/128 Price £9.99 (tape), £12.99
 (disc) Supplier Palace Software, 276
 Pentonville Road, London N1 9NL



TONGUE IN CHEEK, STIFFLI

Palace Software's releases are few and far between; when they do emerge, though, they tend to be goodies. Witness the excellent chop 'n' slash simulator *Barbarian*, and now the equally excellent (though completely contrasting) *Stiffli* & Co.

Rarely have I seen the idea of the 'icon-driven adventure' implemented with such style and sense of humour. The synthesis of the two forms is managed with great skill, both the graphic and adventure elements being novel and advanced enough to capture the imagination of the most jaded player.

Bonuses are the excellent music and effects by Richard Joseph; well up with your Hub-

bards and your Whittakers if you ask me. Stirring patriotic



themes and good spot effects.

Stiffli is set in the days when the sun never set on the British Empire, when Englishmen were all gentlemen and when Johnny Dago could expect a visit from a gunboat if he stepped out of

line and, yes, it is all tongue in cheek.

Against this scene is played out the drama of the greatest threat to the empire since the Kaiser; Count Chameleon's Rubbertronic Ray, which would take the stiffness out of upper lips, neutralise the starch in wing-collars and radically alter the bounce of cricket balls.

You, Viscount Stiffli, together with companions Col R G Bargie, Prof Braindeath and Miss Primbottom, have travelled to the state of Banarnia to investigate the disappearance of the rubber crop. At the left hand side of the screen are the action icons, the middle is occupied by comic-style drawings of the action, and the characters you

wish to control are selected from the sketches on the right.

As with a conventional adventure, you can speak to other characters, give and take objects, fight, explore your surroundings and check your status. All these functions and many more are selected from the main icons.

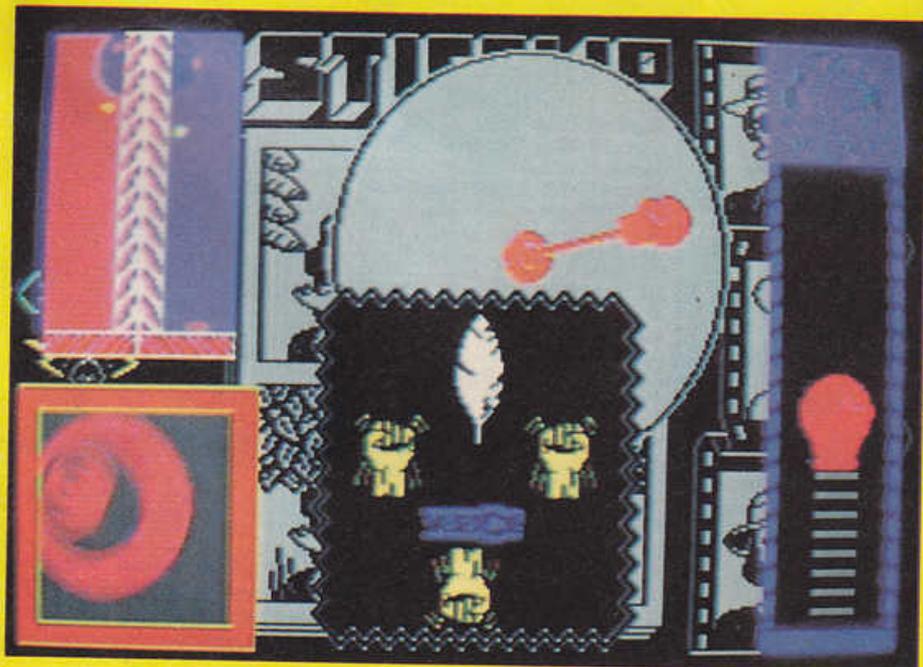
The fight screen is a complex affair requiring you to build up your power and aim at the centre of a movie target in order to throw the most effective punch. You can also opt to run away, or hit below the belt - not sporting, but sometimes effective.

Dialogue with other characters such as General Moustachio appears in speech bubbles, and normally sounds like something from a Biggles novel, while other characters such as the swarthy barman, native and monkey can offer help, advice and clues - or a biff on the nose.

The adventure itself is as complex as you might desire; it took me ages just to work out how to pay General Moustachio the airport tax and get on to the second scene, but after that things started moving at a fair pace, ending with my untimely demise in a jungle animal trap. Back to the start; alternatively, there's a Ram save facility which will avoid hours of trouble.

Most impressive is the character-switching function by which you can abandon one player, switch to another character, and try to solve any given problem from another direction; using different objects, trying different responses to questions and so on. This makes the game almost infinitely variable.

Chris Jenkins



Above right: the title screen. Above left: the status screen shows your strength, and what percentage of the game you have played. Left: the fight screen, where you get to biff people on the nose.

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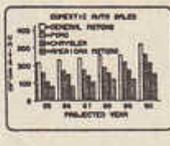
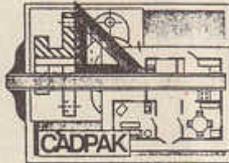
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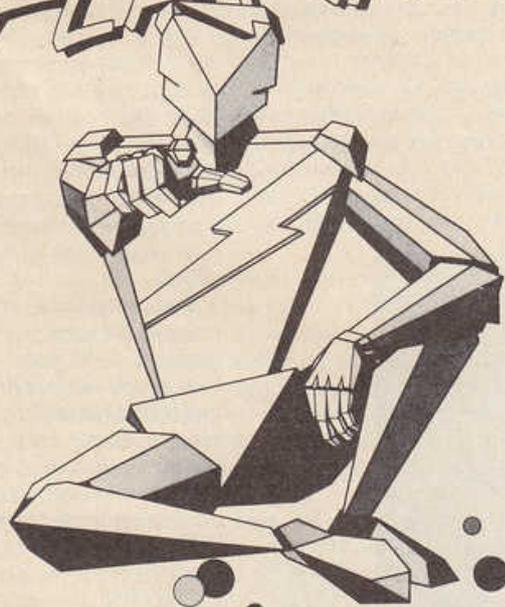
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◀ continued from page 40

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See Amstrad CPC for comment.

Program Thrust **Type** Arcade **Price** £1.99 **Supplier** Firebird Silver, 74 New Oxford Street, London WC1A 1PS.



Conversion of one of last year's arcade shoot'em up gems.

Program GWNN **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC2A 2JH.



Commodore 64/128

Program Colossus 4 Bridge **Type** Card Game Simulation **Price** £11.95 (tape), £14.95 (disc) **Supplier** CDS Software, CDS House, Beckett Road, Doncaster DN2 4AD.



Bridge simulation for those who can't stay on speaking terms with human bridge partners - this one is packaged excellently for beginners or near-beginners.

Program Wonder Boy **Type** Coin-op. Conversion **Price** £9.99 (tape), £14.99 (disc) **Supplier** Activision, 23 Pond Street, London NW3.

See panel for comment.

Program Colony **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8-10 Paul Street, London EC2A 2JH.

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Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

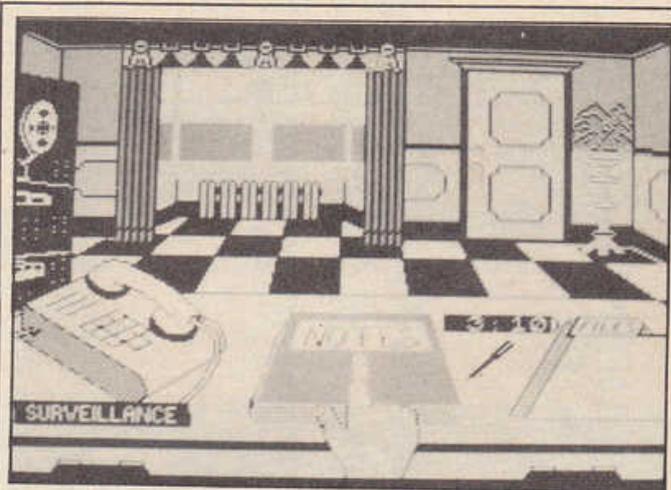
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Program Wiz **Type** Graphic Adventure **Price** £8.95 (tape), £14.95 (disc) **Supplier** Melbourne House, 8-10 Paul Street, London EC2A 2JH.



I hope you like Agatha Christie, because if murder mysteries are not your thing you won't get much fun out of *Killed Until Dead*.

What goes on is this: five of the world's best selling murder mystery writers, known as the Murder Club, have booked into the Gargoyle Hotel for their annual reunion. During the conference they will all try to bump each other off to lay claim to being the world's greatest murderer. Your task, as Hercule Holmes (really!) is to prevent these nefarious acts from taking place, and to get the vital information that will enable you to arrest a suspect.

There are four basic steps to solving the case, the first of which is checking the profiles of the guests, getting to know who dislikes who and what. And why!

Part two concerns break-ins, where the suspects leave their rooms and go a wandering in the night. You have to answer a few questions from a security guard before you can get to do anything useful like tape record meetings or attend them personally.

Step three is actually using your tape recorder to garner useful hints and clues as to the goings on.

The penalty for failing to arrest the right person before midnight is death. Yours and the victims.

There are a few problems with the game. The first is that this was a disc based game so converting it to a tape system has resulted in lots of messing about with the two tapes. The second is that a lot of the notes given in play are riddled with American jargon.

Still, if you can cope with these two things, and you like mysteries, then I think you'll find *Killed Until Dead* intriguingly good.

Duncan Evans

continued on page 45 ▶



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◀ continued from page 43

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Program *Kat Trap* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

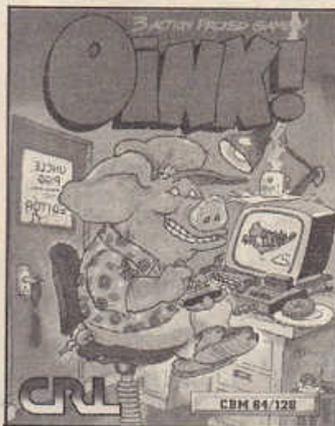
See Spectrum for comment.

Program *Frankenstein* **Type** Adventure **Price** £8.95 (tape), £14.95 (disc) **Supplier** CRL, 9 Kings Yard, Carpenters Road, London E15.



been amassed into the *Oink!* cult or not.

This is the game of the comic. Thus you'll either be tickled to bits by it or completely bewildered.



Program *Zolyx* **Type** Arcade **Price** £1.99 **Supplier** Firebird Silver, 74 New Oxford Street, London WC1A 1PS.

IBM PC and Compatibles

Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

See Amstrad CPC for comment.

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Program *10th Frame* **Type** Ten-pin bowling simulation **Price** £9.99

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Program *Bubbler* **Type** Arcade Adventure **Price** £9.99 (tape) **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Flash Gordon* **Type** Arcade **Price** £2.99 (tape) **Supplier** Mastertronic, 8-10 Paul Street, London EC2A 2JH.

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See panel for comment.

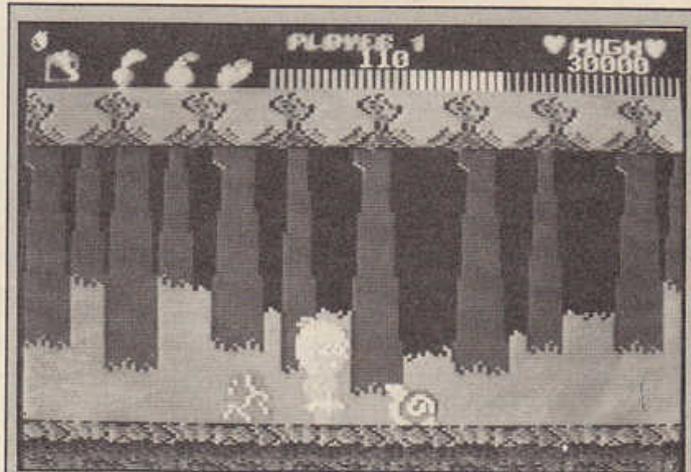
Program *Bubbler* **Type** Arcade Adventure **Price** £8.99 **Supplier** Ultimate/US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Kat Trap* **Type** Arcade **Price** £8.95 **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

Program *Oink!* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** CRL, 9 Kings Yard, Carpenters Road, London E15.

Oink! is a fanzine/comic with a wholly unhealthy obsession with pigs - or a hilariously funny obsession, depending on whether you've



Remember *Hunchback*? Scrolling landscape from right to left, side on view, holes to jump over, things to avoid. That was all three or four years ago.

Now, tart up the landscape, provide a few weapons to collect and use, sprinkle on a bit of platform and ladders and substitute a small golden haired boy for the hero and what have you got? *Wonder Boy*.

The storyline has small brat bouncing through the unfriendly landscape to rescue his girlfriend. In defence of Activision I should say the light first dawned over *Wonder Boy's* nappy in the arcades with Sega's original.

From a technical point of view the game is quite reasonable, the graphics are nice, the animation and scrolling good. Unfortunately from an entertainment viewpoint it is mind numbingly uninspiring. The music is routine and monotonous and the whole affair generates little excitement or interest.

Duncan Evans

CHARTS

Top Twenty

- | | | |
|----|------|-----------------------|
| 1 | (1) | BMX Simulator |
| 2 | (3) | Four Great Games |
| 3 | (2) | Football Manager |
| 4 | (20) | Paperboy |
| 5 | (7) | Feud |
| 6 | (6) | Enduro Racer |
| 7 | (4) | Gauntlet |
| 8 | (-) | Barbarian |
| 9 | (5) | Six Pack |
| 10 | (8) | Konami's Coin-op Hits |
| 11 | (11) | Army Moves |
| 12 | (13) | Ollie and Lisa |
| 13 | (9) | Five Star Games 2 |
| 14 | (14) | 180 |
| 15 | (17) | Head Over Heels |
| 16 | (15) | Milk Race |
| 17 | (-) | Big 4 |
| 18 | (16) | Vampire |
| 19 | (-) | Curse of Sherwood |
| 20 | (-) | Leaderboard |

All figures compiled by Gallup/Microscope

- | |
|----------------|
| Code Masters |
| Microvalue |
| Addictive |
| Elite |
| Bulldog |
| Activision |
| US Gold |
| Palace |
| Elite |
| Imagine |
| Imagine |
| Firebird |
| Beau Jolly |
| Mastertronic |
| Ocean |
| Mastertronic |
| Durell |
| Code Masters |
| Mastertronic |
| Access/US Gold |

HAVE HUMANS OUT-GROWN THEIR USE?

Robots, and more specifically, the Android have gripped the imagination of scientists and sci-fi enthusiasts since the dawn of rational thought.

To create a perfect being in our own image is now much closer to being a reality than Mary Shelley, the author of *Frankenstein*, could ever have imagined.

Two recent technological developments have helped to bring this dream a step closer. The first is the development of the 'bio-chip'; and the second the imminent perfection of the use of superconductors at room temperature.

Briefly, the bio-chip uses organic molecules, such as proteins, to channel the flow of electric current through a circuit, instead of inorganic materials such as the silicon chip. Already, laboratory experiments have shown bio-chips to have a potential for memory far greater than that of silicon-based chips.

One drawback, however, is that they tend to be slower in operation than traditional chips. These bio-chips, therefore, can be considered as similar to the way in which our own biological brains work.

We also, have a far greater memory capacity than a computer-brain. However, we do suffer from the problems of slower interaction between circuits (try beating a computer at mental arithmetic). It would appear, therefore, not to be unreasonable for us to consider the bio-chip as the basic building block of a future human 'look-alike' android.

Computers based on bio-chips (because of their greater memory capacity pro rata) could be much smaller. With further technological advance, it's conceivable that a computer the size of a human brain could have similar faculties and attributes to that

of a 'real' human brain.

Imagine now a latex being with a bio-chip brain; sub-microprocessors dotted around his body to gather information from input devices in eyes, ears, fingertips and feet. Further bio-chips to generate speech and output movements through limbs, wrists, waist, fingers and most importantly - the opposable thumb. A cooling system to aid the heat sinks and dyed red for effect.

What do we have? We have an android! Furthermore, an android who, from the outside at least, is indistinguishable from a human, and equally as intelligent and sensitive. What rights would this being have? Should it be allowed to vote? Or go to a disco? Does it need an MOT? The questions are endless.

But think on. Recent advances in the development of superconductors, and the sudden influx of money into Japanese companies with an interest in the product, suggest that we will soon have superconductors that work, not at near-absolute zero, but rather at room temperature. Superconductors, for the uninitiated, are materials that allow electric currents to flow with negligible resistance, thereby increasing the speed and cost effectiveness of an operation dramatically.

Imagine, if you will, therefore, an android whose brain consists of superconducting circuitry of heuristic design (ie, it learns from its own experiences) and with a bio-chip backup for memory storage.

This android would be astonishingly more intelligent than a human being (and learning all the time) and - provided it can arrange its own maintenance (android doctors based on expert systems perhaps) it will be permanently in peak condition.

Andrew G Stephenson

Puzzle No 261

What is the millionth digit?

By this I mean that if you were to write out every number starting with one and proceeding upwards, at which point would you write the millionth digit?

For example the first 21 digits would be:

123456789101112131415

By continuing in this way can you determine in which number the millionth digit would occur, and what that digit is?

(Of course, it is not difficult to find the result by a process of logical deduction - but can you do it by computer?)

Solution to Puzzle No 256

The fourth triangle in the series is one having sides of 193, 194 and 195 units length, and an area of 16,296 square units.

The standard formula for finding the area of a triangle of which the dimensions of the three sides is known is

$$\text{Area} = \text{SQR}(S * (S-A) * (S-B) * (S-C))$$

where A, B, and C are the sides, and S is half the perimeter, ie, (A+B+C)/2.

This formula is used in line 30 of the program. Starting with a triangle with smallest side 3 units, line 20 computes the sides B and C, and the value of S. This information is then used to calculate the area. If this value is integral (a whole number) the results are printed and variable T is incremented by one to keep a tally of the number of such triangles found. When this value reaches 4, the program stops.

```
10 A=3:T=0
20 B=A+1:C=B+1:S=(A+B+C)/2
30 AREA=SQR(S*(S-A)*(S-B)*(S-C))
   A;" ";B;" ";C;" ";AREA:T=T+1
40 IF AREA=INT(AREA) THEN PRINT
50 IF T=4 THEN END
60 A=A+1:GOTO 20
```

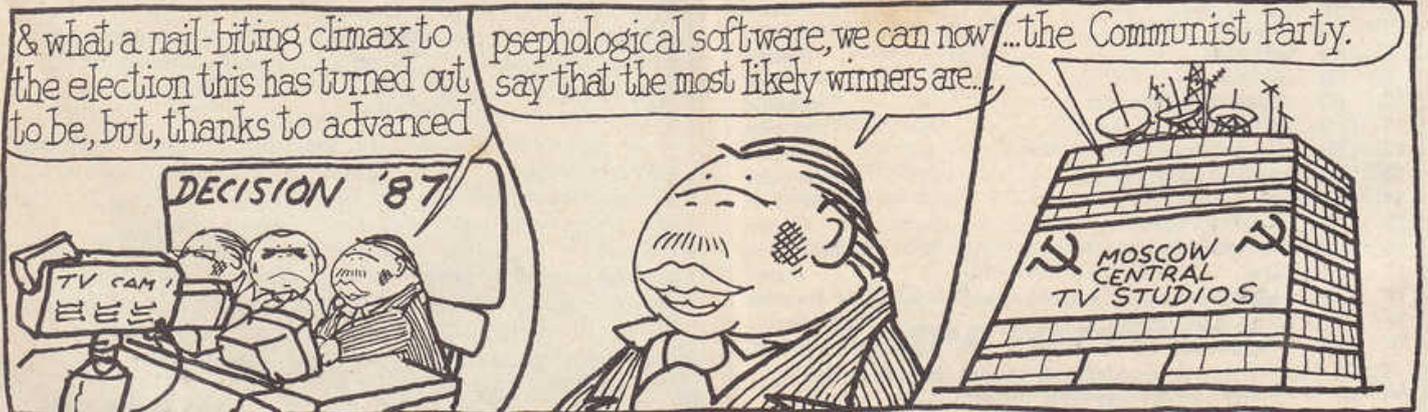
Winner of Puzzle 256

This week's winner is P E Webber of Salisbury Wilts, who will receive £10.

Rules

The closing date for Puzzle 261 is July.

HACKERS



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COMMODORE

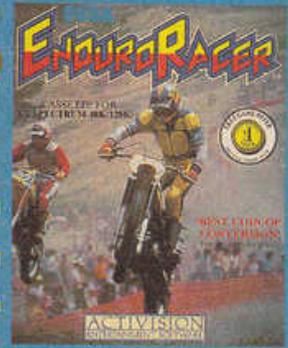
SPECTRUM



SPECTRUM



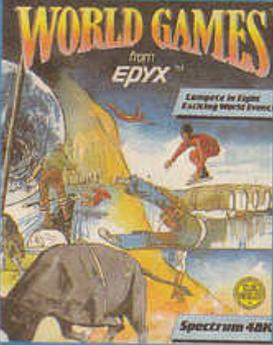
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30.	Paperboy	Elite	C64	9.95

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