

POPULAR Computing WEEKLY



**Amstrad launches
new PC range**

**Psion Organiser's
memory improves**

**Arnor joins the
C brigade**

**Knight Orc
from Level 9**

THE Z88
Sir Clive Sinclair's
portable micro
reviewed
see page 12



ATARI

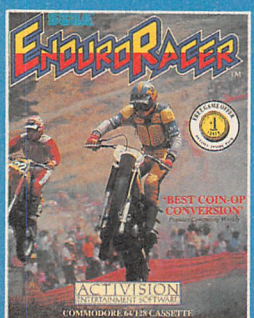
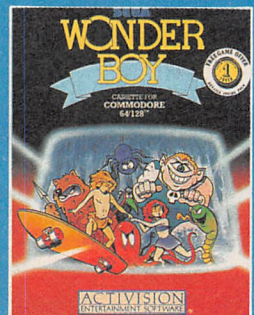
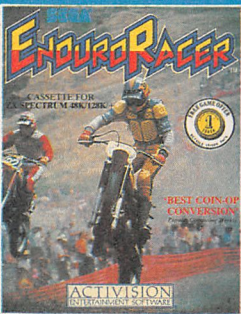
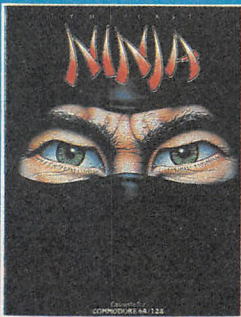
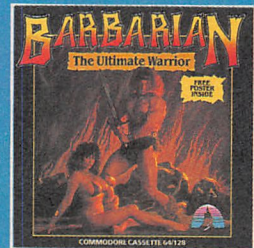
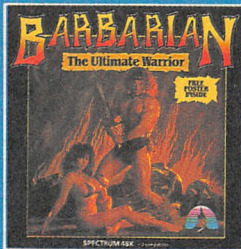
COMMODORE

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JULY 1987

POSITION	TITLE	SOFTWARE HOUSE	MACHINE TYPE	PRICE
1.	Last Ninja	System 3	C64	9.99
2.	Barbarian	Palace	Spectrum	9.99
3.	Enduro Racer	Activision	Spectrum	9.99
4.	6 Pack	Elite	Spectrum	9.95
5.	Wonderboy	Activision	Spectrum	9.99
6.	6 Pack	Elite	C64	9.95
7.	Barbarian	Palace	C64	9.99
8.	Enduro Racer	Activision	C64	9.99
9.	Army Moves	Ocean	Spectrum	7.95
10.	World Games	U.S. Gold	Spectrum	8.99
11.	Metrocross	U.S. Gold	Spectrum	8.99
12.	Saboteur 2	Durrell	Spectrum	7.95
13.	Wonderboy	Activision	C64	9.99
14.	Mag Max	Ocean	Spectrum	7.95
15.	F15 Strike Eagle	Microprose	Spectrum	9.95
16.	Metrocross	U.S. Gold	C64	9.99
17.	Gauntlet	U.S. Gold	Spectrum	8.99
18.	Leaderboard	U.S. Gold	Spectrum	9.95
19.	Big 4	Durrell	C64	9.95
20.	Auf Wiedersehen Monty	Gremlin	Spectrum	7.99
21.	Enduro Racer	Activision	Amstrad	9.99
22.	Sentinal	Firebird	Spectrum	9.95
23.	Konami Coin Op	Imagine	Spectrum	9.95
24.	Auf Wiedersehen Monty	Gremlin	C64	9.99
25.	Quartet	Activision	C64	9.99
26.	Konami's Coin Op's	Imagine	C64	9.95
27.	Paperboy	Elite	Spectrum	7.95
28.	Shadows of Mordor	Melbourne House	Spectrum	7.95
29.	6 Pack	Elite	Amstrad	9.95
30.	Shadows of Mordor	Melbourne House	C64	8.95



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* Items subject to availability

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July 10-16

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Computing
WEEKLY

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Features

- 12 Z88 portable** Sir Clive's new micro is finally finished and being delivered to mail order customers. Does it herald Sir Clive's return to the forefront of computing? Simon Rockman tries out the machine and evaluates its potential.
- 17 Arnor C** Much has been made of C as a fashionable programming language for its speed and versatility, Kenn Garroch puts Arnor's contribution to the genre to the test. The promised review of Betasoft's *Beta Basic 4.0* will be published in next week's issue.



Top: Amstrad's new IBM-compatible PC1640 machine. Above: The Z88 portable

Programming

- 19 Graphics packages - and how to get the best from them** Paul McKinley begins a new series on how to create real pictures, rather than doodles, from the many graphics aids now on the market.
- 22 Listings** Our Spectrum football game continues this week: please note it is now called A Game of Two Halves. We would like to point out that it has no connection with Alternative Software's game, *Soccer Boss*, and we apologise for the error. This week sees the beginning of a two part listing for the Amstrad CPCs, which will give you more graphics commands to use in your own programs, and the start of a two week feature on machine code graphics on the BBC.
- 29 Bytes and Pieces** Short routines for you to type in.
- 30 Peek and Poke** Kenn Garroch answers your programming queries.

Games

- 40 New Releases** Your complete guide to all the games released this week, including Virgin's *Transatlantic Balloon Challenge*, *Bride of Frankenstein* from Ariola's 39 Steps label and *Knight Orc*, the new adventure from Level 9.

Mastertronic Day Out at Silverstone

Due to a postal strike in central London, we are unable to bring you the results of the competition. We have therefore extended the deadline by one week. Winners will have been notified this week - results published next week.

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An unbiased opinion

I finally decided to write my first letter to a computer magazine because of all the rubbish that has been written about the Amiga.

The summarisation of your article on it seemed to be 'the Amiga is better than the ST but don't buy it because the ST has more software available'.

That's just like saying 'don't vote SDP because it's a wasted vote'. What is the point in companies bringing out new computers if you're going to think like that? The Amiga has plenty of software available on import from America and once people over here have bought one, English companies will start to produce more software.

Starglider is 30% faster on the Amiga and Amiga boards are being used in arcade machines by Mastertronic and Bally Midway. I think it's obvious which machine is superior where games are concerned.

If anyone out there is trying to choose which machine to buy I only hope that they chose the Amiga. The present software for it is amazing but once people get to know the system and start pushing the machine to its limits it's going to make the ST look an extremely poor relation.

I don't own either machine so this letter isn't written on the defensive.

Leonard Petch
London N9

The comparative review

Over the past few weeks I have been reading your letters page regarding the merits of the Amiga 500 and the Atari 520STFM. I can no longer keep silent, I just have to set the record straight by showing the merits of both machines together.

Below I have listed the major features of both machines so that they can be compared.

Feature	Amiga	Atari 520STFM	Price
Graphics	Low res	320-200	£389.95
		32 colours	
		320-400	
		32 colours	
Med res		640-200	£929.85
		16 colours	
Hi res		640-400	£149.95
		16 or 4096 using HAM	
Memory	Standard	512K	Total £1069.80
	Expandable to	8.5MB	
CPU		68000 at 7.16MHz	
Mass storage		Internal 880K disc	



"I want something loose and shapeless in which to carry an expanded Psion Organiser"

Atari 520ST

- 320-200
- 320-200
- 16 colours
-
- 640-200
- 4 colours
- 460-400
- Black and white needs mono monitor
- 512K
- 1024K after open heart surgery
- 68000 at 7.16MHz
- Internal 380K disc

These are just a few of the features of both machines, I think they clearly show the Amiga 500 a clear winner.

Most of the letters complaining about the price of the A500 did not take a close look at the specs of both machines. For example the A500 disc capacity is 880K formatted while the STs is only 380K. Also the A500 with or without monitor can display all graphical modes on the same screen, but in the higher resolutions it does get hard on the eyes. If you want to use all of its modes you will require a colour monitor or TV for the first two, but for hi res black and white graphics you will need a mono monitor.

Below I have listed the prices of both machines, adding the required extras to bring the ST up to the A500 standard.

Atari 520STFM keyboard 380K disc	£389.95
extra 380K disc to get close to 880K	£149.95
Med res colour monitor	£389.95
	£929.85
plus mono monitor to use all modes	£149.95
	Total £1069.80

You could get the systems a great deal cheaper if you purchased them at once or used a TV instead of a monitor. I hope you can see the comparison I

am making the ST may be cheap but its spec is much lower than the A500 as you can see when comparing storage sizes and the need for two monitors.

I am sure you are getting fed up with the A500 ST debate but I feel this should put the record straight.

Trevor Monahan
Skegness

Oric Software

In *Popular*, 29 May, you carried a letter requesting information on the availability of software for the Oric Atmos 48k.

I am developing a range of software, on tape, in machine code for and on this machine. I do not write games software, but 'serious' software. Currently in development are a very compact assembler which is relocatable, and loadable in blocks (assembler, disassembler, monitor, etc) to make maximum use of space, also a tape Directory editor which creates a fixed length directory file, then provides many facilities from this. Finally, a set of Basic extensions which includes such commands as IREMOVE, which eliminates all REMs in a program.

I should be very pleased to sell copies of these to your correspondent or any reader, complete with full program notes. Should anyone wish to receive details of these and subsequent programs on completion, I should be pleased to send these on receipt of a cheque/PO for £1.00, which will cover an immediate reply and three sets of details as programs are completed.

John Pearson
The Garden Flat
8 Royal Crescent
Scarborough
N Yorkshire
YO11 2RN

The small number of letters this week is due to the postal strike. We will be back to full strength next week.

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.

Colossus develops its hard pawn

In Game One of our readers' versus *Colossus* chess tournament, the readers, playing black, have voted to move the bishop back to c7. *Colossus* has continued its aggressive pawn expansion, but it may create a weakness in its king's side which the readers can exploit later on.

Over to you

What do you think would be the best next move for the readers' team?

Send your suggested move to either Inter-Mediates (*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, July 15.

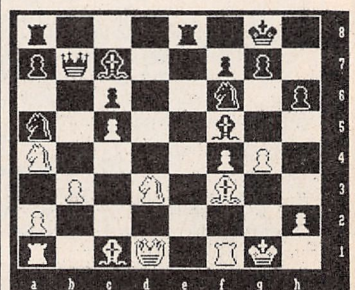
The move which gets the most votes will be entered into the game. Results and *Colossus's* response will be published in two weeks time.

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 | Qc7-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 | Qb5-b7 |
| 21 Pc4-c5 | Bd6-c7 |
| 22 Pg2-g4 | ? |



Commodore 64 PROGRAMMER

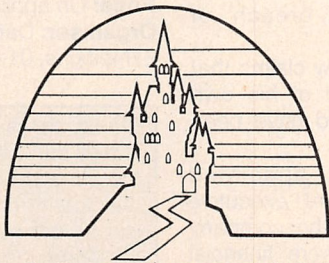
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SYSTEMS ARCHITECTS

Syndicate Dept. Store, Market Place, Kingston Upon Thames, Surrey
KT1 4BR. Tel: 01-549 3028 (24-hr ansaphone) (312)

Amstrad displays new PCs to UK market



AMSTRAD'S PC1640 machines were previewed at last week's PC User show, and the company also revealed the prices of the PC1640 series.

The 360K single floppy disc version will be £918.85 inclusive of VAT, the double floppy disc version £1033.85 inclusive, and the 20 megabyte hard disc model weighs in at £1378.85 inclusive.

Amstrad had taken a late decision to include the ma-

chines on its stand for their UK debut and the machines are now due for release later this month (see *Popular Computing Weekly*, June 26).

Amstrad's chairman Alan Sugar announced at the show that his company is to sponsor a computer marketing course at City University. Amstrad's contribution will be worth £25,000 over two years.

Sugar also took part in a press conference alongside

chiefs from Tandon, Toshiba, Microsoft, Zenith and Dell Computers, and used the occasion to hit out at City analysts, whose revised forecasts of his company's profits for next year wiped thousands of pounds of Amstrad's share price last month.

"The City is followed by analysts, those who get their information from journalists and going along to Dixons," he said.

Sugar also found time to dismiss Dell Computer Corporation's mail order system for selling PCs to business users.

"The British consumer's a little bit smarter than one in North America," he said, and added that he didn't know whether Dell would make it on the European front. Dell's US operation, PCs Limited, last year had a turnover of \$70m.

The next public showing for the new Amstrad machines will be at this weekend's Amstrad Computer show at Alexandra Palace in north London (see Diary Dates).

For the first time, Digital Research, author of the Gem operating system which is bundled on Amstrad's current PC range, the 1512s, will be exhibiting at the show, with its range of Gem applications on display.

DIARY DATES

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 8383

24-26 July

Acorn User Exhibition

Red Hall, Barbican Exhibition Hall, London

Details: Latest hardware and software plus seminars

Price: £2, advance, £3 on the door

Organiser: Redwood Publishing 01-836 2441

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

OCTOBER

15-17 October

Desktop Publishing Show

Business Design Centre, London

Details: Demonstrations of latest hardware and peripherals, plus seminars and user clinics

Price: On application

Organiser: Database Exhibitions, 01-456 8383

Red Box gets analogue and digital device

A NEW interface device is now available for the Red Box home control system.

The Red Three unit enables the user to read, from the computer, information from a range of monitors such as temperature sensors, light meters or humidity detectors. Red Three converts the voltages given out by these devices into digital signals.

Red Three costs £59.95. Details from General Information Systems, Croxton Park, Croxton, Cambs.

Commodore countersues former chief Rattigan

THE acrimony surrounding the departure of Tom Rattigan as chief executive officer of Commodore intensified last week. It emerged that Commodore has responded to Rattigan's \$9m (around £5½ million) lawsuit against the company with a \$24m (£15 million) countersuit.

Rattigan - widely believed responsible for Commodore's recent recovery - resigned two months ago to be replaced by former chairman Irving Gould. A number of sackings followed (see *Popular Computing Week-*

ly, May 1). He sued the company, claiming breach of contract.

Commodore now claims that Rattigan resigned of his own accord, and would have been fired anyway.

Rattigan was appointed Commodore's chief executive at a time when the company was suffering severe financial losses. Rattigan implemented a heavy cost-cutting programme, and presided over Commodore until it recorded its first quarterly profits.

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.

Psion upgrades XP Organiser's Ram

PSION has doubled the memory of its XP version of the Organiser II.

The XP, the more powerful of the series, is now being sold with 32K on-board Ram as opposed to 16K. The price, however, remains the same at £139.50.

The effect of the increased memory is to accommodate larger programs, such as the recently launched *Pocket Spreadsheet*, more quickly and easily.

This move by Psion follows on from the company's introduction of the 32K version of the XP Organiser in the US last month.

In the UK, the XP has outsold its companion machine, the Organiser CM by about three to two.

Psion's chairman, David Potter, claims that over 140,000 Organisers will have been sold by the end of 1986.



ALONG with the launch of the PC1640 machines, Amstrad also launched a new printer in the DMP series, the 3160 model.

Although intended for use with Amstrad's PC machines, the dot matrix DMP3160 will work with any computer with a standard parallel printer output.

Printing speed is up to 160cps in draft mode, 40cps for near letter quality. It will retail at £194.35.

Paperboy delivers to CPCs

ELITE Systems is about to release its successful arcade conversion, *Paperboy*, for the Am-

strad CPC machines almost a year after the game became a hit on the Commodore and Spectrum, and is also planning a version for the ST.

The CPC game will cost £8.95 on cassette or £14.95 on disc, but no firm release date or price have been decided for the ST version.

**More news
on page 10**

SOFTWARE HOTLINES

IN between buying up **Melbourne House**, launching its own video label and generally conquering the universe, the happy band at **Mastertronic** has decided to launch yet another software label.

This one, called **Ricochet** "because it suggests something exciting", is devoted to budget-priced re-releases of old full priced games (if I were given to cynicism I might say that it also suggests something on the rebound, but I'm not so I won't). The first releases on the new label come from a deal with **Martech** for some of its old titles, so look out for *Brian Jacks' Judo*, *Eddie Kidd's Jump Challenge*, and (wild applause from the gallery) *Crazy Comets*, all at £1.99.

And on the subject of the wonderful *Crazy Comets*, the good news is that **Martech's** next game, *Mega Apocalypse* is a *Comets* sequel that the game's author, Simon Nicol, claims is even more frantically action packed than the original. My joystick goes into training right this minute...

If you're in a slightly more refined frame of mind, **Mosaic's** *Yes Minister* might be more your cup of tea. The adventures of hapless Prime Minister Jim Hacker form the basis of a text and graphic adventure in which you have to cope with life at the top, with the help of sidekicks Sir Humphrey Appleby and Bernard.

The game is being written with the help of the show's scriptwriters, but unlike

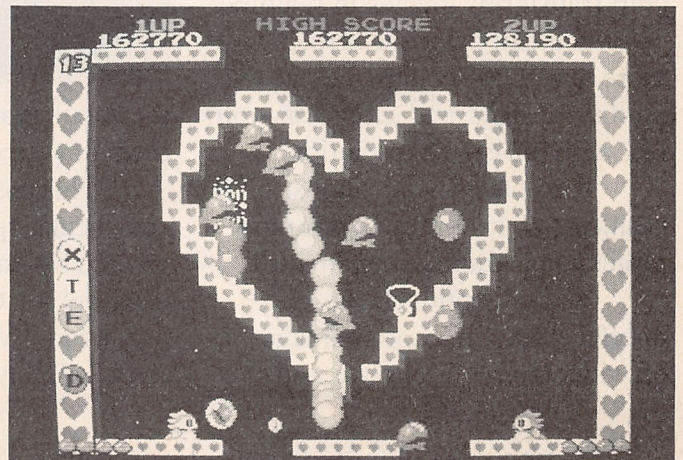
Mosaic's recent *Adrian Mole* games, *Yes Minister* isn't being programmed by **Level 9** (which may or may not be a good thing). **Mosaic** see this as being something of an "executive" game, and they'll be trying to get into the PC market with it as well as the normal C64/Spectrum/Amstrad games market.

Staying at the top end of the market for a bit, there are a few games on the way for the Amiga from **Anco** soon. *Phalanx*, *Demolition* and *Battle*, are more or less complete, but might not be released until the PCW Show in September. Nearer at hand is **Psygnosis'** *Barbarian*, an animated combat game for the Amiga and ST, which looks excellent though there are still a few final bugs that need ironing out. Just to confuse matters, it looks like **Palace Software** will be releasing an ST version of their *Barbarian* game in about a month, too.

Rainbird is weighing in with *Tracker* and *Advanced Art Studio* for the ST. The latter contains a new map-drawing facility, as well as sprite design and animation routines which together can be used to design landscapes and animated graphics for games. It seems that the package is so powerful that **Rainbird** has already been approached by a software house who want to use it for their own games.

Also at BT, **Firebird** is converting the arcade game *Bubble Bobble* (picture below). This is one of those simple and utterly addictive arcade games, and it looks like **Firebird's** version will be pretty faithful to the original, containing all 100 screens, that are in the arcade machine version.

Cliff Joseph



NOW OTHER HOME COM NEW AM

Amiga 500 is here.

With a mind-blowing array of features and capabilities.

And a £499‡ price ticket (ex VAT), hundreds of pounds less than anyone could have predicted.

"...a miracle of compression..." writes *Popular Computing Weekly** "...it all adds up to a formidable system which is clearly better than anything else at the price."

This elegant little machine takes family computing into new dimensions of creativity, excitement and productivity.

It outruns and outguns office PCs as a business multi-tasker, performing a deskful of different jobs simultaneously, at over 7 million steps per second in realtime.

So other home computers may not be the only machines it consigns to the toy cupboard.

AMAZING SCIENCE FACT!

Amiga is used by Disney, Universal and other Hollywood studios for its dazzling 3D graphics manipulation and animation powers.

A sophisticated high-speed graphics processor called a blitter chip transforms images in realtime.

You can paint the screen with more than 4,000 colours. Create and modify designs and effects as you like, with pin-sharp resolution.

You command an almost limitless workshopful of stunning professional graphics capabilities.

With an optional Genlock interface, you can capture images off videotape. Manipulate and mix



them with graphics. Then re-transfer them to videotape!

This means you can produce spectacular special effects like those created by Amiga computers for Channel 4's *Chart Show* and the American TV science fiction series *Amazing Stories*.

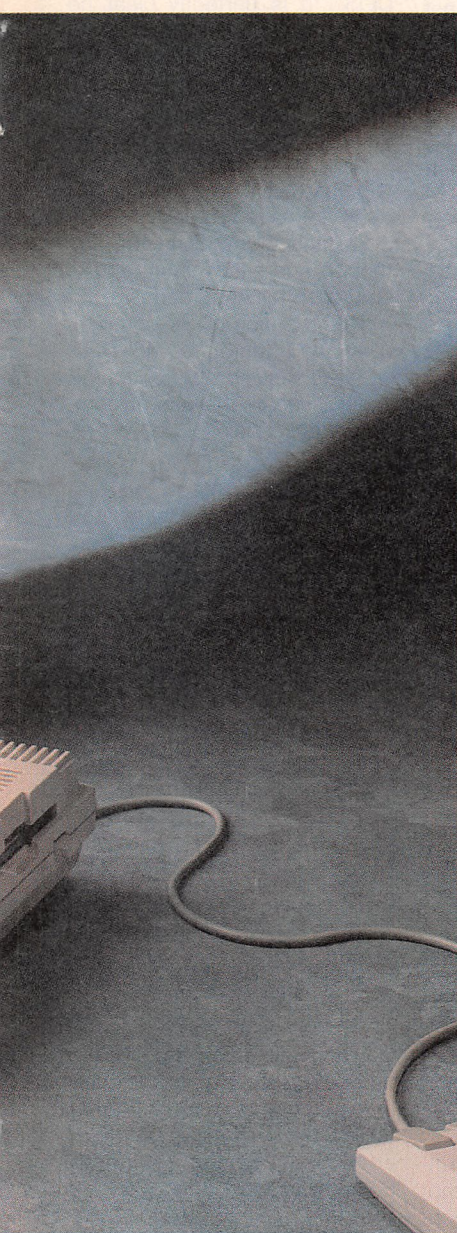
YOU AIN'T HEARD NOTHING YET!

Concealed within the sleek Amiga shape, there is also a pro-quality sound synthesiser and four-track stereo sound system.

Driven by another powerful and unique custom chip, it can synthesise musical instruments and

‡Includes DeluxePaint from Electronic Arts worth £79 + VAT! (Excludes monitor or TV modulator.)

AMIGA 500. COMPUTERS ARE JUST TOYS.



Your Amiga can also synthesise the human voice.

It can speak back anything you care to write on the keyboard.

So this is one computer that can not only word process with faultless professionalism, and incorporate superlative graphics into the text, it can also read the text back to you aloud.

GAMESMANSHIP AND WORKMANSHIP!

The new Amiga 500, in fact, dumbfounds its competitors in every way.

Graphics, stereo sound, multi windowing, multi screens, 512K to 1Mb RAM (expandable by an incredible 8 further megabytes externally**), 3½" internal disk drive with 880K of mass memory, 4 unique dedicated chips plus the 16/32-bit power and 7.14MHz speed of its central processor, communications and vast expansion potential all add up to a computer of immense professional capability.

Yet the same technology allows the Amiga 500 to play games so mind bending that only full-scale arcade machines

have been able to play them until now.

AND AMIGA MEANS 'FRIEND'!

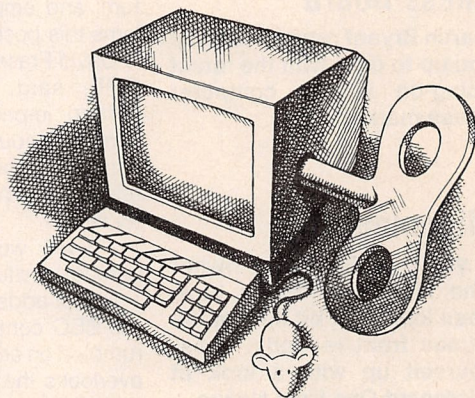
However many of the Amiga's extraordinary talents you find yourself using, they will all be beautifully simple and natural.

You will be totally at home in the friendly and effortless Amiga

environment, where everything happens by windows, icons, mouse and pulldown menus.

And the Amiga 500 simplifies life in another way too.

There is now no comparable home computer. At any price.



Try the astonishing new Amiga 500 at your nearest Commodore Amiga dealer.

And discover why *Personal Computer World*†, having tested the graphics performance of Amiga's latest and most powerful rival, concluded "...Amiga still reigns supreme..."



Commodore

sound effects.

An optional digitiser allows you to take onboard real sounds. Mix and modify the two. Translate your compositions from keyboard to sheet music. Play them back through the monitor's speaker or your hi-fi.

*Popular Computing Weekly, 22-28 May 1987. †Personal Computer World, February 1987. **Subject to availability.

NEXT
WEEK**Graphics**

The second part of our series on how to get the best out of computer art packages. Paul McKinley explains how to manipulate line drawing functions to create quite complex pictures.

Chess Board

Martin Bryant returns to keep you up to date with the latest going-on in the computer chess market.

Micronaut One

If you're a Spectrum owner who feels that things have been looking a bit thin on the games front recently, cheer yourself up with a look at *Micronaut One* from Nexus.

Prestel and Telecom Gold link up

The much-promised 'gateway' between Prestel and Telecom Gold's e-mail service is now open. Steve Gold reports on this new Prestel facility and how it works.

Silverstone results

Apologies, but our Day Out at Silverstone competition was disrupted by a postal strike in London. Results next week.

Spectrum Beta Basic 4.0

Also due for inclusion this week, but unavoidably delayed. Duncan Evans reports on BetaSoft's new upgrade to its Basic series for Spectrum machines.

BBC's Archimedes approval attacked by BMF and RML

by Peter Worlock

THE BBC's adoption of the Archimedes 300 as the latest official BBC micro (see News Desk, June 26) has opened old wounds.

RML, formerly Research Machines, led the attack, calling the BBC's endorsement unfair and inappropriate.

This was followed by a British Microcomputer Federation statement announcing a campaign against the endorsement.

Both attacks centre on the non-standard nature of the hardware and its operating system, and emphasise the problems this poses for education.

David Fraser, chairman of the BMF, said, "Approval will further impact adversely on computer education both in curriculum planning and long term relevance to national and industry needs.

"It will worsen an already damaging situation."

Fraser adds that the row over the BBC contract - which has rumbled on and off since 1982 - overlooks the real problem: the establishment of a certain standard for educational computing, complete at odds with the standard in the "real world".

"BBC Basic and BBC software are often central to computer education, in total contrast to the MS DOS dominated business world," he said.

"The result is poorly prepared students and expensive, time consuming re-learning.

"To perpetuate this situation,

in an industry already suffering from serious skills shortages, is very damaging."

The BMF adds that it is not concerned with the technical merits of one machine over another, or the "seal of approval from a public broadcasting corporation".

RML, however, is very much concerned with this. RML's Mike Fischer - while joining in the non standard line of attack - bluntly states that the BBC should not be endorsing products.

A spokesman for BBC Enterprises said that the latest endorsement was merely a continuation of the BBC computer literacy project. "It is not just a question of putting our name to a machine and waiting for the royalties to come in. There are television and radio broadcasts, software and other publications, exhibitions and seminars, and so on."

Acorn has reacted to the latest row with angry rebuttals and a counter attack on David Fraser.

Michael Page, Acorn's public relations director, said: "It's an indication of his lack of knowledge of what computers are used for in schools.

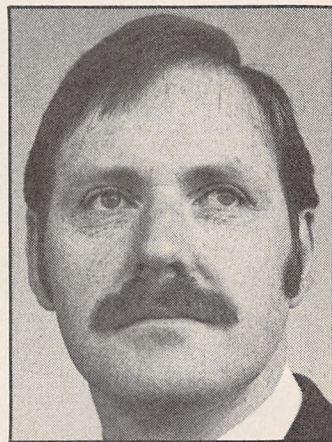
"They are not used for teaching one package, but for teaching across a wide range of computers and a wide range of subjects."

Page and the BBC were also quick to make gain of the fact that Fraser, chairman of the BMF, is also managing director of Microsoft, publisher of MS DOS. "It is perfectly clear he has an axe to grind", said Page.

While Acorn is not a member of the BMF, hardware manufacturers Apple, Apricot, Atari, ICL and RML are all members.

Also Acorn, alone of the British hardware manufacturers, does not have an IBM compatible machine in its range, although Acorn is working on PC emulation for Archimedes.

The question of PC-compatibility, and therefore MS DOS compatibility, is central to the wider issue of the use of computers in schools.



David Fraser of the BMF and Microsoft

Z88 ORDERS 'UP TO DATE'

SIR Clive Sinclair has reacted strongly to our news item last week over delayed deliveries of the Z88.

"The ASA only had one complaint about the advertising of the Z88 - just one, which is hardly 'strong criticism'," said Sir Clive. "They asked us to put the '28 days for delivery' notice in it, which we hadn't done before because it wasn't to be delivered in 28 days. We added the notice for one advertisement before we stopped advertising it.

"Really, the whole thing got out of proportion."

Sir Clive went on to confirm that over half the orders for the Z88 portable machine had been fulfilled last week, and that by the end of this week, "we should be bang up to date".

Cambridge Computers is also confident that the Z88 will be sold in retail outlets - by next month. Although the company would not name any stores, its marketing manager Peter King says that a number of retailers have agreed to stock the machine, starting at the end of July.

Turn to page 12 for a full review of the Z88.

A spokesman for the Department of Education and Science revealed that talks are currently taking place involving the DES, education minister Kenneth Baker, and local education authorities, to determine the future prospects for computers in schools.

"Under normal purchasing agreements, the local authorities can buy what they want," the spokesman said. However, as part of the current discussions, there is a question of whether the government should issue purchasing guidelines.

The subject of these discussions is a £19 million Educational Support Grant from the government to be spent on computers.

LAST week's *PC User* show threw the Amstrad Effect into sharp relief. A year ago Alan Sugar's company hadn't even launched the PC1512, while the PCW 8256/8512 machines were becoming established and notching up good sales. But then Amstrad always has moved quickly.

The *PC User* show saw the launch of the latest Amstrad PC, the 1640 – the company's major stab at the corporate market. And at the opening press conference, attended by a number of industry figures, it was Alan Sugar who everybody wanted to speak to.

Since the company is never (unless it completely up-ends its product strategy) going to develop new technological breakthroughs, but rather look for new buyers, it is dependent on existing manufacturers to provide the technological leads for Amstrad to follow and exploit.

The past three years has seen Amstrad established as a leading mass market computer manufacturer. The CPC machines provided Amstrad with a firm base in the home market between April 1984, when the 464 was launched, and the arrival of the 6128 in August 1985.

that to most people, Amstrad's name still means £99 combined TV and video recorders.

Another, which is proving rather harder to overcome, is technical specification, reliability and support, or at least, perception of such by the PC 'establishment'.

While the PC1512s were almost universally favourably received at launch a steady stream of questions have been raised, over claims of sales figures to corporate buyers, and over safety. None of the worries over reliability/safety have gained widespread credence, but will the sceptics plunge in

affect sales too much when you're talking about Spectrums, CPCs or PCWs, but it does matter when you're trying to sell to businesses.

In the home market, Amstrad has let the Spectrum standard, which it bought from Sinclair Research 15 months ago, replace its own CPC machines. However, the company cannot remain in the home area with the Spectrum as a flagship machine, even if it is now discarded, for much longer.

The Spectrum has done phenomenally well, and its software base is the widest in quantity of any home computer. But it is

Amstrad's PC1640s mean big business

John Brissenden eyes the strategy that Amstrad's new PC range is pursuing.

In Amstrad's first year as a manufacturer of IBM clones, the business end of the market has been forced to take the company seriously. PC1512 sales may be falling now, but they were walking off the shelves for nine or ten months after launch.

When Amstrad initially moved into home computers, many people were sceptical of their staying power in the market, feeling that Amstrad was a 'dabbler' in the field, and would move out and off into fridges, CD players, portable telephones, whatever.

But with computers now counting for around half of Amstrad's total business, the company is going to hang on in there, so long as it can continue to find markets as yet untapped (the CD players are, of course, already part of Amstrad's product line-up).

For Amstrad's success, from the introduction of the CPC464 onwards, has rested on using accepted, familiar (old) technology. Having been around for some time, the parts are cheap, and thus Amstrad can undercut most of the competition. With the PCWs and PCs, using standard (old) operating systems means no uphill battles with creating a software base.

But it is the capture of new micro markets since then which has contributed to profits and turnover increasing in leaps and bounds. In 1984, Amstrad announced profits of £9 million on a turnover of just under £85 million. By 1986, the corresponding figures were £75 million on a turnover of £304 million.

Since 1984, Amstrad has been gradually testing the business market in stages. CP/M compatibility in the 6128, the PCW word processor machines, then a full-blown business compatible, the PC1512s. And with the 1512s, a hiccup. The corporates are still buying IBM; it's the home users and small businesses that are looking to Amstrad, Alan Sugar predicted as much at the PC1512's launch.

Hence the upgraded PC1640s, with the enhanced graphics boards, and higher resolution. This is to attract the corporate buyer to CAD, desktop publishing and EGA software opportunities.

But there are reasons why Amstrad has a tough marketing job in attracting corporate buyers.

One is simply persuading them to buy the PC at all, given



again with the new machines?

On the question of support, it will be needed on-site – the lack of support guarantees is one reason why Amstrad undercuts the opposition.

Amstrad has already attracted city flak and a drop in its share price for perceived dithering over the introduction of the PC1640s in the UK, and a reported drop in sales of the PC1512.

City endorsement may not

over five years old, and there are more technologically advanced machines breathing down its price point all the time. While the user base will continue for years, new buyers won't.

Amstrad has already reaped profits from its £5 million pay out to Sinclair Research. But to leave the Spectrum Plus 3 as its final upgrade to the family could leave it without a stake in the home market by, say, Christmas 1988.

By then, of course, we could be all playing games on one of the cheap consoles and using home PCs, such as the PC1512s, or, although this is not Amstrad's intention, the PC1640s, for utility and business use.

Or we could be buying £199 STs and £299 Amigas for all types of home use.

If the mass market *has* moved all that way in 18 months' time, then there will doubtless be an Amstrad games console, or an Amstrad 68000 machine to choose from, but, only once the shift has occurred, can we start looking out for Amstrad's own competing machines.

In the short term, however, the company has its eye on the potentially lucrative, but difficult, corporate market.

The most portable computer yet

Simon Rockman reviews the newest portable computer – Sinclair's Z88 – and finds it ideally suited to many purposes.

Sir Clive's new company may be called Cambridge Computers Ltd, but that does not stop people calling the Z88 the new Sinclair.

It is no surprise that the machine was three months late, nor that it is only being sold mail order initially, nor that the Advertising Standards Authority has stepped in over the lack of a '28 days for delivery' rider. What is surprising is that the machine is very, very good.

Portable computers are not new. Tandy, Olivetti and NEC have been producing versions of the same machine for years. What is new is the price and performance of the Z88.

For a start it is pretty cheap. At £230 it is almost half the price of the Oriental offerings. The screen is 80 columns wide and bit-mapped. The whole thing is very light. In fact it is so light that if you are wearing good trousers it slides all over the place. Obviously a machine for the trendy 501 (black) clad computer user.

There are three slots in the front for Ram or Rom expansion, an edge connector so that Kempston can design a joystick interface and a 9 pin RS232 port. I would have liked to have seen a Centronics port on the machine, or a standard RS232 port, although I'm assured that the 9 pin connector is a very good RS232 with full voltages.

Keyboard

As with every machine Sir Clive is known for, the keyboard is a target for controversy. The Z88 is more like the dead flesh Spectrum Mk 1 than anything since.

Typing on it is a bit like bashing your fingers on the kind of practice mat drummers use when they don't want to wake the neighbours. The lack of tactile feedback makes you type harder and then your fingers hurt. As I became more confident and typed more gently I grew to like the thing. The rubber surface picks up dirt very easily but it is washable.

Having so few moving parts the keyboard is virtually silent; the Tandy model 100 may not be noisy but I'd rather use a Z88 in something like a lecture theatre.

The layout is good, with well spaced keys, although I don't like Americanised keyboards which have @ on the shifted 2, instead of quotes. However, the Z88 is

clearly not aimed at the US market; significant changes would have to be made to both the software and the manual before Cambridge try over there.

Dedicated keys

Five special keys make the software easy to use. Diamond, Index, Help, Menu and Square all have special functions consistent throughout the packages supplied with the computer.

“The display quality is excellent, LCD usually suffers from a limited viewing angle, but on the Z88 this is only a slight problem. The five by seven matrix is blue on grey and easy to read”

Diamond is a control key. Holding down diamond and a letter invokes a function. On the index page *diamond KILL* will delete a suspended activity. Inside the *Pipedream* application (see below) diamond X switches from text to number mode, diamond Z marks areas of text for copying and deletion, diamond BWC counts the words and so on. There is a crib sheet below the screen which details the most commonly used diamond commands.

Menu is a friendlier way of accessing all the diamond commands. Each Z88 application offers a list of commands in a menu on the right hand side of the display. Pressing Menu steps through these commands and the main display is replaced by a list of the diamond functions.

Experienced users will no doubt learn all the short cuts, but until then the menu key is the fastest way to locate the operation you want and a good way to learn about the software.

Help is of limited use. The idea is that you press this key whenever you are stuck and an appropriate page is displayed explaining

the options. Instead you press the help key and a correspondingly titled page appears which is blank.

Pipedream has some help on offer but all the other applications stare at you blankly. I would expect that the help pages either have not been written yet which would require an upgrade, or that Cambridge Computers ran out of space in the Rom.

The square key (this is beginning to sound like *Play School*), swaps from program to program. This is a bit like having several programs in sideways Rom on a Beeb or Amstrad, or using memory resident utilities on a PC.

The ability to switch from one job to another makes the Z88 useful as a diary and notebook. Programs are suspended when a new job is started, so the Z88 does not truly multi-task, in the way an Amiga does (and ST doesn't), but it's close enough to be a pleasure to use.

The display

A portable stands or falls by the quality of the display (Data General suffered egg on its corporate face when the DG One display had to be upgraded free of charge). The Z88 uses a new type of LCD known as supertwist, a British invention which has not been patented and so the Japanese are going to make all the money from it.

The quality is excellent, LCD usually suffers from a limited viewing angle, but on the Z88 this is only a slight problem. The five by seven matrix is blue on grey and easy to read. There are three character sets to indicate normal, bold and italic type. Even the three pixel wide characters, used in special words, are clear.

Letters such as p, y and j only have a single pixel descender, and these will touch an ascender on the next line.

Display layout

The layout of the display is clever. The menu commands are listed on the lefthand side, the application is run in the centre and extra information on the right. Within *Pipedream* a small screen shows a pixel map of what a full page would look like in terms of layout.

With my Tandy Model 100 I always have to port text to a machine with a proper screen before printing, if I want to tidy up

the layout. It is the job of the microscreen to eliminate this problem.

The software

I have already said a fair bit about *Pipedream*, and to cover it fully would take a lot more time and space than is allowed for in this review, but these are the salient points.

Pipedream is a cross between a spreadsheet, database and word processor. In this respect it is quite similar to *Ability*, a 100 package for IBM PCs.

Text can be entered without any special prefixes. It can then be cut and pasted, edited and erased in normal word processor fashion. Numbers for the spreadsheet features need to be prefixed with a diamond X, although a spreadsheet only mode can be selected.

This is the area for which the greatest amount of help is available. There is a full range of scientific functions, conditional operators and limited text manipulation – things like alphabetic sorts. The spreadsheet side of things seems to be the strongest part of the Z88's software. I could not find a way to place the value from one cell into free running text, and resorted to writing text to go around the number.

The database side of things seemed a little weak, but no doubt some clever manipulation will stretch the possibilities.

Basic

Sir Clive may have eaten his words on the use of LCD screens, but it must be hard to justify using BBC Basic after his attacks on Acorn for using it.

At the Z88 launch, Sir Clive said that "it's a very good Basic". He was, of course, right. BBC Basic may not be Microsoft standard and may be full of peculiar VDU commands but it is very fast, structured and well implemented on the Z80.

M-Tec has been selling Richard Russell's CP/M version of BBC Basic for a while so there should be few problems with it.

Some BBC Basic commands have been omitted, including ADVAL, which requires an analogue port, the sound commands and all the graphics statements, which give the QLesque error message *Sorry, not implemented*.

It is a shame that some of the simple graphics facilities could not have been included, since the display would cope with anything except colour.

The Z88 runs Beeb Basic at around half the speed of a real Beeb, which is pretty impressive and the LCD screen does a good job of keeping up.

There is a full, in-line, Z80 assembler so Basic and machine code can be mixed. The greatest limitation is that there is only 8K free from Basic, even if you do have megabytes of Ram plugged in. You could store lots of 8K programs and chain them but that is an unwieldy solution. The overhead for running Basic is 8K, often a problem if you have an unexpanded machine with large files.

Other software

The diary will appeal to any yuppie who has traded in a Filofax for a Psion Organiser. The calendar is pretty simple with no editing needed or allowed. The calculator offers some useful conversion options, such as litres to gallons. UK gallons as opposed to US so at least I can now work out a true fuel consumption figure. Anything more complicated is better left to *Pipedream*.

The alarm sounds a buzzer or can be set to run a Basic program. Several alarms can be programmed with a choice of frequencies and a stated reason. Ideal for hypochondriacs who want to take blue pills every three hours.

The printer driver is very flexible offering things like translation tables to redefine hashes as pounds.

The terminal is designed for use with scrolling electronic mail systems like Telecom Gold. For sending files from the Z88 to another machine you should use the Import/Export option. It is strange that file transfer and terminal have not been built into the same program.

The filer looks after stored texts. With so much room for Ram expansion a neat way of keeping directories is needed. Cambridge Computers has opted for a hierarchical tree structure, as with MS DOS. Eproms may be blown and removed, then reinserted later in Psion Organiser fashion.

I doubt that this will enhance the battery life. In fact I would recommend keeping the keyclick off if you are worried about the batteries. I have used one pack of alkaline cells in a week – on a par with Model 100, but still a noticeable running cost.

Documentation

Having watched people battle with manuals, and having watched technical authors lose sleep over what to put in and what to leave out, my heart goes out to anyone who

Peripherals and availability

While the Z88 itself is now being delivered to early customers, Cambridge Computers is no longer taking mail orders.

The machine should be available in the shops at the end of this month. Peter King of Cambridge Computers says that the company is currently unable to specify which stores are taking the machine, but confirms that the Z88 will be shipped to retailers at the end of July.

The price has also increased from that quoted originally. The Z88 will now cost £287.50 (inclusive of VAT), because, according to King, of the recent rise in the value of the Japanese yen.

Extra Ram cartridges at £14.95 for 32K and £49.95 for 128K will be available at the same time, as will the extra Eproms: £14.95 for 32K and £49.95 for 128K.

The IBM file transfer cable (£14.95 – not tested in the review), the mains adaptor and RS232 cable (both £9.95), UVA Eprom eraser (£39.95) can also be bought.

However, the dedicated modem, while King says it has now been approved for use by the BABT, is not ready yet. Estimated time of arrival is September, and it will cost £99.95.

Cambridge Computers can be contacted for details at Chesterton Mill, French's Road, Cambridge CB4 3NP.



The Z88: obviously a machine for the trendy

continued on page 15 ►



Z88

CAMBRIDGE COMPUTERS

Post the coupon for full information.

To: Cambridge Computer Ltd,
Unit 4, Chesterton Mill, French's Road, Cambridge, CB4 3NP.
Please let me have full information on the Z88 computer.

Name

PLEASE PRINT

Address

Post code

POP1

◀ continued from page 13

has to document something as complex as the Z88.

Hardware hackers will bemoan the lack of firmware documentation, while novice users will find it difficult to take everything in at once.

Pitched somewhere in the middle the manual covers the basics quickly, is well laid out and produced but could have done with a higher degree of cross referencing. Cambridge Computers claims that there is one mistake in the manual. Unless they mean that the index is skew-whiff I couldn't find it.

Conclusion

The Z88 is very, very good. I'm not sure why I bought it when I already had a Tandy, but I'm pleased I did. It is ideally suited to, say, a college student who has access to an RS232 printer.

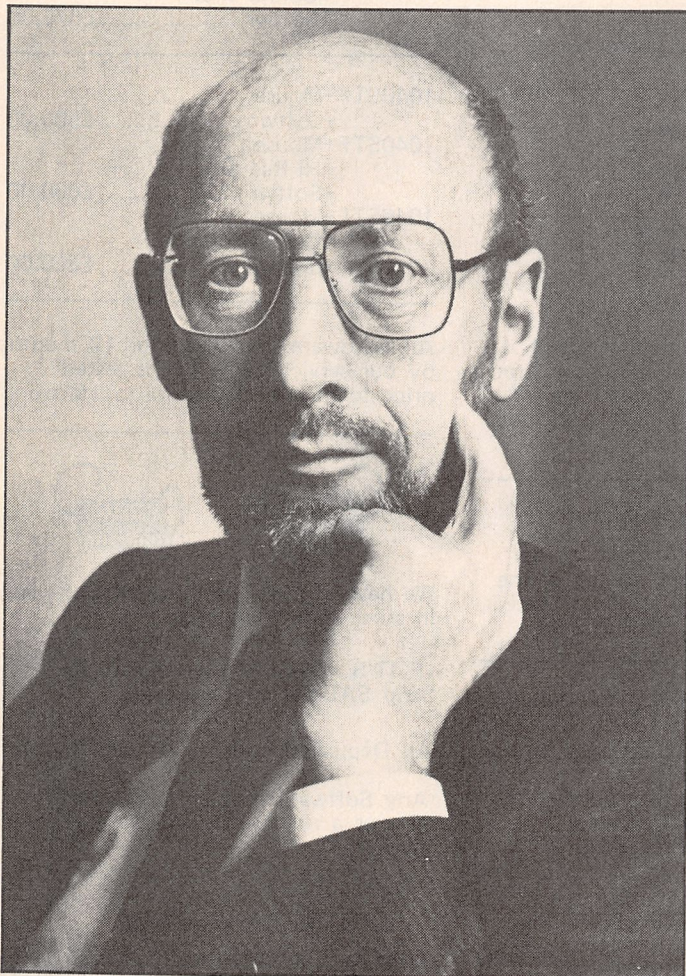
The spreadsheet will cope with scientific calculations and the machine is light enough to be taken to lectures, indeed it is lighter than many textbooks.

A journalist may find that *Pipedream* concentrates too much on numbers and that text becomes hidden inside spreadsheet cells as a result of formatting.

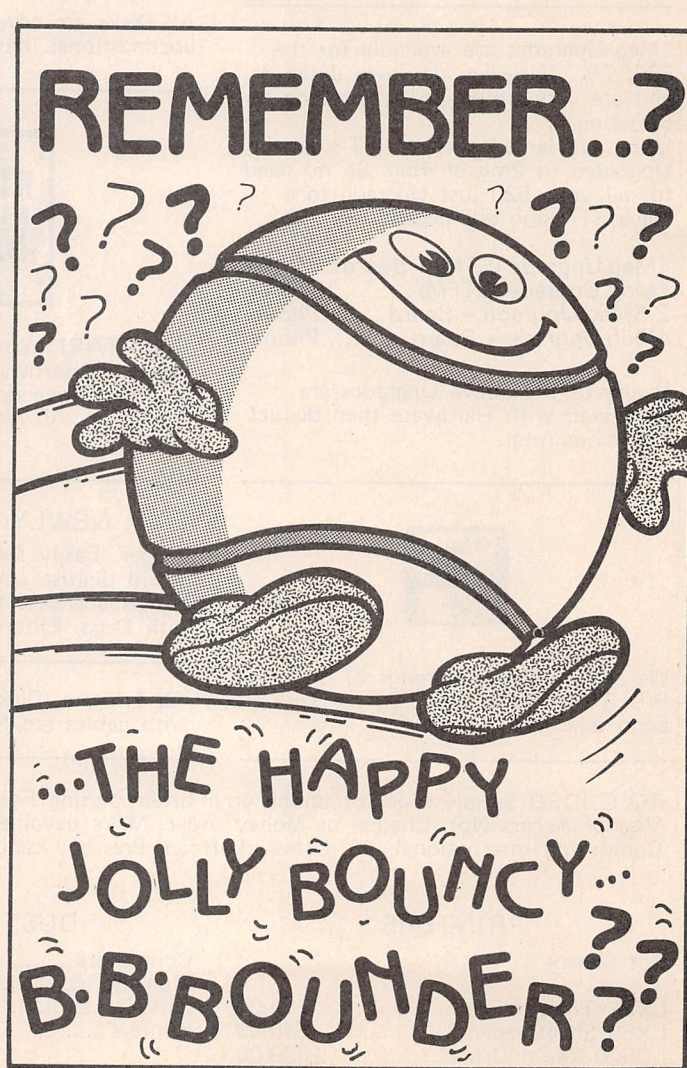


A programmer who wants to play with algorithms and make notes would make full use of the BBC Basic, but I'd have reservations about using machine code in case I crashed the machine and lost text.

I believe that Cambridge Computers is financially sound, and have no reservations on the basis of continued support. With a machine which should sell, I wish Sir Clive well with his latest venture.



Sir Clive Sinclair: filling the gap in the portable market with the ultra-light and inexpensive Z88





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Specialist ATARI Dealer



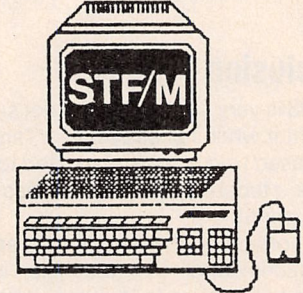
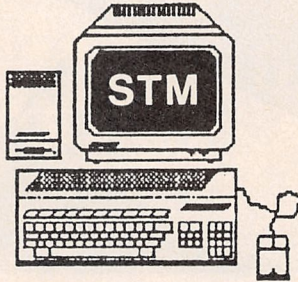
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LINKING UP WITH ARNOR C

Now that you've all become master C programmers, following our recent series, Kenn Garroch introduces *Arnor C*, the C compiler, linker and editor

C is rapidly becoming quite a popular programming language with software houses. That is, they think that people should be using it instead of Basic or machine code. The price of many of the packages is coming down thus putting this powerful language in the hands of the home user. *Arnor C* at £49.95 is pretty cheap as far as C's go, and is pretty comprehensive.

What you get for your money is basically a development system for writing applications on Amstrad machines running CP/M Plus, ie, the 6128 and the PCW8256/8512s. There are six main sections to the package: the compiler, linker, joiner, editor, runtime handler and runtime generator.

This means that the C can be used for development and also to create your own saleable software. The inclusion of the runtime generator will turn your object files into COM files and includes a licence to sell.

If you are starting with C for the first time then you will also need a couple of good books to enable you to understand the language. *The Big Red Book of C* by Kevin Sullivan from Sigma Press, 5 Alban Road, Wilmslow, Cheshire, is quite a good introduction, and is not mentioned in the manual. The manual is quite helpful about compiling, linking, and the libraries. It is not, however, very useful for the beginner since it contains no examples and no information on the basics of the language.

The C implementation is pretty well complete and includes all of the standard commands used in the major C implementations. In addition, it has a couple of libraries (predefined sections of code) that cover maths, and a good many system access functions such as windowing and character definition plus all of the standard input/output.

On the version I looked at, the windowing didn't work but, I am reliably informed that this has now been fixed and it is now possible to have eight windows on screen. A good example of the windowing appears in the editor APED which is a version of *Protex*. Here, it is possible to have nearly full access to the operating system, and the ability to flip between this and the editor at the touch of a button.

Arnor C comes on both sides of one disc

and before any programming is done, needs to have various sections transferred to a working disc: basically, the editor, compiler, runtime system, the linker and the standard library. I found that the best method of using it was to make up a working disc and then transfer the whole thing to the Ramdisc. This makes the fairly slow compiler work at a reasonable pace and is fine until a fatal crash happens.

To start up, the program APED is run which loads the editor and gives the a> prompt. The editor is in a window at the top

half of the screen, and any code being worked on is in memory. Once a section has been written that can be tested, the Stop key (Amstrad PCW 8256) is pressed and the computer is placed in the pseudo operating system. It is pseudo because, although many of the CP/M commands are available, though not all, and it is a system that runs on top of CP/M imitating it (the prompt becomes a> instead of A>) but including l for load and s for save.

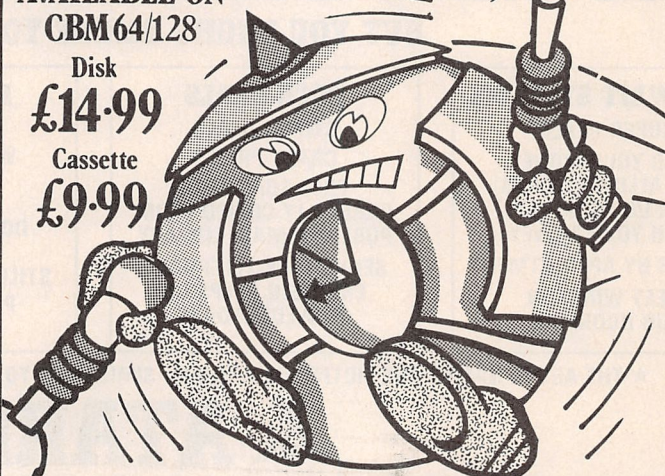
There are a number of ways to compile
continued on page 18 ▶

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SOFTWARE: REVIEW

◀ continued from page 17

the program and the easiest is to use AC (Auto Compile). This compiles, links and then runs the resulting object code, if there are no errors. The process is not amazingly fast, even from the Ramdisc, and for large programs, you may have to develop a little patience. After the program has run, if there are no really nasty fatal errors, a keypress returns the system to editor/system mode and your program code is still there in the editor waiting to be modified.

Compilation can also be performed from the runtime system, RUNC, as can linking, joining and running programs. Compiling a program produces a link file and during compilation, lists each function as it is processed, *include is slightly different from the standard in that it is possible to look for included files on any drive by enclosing the name in <> or on the current drive with "".

Files that are included contain code to be compiled at the beginning such as headers for the libraries. There are a number of compiler options such as turning off the error messages, and creating global tables. The compiler also supports conditional compilation, and most of the other preprocessor commands - these instruct the compiler to treat the code in certain ways.

Once compiled, the link file can be put together with other link files to produce an object file (extension 0) which can then be

run under the runtime system. Using the runtime generator, object files are converted to com files that can be executed directly from CP/M. Linking can be performed automatically after compilation as in AC which, if you are writing a long program, is very useful and speeds up the programming process considerably.

The linker can also be used to insert machine code programs into the main C program. The machine code should be written using Arnor's *Maxam* assembler and follow the conventions set out in the manual. Not having the *Maxam* assembler, it was impossible to check this process out - indeed, the manual is a little hazy on how it is done. However, it seems to be possible to call machine code sections from C, and for machine code programs to call C functions.

Link files can also be concatenated together with the joiner program to produce a single link file. This is handy for making library files since all that need be done is join together all of the functions into one file which can then be linked to different programs where necessary.

Overall, *Arnor C* is a fairly comprehensive package, although it does have a few drawbacks. Not all of the standard C functions are available - that is, they don't appear to be in the libraries. In general, this is not too bad and is more than made up for by the inclusion of a maths library and a

number of Amstrad specific functions.

The manual could have done with an index, and some examples of compilation, and even a short beginners' section. There is a full list of the available library functions, listed in alphabetical order but, again, no index. This makes finding particular functions fairly difficult since the names are not always what they should be. One thing that doesn't seem to be mentioned in the manual is that to get the \ symbol on the PCW8256 (pretty necessary for \n, etc) you need to press Extra and the @/half key.

On the plus side, the editor is excellent and the runtime system of APED brings programming effort down quite a lot. The only moan is that after a program has been compiled, the screen is cleared before the editor can again be used. This wipes off all the error messages and so, if there are a few, they need to be written down.

Arnor C is a useful programming language and if you spend the extra tenner provides all the facilities necessary to write complete applications programs. The compiler is a bit slow but then so is the Amstrad.

Product *Arnor C* compiler, linker, and editor **Micros** Those with Amstrad CP/M Plus; CPC6128, PCW8256/8512 **Price** Compiler, etc, £49.95, Runtime generator £10 **Supplier** Arnor, Protex House, Wainman Road, Peterborough PE2 0BU.

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MICKEY MOUSE GRAPHICS

Paul McKinley begins his series on computer graphics made easy with some help from Mickey Mouse

Anybody reading the computer press this last year or two could not help but be impressed by the photos of the super high resolution graphics that

to create interesting and recognisable pictures. I hope these articles will be of use not only to non-artists who want to add attractive title screens to their programs but also to anybody who is finding the change from paintbrush to mouse more difficult than they thought it would be.

To encourage you to try your hand I'll describe below how to create a simple picture of Mickey Mouse using only Circle, Line, Magnify and Fill commands:

What to use

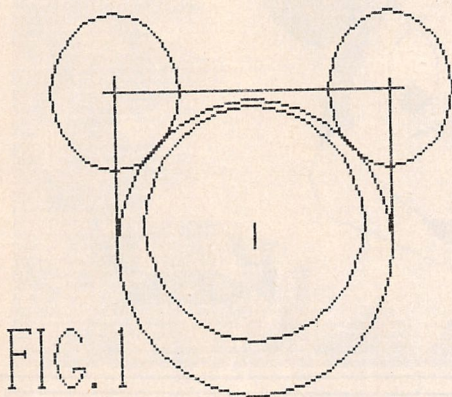


FIG. 1

seem to accompany every new game or application released.

In a very short space of time computer graphics have leapfrogged from the simple pictures in *The Hobbit* on the Spectrum to the almost photographic quality *Defender of the Crown* on the Amiga. Early screenshots of *The Pawn* probably did more for ST sales than all of Atari's advertising put together.

The increased interest in graphics generated by these programs has not been missed by the software houses; what mainstream machine doesn't have three or four graphic utilities available for a budding da Vinci, with each one trying to outdo the others by adding more exotic and sophisticated features?

The only thing which might not have kept up with this increasing sophistication is the ability of the average person to use it. It's all very well having the latest inverting, rotating, 3D and multiple shadow plane features but how do you actually use them to get from a blank screen to a perfect copy of the Mona Lisa?

How many times have you admired a particularly good title screen and thought 'I could do that' but when you load up an art program you haven't got the slightest idea where to start? Over the next couple of weeks I would like to convey a few of the 'nuts and bolts' techniques of producing computer graphics. Even if you've never picked up a pencil in your life, it is possible

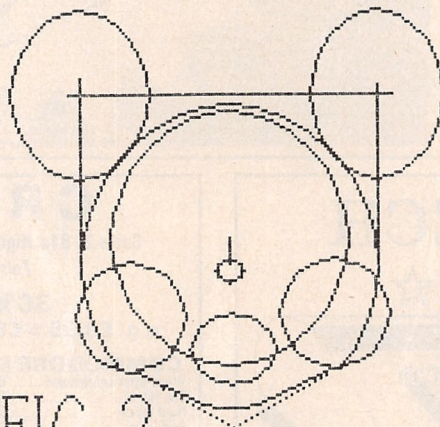


FIG. 2

Most art programs owe a lot of their design to *MacPaint* which was bundled with the early Apple Macintosh computers, so when it comes down to the basic functions there is not much to choose between one utility and the next.

Almost all will provide Draw, Line, Circle, Box, Magnify, Fill and Erase as standard. I used an Atari ST running *Degas* to draw the sample pictures but it would be just as easy to use *Melbourne Draw* on a 48K Spectrum as none of the instructions are machine-specific. I'll leave out colour handling on the various machines for now as that will need an article all to itself.

Where to start

OK, so you've loaded your art program and you're staring at a blank screen, what now? The first thing to do is familiarise yourself with the Undo function. This is possibly one of the most important functions in any graphic package and certainly one of the

most used!

Draw vertical line in the middle of the screen about eight pixels high. Use the bottom pixel as the centre point of a circle. Expand the circle until it's about half the height of the screen. This will form the basic head shape.

Plot another circle inside the first using the top pixel as centre. Expand it till it almost touches the top of the first circle.

Take a line from each side of the outside circle straight up then draw a third horizontal line above the circle to connect them. Use the intersections as centres for the ear circles. They should be about one third the size of the head. The higher the horizontal line is above the head the bigger the ears will be so experiment a bit till you are happy with them.

You should now have something like figure one on your screen. If so we can now get on to the nose, mouth, cheeks and chin.

The nose is formed simply with a very small circle centred slightly under the first vertical line you drew. The cheeks are two more circles centred under and to each side of the nose. Their tops should be level with

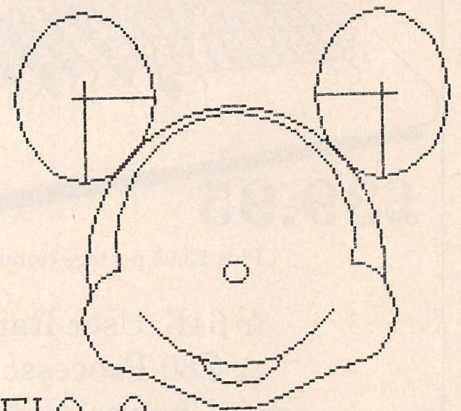


FIG. 3

the top of the nose and their sides slightly outside the circle of the head (see figure two). Don't worry too much about exact size or placing of these circles.

Before drawing in the mouth and chin we must remove the bottom part of the outside circle between the cheeks. This can be done with the Erase function or use Magnify and wipe the pixels one at a time. You should be left with the inside circle, this will form the upper lip.

continued on page 20 ►

PROGRAMMING FEATURE

◀ continued from page 19

Plot a circle with a centre just above it so that the lower edge forms a semi-circle against the upper lip. To form the chin draw a line from a point directly under the mouth to each cheek.

The lines must not intersect the mouth. If they do, move the centre point lower and re-draw. You can use magnify to round off the end of the chin and where the lines meet the cheeks. Now use Magnify and Erase to remove all unnecessary lines (see figure three).

Each eye can be simply an oval with a small circle at the bottom, or, if the program

you are using cannot produce ovals then two circles, one above the other and overlapping, with their outside edges joined with lines and the inside pixels erased will do. To finish off use Magnify to add eyebrows, an arc of pixels above the nose and a small triangle above and between the eyes. Now Fill the enclosed areas with solid black till you have figure four.

You should now have a picture of Mickey

Mouse on your screen. Depending on the abilities of your machine you can try adding colour and different backgrounds. If your graphic program supports a Mirror function, experiment with it to see how it can speed up parts of the drawing process.

Next week, Paul McKinley explains how to use some more common graphics program features to their best effect.

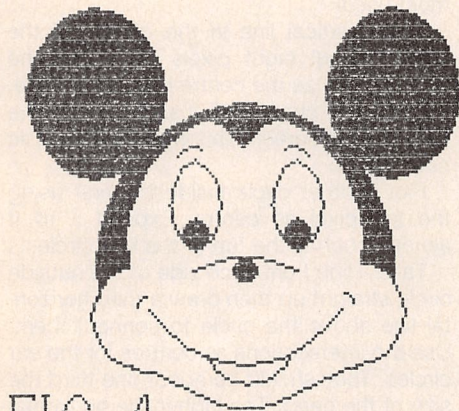
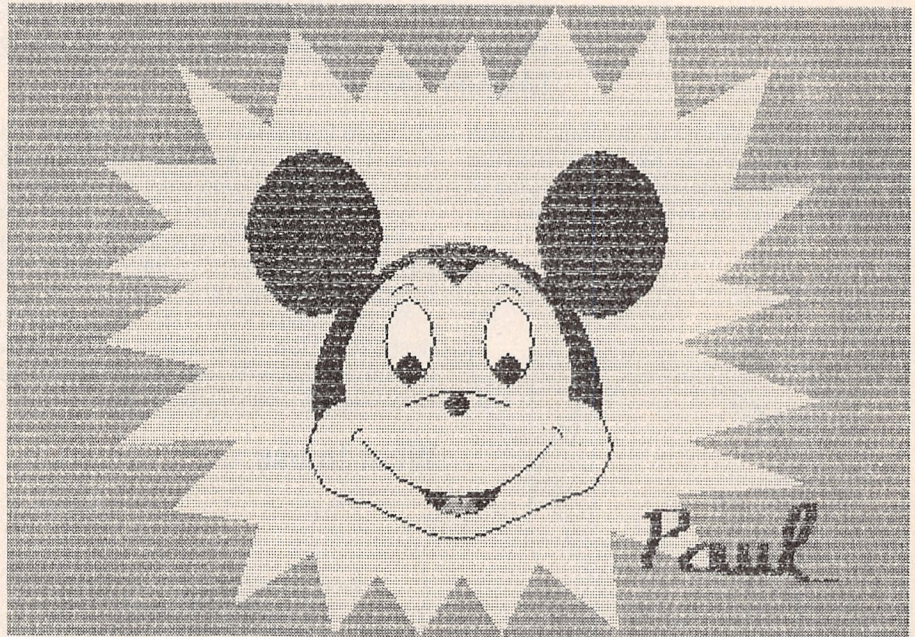
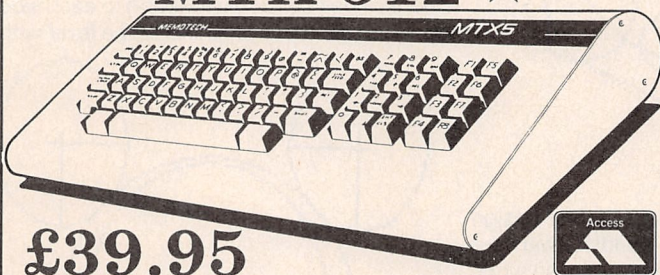


FIG. 4



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Graphics Extension

Gary Vine

This program adds an extra 16 commands to your CPC 464. The first twelve are all equivalents of commands available on the 6128. The 6128 commands are :Frame; :Clear Input; :Graphics Paper x; :Graphics Pen x; :Cursor x,x; :Mask x,x; :Plot x,x,x,x (last two optional); the rest are the same syntax as Plot; Move;

Draw; Plotr; Mover; Drawr.

The rest of the listing and instructions follows next week. If you want a copy on cassette send £3.00, or £5.00 for disc, to 157a High Hill Road, New Mills, Stockport, Cheshire SK12 4HQ. Also sent will be Maxam source code for the program.

```

1 MEMORY &BFFF:L=100
2 FOR A=&9120 TO &989F STEP 8
3 CH=0
4 FOR B=0 TO 7
5 READ A#
6 POKE A+B,VAL("&"+A#)
7 CH=CH+VAL("&"+A#)
8 NEXT B
9 READ CHECK
10 IF CHECK<>CH THEN 20
11 L=L+1
12 NEXT A
13 CALL &9B70
14 END
20 PRINT"DATA ERROR IN LINE";L:STOP
100 DATA 00,CE,AD,FF,00,46,52,41,851
101 DATA 4D,C5,DD,80,00,43,4C,45,835
102 DATA 41,52,20,49,4E,50,55,D4,707
103 DATA DD,81,00,47,52,41,50,48,720
104 DATA 49,43,53,20,50,41,50,45,549
105 DATA D2,DD,82,00,47,52,41,50,859
106 DATA 48,49,43,53,20,50,45,CE,682
107 DATA DD,83,00,43,55,52,53,4F,748
108 DATA D2,DD,84,00,4D,41,53,CB,991
109 DATA DD,85,00,4D,4F,56,45,D2,875
110 DATA DD,86,00,50,4C,4F,54,D2,884
111 DATA DD,87,00,44,52,41,57,D2,868
112 DATA DD,88,00,4D,4F,56,C5,DD,1017
113 DATA 89,00,50,4C,4F,D4,DD,8A,943
114 DATA 00,44,52,41,D7,DD,8B,00,790
115 DATA 56,44,D5,DD,8C,00,53,54,895
116 DATA 4F,52,C5,DD,8D,00,52,45,871
117 DATA 50,45,41,D4,DD,8E,00,55,874
118 DATA 4E,54,49,CC,DD,8F,00,00,803
119 DATA DD,80,6E,94,DD,81,71,94,1218
120 DATA DD,82,77,94,DD,83,80,94,1246
121 DATA DD,84,AB,94,DD,85,C4,94,1367
122 DATA DD,86,F0,94,DD,87,10,95,1264
123 DATA DD,88,00,95,DD,89,E8,94,1244
124 DATA DD,8A,08,95,DD,8B,F8,94,1272
125 DATA DD,8C,BE,95,DD,8D,D7,95,1426

```

```

126 DATA DD,8E,2C,96,DD,8F,8A,96,1209
127 DATA 00,80,00,4C,69,73,F4,00,668
128 DATA 47,6F,74,EF,00,47,4F,53,770
129 DATA 75,E2,00,42,6F,72,64,65,835
130 DATA F2,00,53,50,65,65,E4,00,835
131 DATA 50,72,69,6E,F4,00,57,52,822
132 DATA 69,74,E5,00,49,6E,50,75,830
133 DATA F4,00,49,4E,6B,65,79,A4,888
134 DATA 00,50,41,70,65,F2,00,57,687
135 DATA 69,6E,64,6F,F7,00,44,52,823
136 DATA 61,F7,00,4D,6F,64,E5,00,861
137 DATA 47,52,61,70,68,69,63,F3,913
138 DATA 00,00,00,55,6E,65,7B,70,528
139 DATA 65,63,74,65,64,20,55,4E,712
140 DATA 54,49,4C,00,54,6F,6F,20,571
141 DATA 6D,61,6E,79,20,6E,65,73,795
142 DATA 74,65,64,20,52,45,50,45,649
143 DATA 41,54,73,00,55,4E,54,49,584
144 DATA 4C,20,6D,69,73,73,69,6E,767
145 DATA 67,00,00,7B,FE,20,DB,FE,982
146 DATA 23,00,CD,85,CA,2A,34,AE,1051
147 DATA 22,AB,AD,CD,B0,CB,31,00,1008
148 DATA C0,2A,32,AE,CD,AC,F5,CD,1285
149 DATA B3,FB,CD,FD,D9,CD,DF,CA,1735
150 DATA 2A,AF,AD,EB,21,B1,AD,30,1056
151 DATA 0C,7A,B3,2B,0B,A6,20,05,564
152 DATA 35,EB,C3,93,DD,36,00,3A,963
153 DATA AA,AD,D6,20,11,53,92,CD,1040
154 DATA 48,CC,C3,D3,CA,CD,4E,94,1315
155 DATA 11,25,91,CD,0F,93,38,04,626
156 DATA CD,5E,94,C9,13,1A,4F,13,791
157 DATA 1A,47,ED,5B,02,90,23,79,727
158 DATA 12,13,7B,FE,00,2B,05,12,474
159 DATA 13,CD,00,93,CD,00,93,C9,924
160 DATA ED,4B,04,90,0B,7B,B1,CA,970
161 DATA 2B,DF,ED,43,04,90,C9,ED,1156
162 DATA 53,0A,90,7E,FE,2E,2B,13,722
163 DATA CB,AF,47,1A,4F,E6,5F,8B,1063
164 DATA 20,17,79,06,00,17,DB,23,456
165 DATA 13,1B,EB,1A,E6,20,2B,09,612

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166 DATA 06,00,1A,17,DB,13,04,1B,318
167 DATA F9,13,1A,FE,00,20,FA,13,849
168 DATA 1A,FE,00,20,03,37,3F,C9,634
169 DATA 2A,00,90,1B,C2,CD,4E,94,835
170 DATA AF,32,0F,90,0E,00,7E,23,559
171 DATA 0C,FE,00,20,F9,2B,0D,AF,778
172 DATA B9,2B,5B,06,00,11,CF,AD,719
173 DATA 0C,ED,8B,EB,ED,52,EB,2A,1264
174 DATA 00,90,19,23,22,00,90,11,399
175 DATA F9,91,22,21,91,CD,0F,93,973
176 DATA 30,2F,AF,8B,2B,2B,22,01,572
177 DATA 91,ED,5B,00,90,48,1B,10,732
178 DATA FD,2A,00,90,ED,53,00,90,903
179 DATA C5,ED,B0,D1,2A,01,91,ED,1244
180 DATA 52,ED,5B,0A,90,1A,E6,5F,915
181 DATA 77,1A,17,3B,07,23,13,1B,309
182 DATA F4,2A,21,91,23,7E,FE,00,879
183 DATA 2B,04,FE,3A,20,B9,CD,5E,872
184 DATA 94,C9,E1,22,21,91,CD,51,1072
185 DATA 94,D1,C1,E1,7E,23,55,C5,1362
186 DATA D5,CD,61,94,47,21,25,91,949
187 DATA 22,00,90,7E,17,23,30,FE,661
188 DATA 7E,B9,20,0D,23,7E,8B,20,733
189 DATA 0B,2A,00,90,7E,23,C3,09,559
190 DATA E3,7E,23,FE,00,20,FA,7E,1050
191 DATA FE,00,2B,05,22,00,90,1B,501
192 DATA DA,2A,21,91,E5,C9,4E,23,981
193 DATA 46,22,00,90,ED,53,02,90,714
194 DATA 21,8B,91,11,04,00,7E,B9,694
195 DATA 20,06,23,7E,8B,2B,09,2B,475
196 DATA 19,7E,FE,00,20,F0,1B,15,722
197 DATA 23,5E,23,66,6B,C1,01,4A,641
198 DATA 94,C5,E5,2A,00,90,ED,5B,1088
199 DATA 02,90,C3,3F,DD,2A,00,90,811
200 DATA ED,5B,02,90,C9,1E,05,C3,905
201 DATA 94,CA,D1,C3,8B,DD,22,00,1148
202 DATA 90,ED,53,02,90,ED,43,04,918
203 DATA 90,DD,22,06,90,C9,2A,00,792
204 DATA 90,ED,5B,02,90,ED,4B,04,934
205 DATA 90,DD,2A,06,90,C9,C3,19,978

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Game of Two Halves

Andrew Oldacre

You will notice that this listing, part two of our football managerial game, is now entitled Game of Two Halves, as opposed to Soccer Boss last week.

Popular would like to make it clear that the listing has no connection whatsoever with the commercial game Soccer Boss, published by Alternative Software, and we apologise for mistakenly using Alternative's title in this way.

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960 PRINT PAPER 7; INK 0; AT 21,12; "Full
1 Time": BEEP .09,36: BEEP .07,23: PRINT
  INK 1; PAPER 6; FLASH 1; BRIGHT 1; AT 1
8,2; "Please wait for match results"
961 LET gat=INT (RND*65000+1)-(1000*dv)
: LET gat=gat/dv: LET gat=INT gat
962 IF gat<500 THEN LET gat=500: IF dv
<4 AND gat=500 THEN LET gat=gat+(20000/
dv)
963 LET gat=INT gat: LET inc=gat/3: LET
inc=inc*2: LET inc=INT inc
964 IF fix=1 AND mon>40000 THEN LET in
c=gat/3: LET inc=INT inc
965 PRINT INK 1; FLASH 1; PAPER 5; AT 1
2,12; "Gate "; gat
970 IF hs>as THEN LET mon=mon+12000/dv
: LET mor=mor+(hs+(dv/2)-as)-dv: LET bon
=12000/dv: IF mon>35000 THEN LET bon=30
00/dv: LET mon=mon-(9000/dv)
971 IF hs<as THEN LET mon=mon-9000: LE
T mor=mor+(hs-as): LET bon=-9000: IF mon
<20000 THEN LET mon=mon+6000: LET bon=-
3000
972 IF hs=as THEN LET mon=mon-250: LET
mor=mor+1: LET bon=-250
982 IF j$="Football league match" THEN
GO TO 1000
983 CLS : IF hs=as THEN PRINT INK 7;
PAPER 0; AT 11,13; "**REPLAY*": PAUSE 100:
LET tfi=1: GO TO 600
992 IF hs>as AND gmc=19 THEN LET mon=m
on+20000/dv: FOR x=1 TO 20: PRINT PAPER
2; INK 7; FLASH 1; AT x,2; "**WEMBLEY!*WEM
BLEY!*WEMBLEY!*": NEXT x: FOR x=1 TO 40:
BEEP .03,x: NEXT x
993 IF hs>as THEN LET mon=mon+3000/dv:
PRINT INK 7; PAPER 0; AT 10,1; "Your tea
m marches on in the cup": BEEP .06,33: B
EEP .09,21: BEEP .08,12: PAUSE 200: LET
match=1: LET i$(crd)="o": GO TO 401
994 IF hs<as THEN CLS : PRINT INK 7;
PAPER 0; AT 10,1; "Your team is out of the
cup!": BEEP .06,33: BEEP .09,21: BEEP
.08,12: PAUSE 200: LET u$="D": IF gmc=19
THEN LET d$(20)=m$: GO TO 401
995 IF hs<as THEN GO TO 401
1010 IF fix=0 THEN LET h$(1)=y$: LET g$
(1)=m$
1011 IF fix=0 THEN LET k(1)=hs: LET d(1
)=as
1012 IF fix=1 THEN LET h$(1)=m$: LET g$
(1)=y$: LET k(1)=as: LET d(1)=hs
1020 LET x=2
1030 LET rd=INT (RND*12)+1
1031 IF z$(rd)="*" " THEN GO TO
1030
1040 IF z$(rd)=y$ OR z$(rd)=m$ OR z$(rd)
="*" THEN GO TO 1030
1050 LET h$(x)=z$(rd): LET k(x)=INT (6*R
ND)
1051 LET z$(rd)="*"
1060 LET rd=INT (RND*12)+1
1061 IF z$(rd)="*" " THEN GO TO
1060
1070 IF z$(rd)=y$ OR z$(rd)=m$ OR z$(rd)
="*" THEN GO TO 1060
1080 LET g$(x)=z$(rd): LET d(x)=INT (5*R
ND)
1090 LET z$(rd)="*"
1100 LET x=x+1: IF x>6 THEN GO TO 1110
1101 GO TO 1030
1110 FOR x=1 TO 12
1120 IF dv=1 THEN LET z$(x)=a$(x)
1130 IF dv=2 THEN LET z$(x)=b$(x)
1140 IF dv=4 THEN LET z$(x)=d$(x)
1150 IF dv=3 THEN LET z$(x)=c$(x)
1160 NEXT x
1170 LET ct=1
1180 LET x=1
1190 IF h$(x)=z$(ct) AND k(x)>d(x) THEN
LET a(ct)=a(ct)+3: LET f(ct)=f(ct)+k(x)
: LET h(ct)=h(ct)+d(x): LET p(ct)=p(ct)+
1: LET w(ct)=w(ct)+1
1200 IF h$(x)=z$(ct) AND k(x)=d(x) THEN
LET a(ct)=a(ct)+1: LET f(ct)=f(ct)+k(x)
: LET h(ct)=h(ct)+d(x): LET p(ct)=p(ct)+
1: LET m(ct)=m(ct)+1
1210 IF h$(x)=z$(ct) AND k(x)<d(x) THEN
LET a(ct)=a(ct)+0: LET f(ct)=f(ct)+k(x)
: LET h(ct)=h(ct)+d(x): LET p(ct)=p(ct)+
1: LET o(ct)=o(ct)+1
1220 IF g$(x)=z$(ct) AND k(x)>d(x) THEN
LET a(ct)=a(ct)+0: LET f(ct)=f(ct)+d(x)
: LET h(ct)=h(ct)+k(x): LET p(ct)=p(ct)+
1: LET o(ct)=o(ct)+1
1230 IF g$(x)=z$(ct) AND k(x)=d(x) THEN
LET a(ct)=a(ct)+1: LET f(ct)=f(ct)+d(x)
: LET h(ct)=h(ct)+k(x): LET p(ct)=p(ct)+
1: LET m(ct)=m(ct)+1
1231 IF g$(x)=z$(ct) AND k(x)<d(x) THEN
LET a(ct)=a(ct)+3: LET f(ct)=f(ct)+d(x)
: LET h(ct)=h(ct)+k(x): LET p(ct)=p(ct)+
1: LET w(ct)=w(ct)+1
1240 LET x=x+1: IF x=7 THEN GO TO 1250
1245 GO TO 1190
1250 LET ct=ct+1: IF ct>12 THEN GO TO 1
260
1255 GO TO 1180
1260 BORDER 6: PAPER 6: CLS
1270 PRINT PAPER 7; INK 1; AT 1,2; "Resul
ts Service Division "; dv
1280 LET x=1
1290 BEEP .02,4: BEEP .06,3: PAUSE 100
1300 LET x=1
1310 PRINT INK 0; AT x+3,2; h$(x); " "; k(x
): BEEP .01,3: PRINT INK 2; AT x+3,17; g$
(x); " "; d(x): BEEP .06,12
1311 PAUSE 50
1320 LET x=x+1: IF x>6 THEN GO TO 1330
1325 GO TO 1310
1330 PRINT PAPER 0; INK 7; AT 20,9; "Pres
s any key...": PAUSE 0
1350 FOR x=1 TO 15
1360 IF k$(x)="j" THEN LET k$(x)="f"
1370 NEXT x
1371 LET inju=INT (RND*5)
1372 FOR x=1 TO inju
1380 LET inj=INT (RND*15)+1
1390 IF j(inj)>0 THEN LET k$(inj)="i"
1400 NEXT x
1410 LET x=1: LET pick=0
1420 IF k$(x)="p" THEN LET pick=pick+1
1430 LET x=x+1: IF x>15 THEN GO TO 1440
1435 GO TO 1420
1450 LET pl=INT (RND*40)+1
1451 IF p$(pl)="*" " THEN GO TO
1450
1460 BORDER 0: PAPER 0: CLS
1461 IF sq=15 THEN GO TO 1560
1462 IF mon<100 THEN GO TO 1560
1470 PRINT PAPER 6; INK 0; AT 1,8; "** Tr
ansfer Market **"
1480 PRINT INK 7; AT 5,8; "Player "; p$(pl
) ' AT 7,8; "Club "; f$(pl) ' AT 9,8; "Skill
Rating "; j(pl) ' AT 11,8; "Worth #"; INT j
(pl)*INT (1000/dv): PRINT PAPER 5; INK
1; AT 13,8; "Input your offer or 0"
1490 INPUT p$(41): IF p$(41)="
" THEN GO TO 1490
1491 LET n=VAL p$(41)
1492 IF n<=0 THEN GO TO 1560
1500 LET mn=i(pl)*1000/dv+(INT (RND*3000
/dv))-(INT (RND*4000/dv))
1501 IF mn<200 THEN LET mn=1000
1510 IF n>mn THEN GO TO 1530
1520 LET otc=INT (RND*60)+1: IF v$(otc)=
y$ THEN GO TO 1520
1521 PRINT PAPER 7; INK 0; AT 15,8; "Bid
is refused" AT 16,8; v$(otc); " signed him
": LET f$(pl)=v$(otc): BEEP .03,23: BEEP
.09,30: BEEP .01,6: PAUSE 200: GO TO 15
50
1530 PRINT PAPER 7; INK 0; AT 15,8; "Bid

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PROGRAMMING: SPECTRUM

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is accepted!": BEEP .08,12: BEEP .09,23:
BEEP .04,11
1531 LET mon=mon-n: LET sq=sq+1: LET bu
y=n
1532 LET x=1
1533 IF s$(x)="*
    " THEN LET s$(
x)=p$(p1): LET j(x)=i(p1): LET g(x)=0:
LET k$(x)="f": GO TO 1536
1534 LET x=x+1: IF x>15 THEN GO TO 1536
1535 GO TO 1533
1536 LET p$(p1)="*": LET i(p1)=0
1560 BORDER 1: PAPER 1: CLS
1570 PRINT PAPER 5; INK 1;AT 5,1;"Do yo
u wish to transfer list"AT 6,1;"any pla
yers (y/n)
": INPUT I$(1)
1580 IF I$(1)<>"y " THEN GO TO 1600
1581 CLS : PRINT PAPER 5; INK 1;AT 1,9;
"Transfer Listing"AT 4,1;"No.Player...
...Sk.###...Goals"
1582 FOR x=1 TO 15: PRINT INK 6; BRIGHT
1;AT x+5,1;x;AT x+5,4;s$(x);AT x+5,16;j
(x);AT x+5,19;"#";j(x)*INT (1000/dv);AT
x+5,27;g(x): BEEP .05,x*2: NEXT x
1583 PRINT INK 6; PAPER 0;" Player No.?"
": INPUT I$(1): LET n=VAL I$(1): IF n<1
OR n>15 OR I$(1)=" " THEN GO TO 1581
1584 IF k$(n)="i" THEN PRINT INK 7; PA
PER 0;AT 0,9;"Player is injured": BEEP .
1,2: PAUSE 100: GO TO 1581
1585 LET co=INT (RND*60)+1: IF s$(n)="*
    " THEN GO TO 1581
1586 LET mo=j(n)*INT (1000/dv)+(RND*INT
(3000/dv))-(RND*INT (2500/dv)): LET mo=I
NT mo
1587 IF mo<500 THEN LET mo=1000
1588 IF v$(co)=y$ THEN GO TO 1585
1589 CLS : PRINT PAPER 5; INK 1;AT 3,10
;v$(co): PRINT INK 7;AT 6,3;"have offer
ed #";moAT 8,3;"For ";s$(n)AT 10,3;"

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PROGRAMMING: C64

Handycalc

David Green

This week features the final instalment of Handycalc. The functions are all self explanatory, except the arrow

key. This is actually a clear error function. If a very large number is generated it will exceed the calculator display. If this happens cancel the calculator then restart it to rectify the display.

127 DATA174, 192, 198, 224, 9, 208, 3, 76	164 DATA75, 195, 152, 157, 64, 4, 76, 207
128 DATA207, 192, 173, 190, 198, 157, 75	165 DATA192, 169, 0, 160, 32, 157, 95, 195
129 DATA195, 157, 64, 4, 232, 142, 192, 192	166 DATA152, 157, 64, 4, 76, 207, 192, 32
130 DATA76, 207, 192, 162, 11, 169, 32, 157	167 DATA110, 196, 76, 207, 192, 32, 110
131 DATA62, 4, 202, 208, 250, 96, 174, 192	168 DATA196, 169, 54, 133, 1, 169, 0, 141
132 DATA198, 224, 0, 208, 3, 32, 166, 195	169 DATA195, 198, 141, 197, 198, 169, 1
133 DATA174, 192, 198, 224, 9, 208, 3, 76	170 DATA141, 196, 198, 32, 242, 192, 32
134 DATA207, 192, 173, 190, 198, 157, 95	171 DATA52, 193, 169, 55, 133, 1, 169, 0
135 DATA195, 76, 156, 195, 165, 122, 141	172 DATA141, 196, 198, 76, 207, 192, 169
136 DATA182, 198, 165, 123, 141, 183, 198	173 DATA9, 141, 5, 212, 169, 80, 141, 6, 212
137 DATA169, 75, 160, 195, 133, 122, 132	174 DATA169, 33, 141, 4, 212, 169, 126, 141
138 DATA123, 32, 121, 0, 32, 243, 186, 32	175 DATA0, 212, 169, 159, 141, 1, 212, 160
139 DATA27, 188, 162, 6, 181, 96, 157, 115	176 DATA32, 162, 255, 202, 208, 253, 136
140 DATA195, 202, 208, 248, 169, 95, 160	177 DATA208, 248, 169, 0, 141, 4, 212, 96
141 DATA195, 133, 122, 132, 123, 32, 121	178 DATA173, 191, 198, 208, 16, 169, 1, 141
142 DATA0, 32, 243, 188, 32, 27, 188, 162	179 DATA187, 198, 141, 191, 198, 169, 0
143 DATA6, 189, 115, 195, 149, 104, 202	180 DATA141, 192, 198, 76, 207, 192, 32
144 DATA208, 248, 173, 182, 198, 133, 122	181 DATA43, 197, 76, 207, 192, 173, 187
145 DATA173, 183, 198, 138, 123, 96, 32	182 DATA198, 201, 1, 240, 9, 32, 8, 198, 169
146 DATA221, 189, 32, 166, 195, 162, 0, 189	183 DATA1, 141, 187, 198, 96, 32, 206, 195
147 DATA0, 1, 157, 75, 195, 232, 224, 9, 208	184 DATA165, 97, 32, 106, 184, 32, 25, 196
148 DATA245, 56, 32, 240, 255, 140, 193	185 DATA96, 173, 191, 198, 208, 18, 169
149 DATA198, 142, 194, 198, 24, 162, 1, 160	186 DATA2, 141, 187, 198, 169, 1, 141, 191
150 DATA23, 32, 240, 255, 173, 134, 2, 141	187 DATA198, 169, 0, 141, 192, 198, 76, 207
151 DATA189, 198, 169, 1, 141, 134, 2, 169	188 DATA192, 32, 100, 197, 76, 207, 192
152 DATA0, 160, 1, 32, 30, 171, 162, 10, 169	189 DATA173, 187, 198, 201, 2, 240, 9, 32
153 DATA0, 141, 192, 198, 157, 94, 195, 202	190 DATA8, 198, 169, 2, 141, 187, 198, 96
154 DATA208, 250, 24, 174, 194, 198, 172	191 DATA32, 206, 195, 165, 97, 32, 83, 184
155 DATA193, 198, 32, 240, 255, 173, 189	192 DATA32, 25, 196, 96, 173, 191, 198, 208
156 DATA198, 141, 134, 2, 96, 169, 0, 170	193 DATA18, 169, 4, 141, 187, 198, 169, 1
157 DATA141, 191, 198, 141, 187, 198, 141	194 DATA141, 191, 198, 169, 0, 141, 192
158 DATA192, 198, 157, 75, 195, 157, 95	195 DATA198, 76, 207, 192, 32, 157, 197
159 DATA195, 157, 115, 195, 232, 224, 9	196 DATA76, 207, 192, 173, 187, 198, 201
160 DATA208, 242, 32, 166, 195, 96, 174	197 DATA4, 240, 9, 32, 8, 198, 169, 4, 141
161 DATA192, 198, 208, 3, 76, 207, 192, 206	198 DATA187, 198, 96, 32, 206, 195, 165
162 DATA192, 198, 174, 192, 198, 173, 191	199 DATA97, 32, 43, 186, 32, 25, 196, 96
163 DATA198, 208, 14, 169, 0, 160, 32, 157	

continued on page 24 ►

PROGRAMMING: C64

◀ continued from page 23

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200 DATA173,191,198,208,18,169,8,141
201 DATA187,198,169,1,141,191,198
202 DATA169,0,141,192,198,76,207,192
203 DATA32,214,197,76,207,192,173
204 DATA187,198,201,8,240,9,32,8,198
205 DATA169,8,141,187,198,96,32,206
206 DATA195,165,97,201,0,208,4,32
207 DATA110,196,96,32,18,187,32,25
208 DATA196,96,173,191,198,208,3,76
209 DATA207,192,32,8,198,76,207,192
210 DATA173,187,198,201,1,208,3,76
211 DATA43,197,201,2,208,3,76,100
212 DATA197,201,4,208,3,76,157,197
213 DATA201,8,208,3,76,214,197,96
214 DATA162,0,189,54,198,157,64,3
215 DATA232,224,129,208,245,96,255
216 DATA254,0,192,6,0,191,250,0,191
217 DATA250,0,192,6,0,255,254,0,255
218 DATA198,0,255,198,0,255,254,0
219 DATA196,70,0,196,70,0,255,254
220 DATA0,196,70,0,196,70,0,255,254
221 DATA0,196,70,0,196,70,0,255,254
222 DATA0,196,70,0,196,70,0,255,254
223 DATA0,0,255,0,0,254,0,0,252,0
224 DATA0,254,0,0,255,0,0,255,128
225 DATA0,223,192,0,143,224,0,7,240
226 DATA0,3,248,0,1,240,0,0,224,0
227 DATA0,64,0,0,0,0,0,0,0,0,0
228 DATA0,0,0,0,0,0,0,0,0,0,0
229 DATA0,0,0,0,0,0,0,0,0,0,0
230 DATA0,0,0,0,0,213,195,195,195
231 DATA195,195,195,195,195,195,195
232 DATA195,201,194,32,32,32,32,32
233 DATA32,32,32,32,32,32,194,202
234 DATA195,195,195,195,195,195,195
235 DATA195,195,195,195,203,160,160
236 DATA160,160,160,160,160,160,160
237 DATA160,160,160,160,160,160,160
238 DATA160,160,160,160,160,160,143
239 DATA134,134,160,160,160,160,160
240 DATA160,160,160,160,160,160,160
241 DATA160,160,160,160,184,160,160
242 DATA160,185,160,160,160,176,160
243 DATA160,160,160,160,160,160,160
244 DATA160,160,160,160,160,160,160
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245 DATA160,160,181,160,160,160,182
246 DATA160,160,160,183,160,160,160
247 DATA160,160,160,160,160,160,160
248 DATA160,160,160,160,160,160,160
249 DATA178,160,160,160,179,160,160
250 DATA160,180,160,160,160,160,160
251 DATA160,160,160,160,160,160,160
252 DATA160,160,160,160,160,170,160
253 DATA160,160,174,160,160,160,177
254 DATA160,160,160,160,160,160,160
255 DATA160,160,160,160,160,160,160
256 DATA160,160,160,171,160,160,160
257 DATA173,160,160,160,175,160,160
258 DATA160,160,160,160,160,160,160
259 DATA160,160,160,160,160,160,160
260 DATA160,131,160,160,160,159,160
261 DATA160,160,189,160,160,160,160
262 DATA160,160,160,160,160,160,160
263 DATA160,160,160,160,1,1,1,1,1
264 DATA1,1,1,1,1,1,1,1,1,1,1,1
265 DATA1,1,1,1,1,1,1,1,1,1,1,1
266 DATA1,1,1,1,1,1,1,1,14,14,14,14
267 DATA14,14,14,14,14,14,14,14,14
268 DATA14,14,14,14,14,14,14,14,14
269 DATA1,1,1,14,14,14,14,14,14,14
270 DATA14,14,14,14,14,14,14,14,7
271 DATA7,7,14,7,7,7,14,7,7,7,14,14
272 DATA14,14,14,14,14,14,14,14,14
273 DATA14,14,14,14,7,7,7,14,7,7,7
274 DATA14,7,7,7,14,14,14,14,14,14
275 DATA14,14,14,14,14,14,14,14,14
276 DATA7,7,7,14,7,7,7,14,7,7,7,14
277 DATA14,14,14,14,14,14,14,14,14
278 DATA14,14,14,14,14,3,3,3,14,7
279 DATA7,7,14,7,7,7,14,14,14,14,14
280 DATA14,14,14,14,14,14,14,14,14
281 DATA14,3,3,3,14,3,3,3,14,3,3,3
282 DATA14,14,14,14,14,14,14,14,14
283 DATA14,14,14,14,14,14,15,15,15
284 DATA14,10,10,10,14,13,13,13,14
285 DATA14,14,14,14,14,14,14,14,14
286 DATA14,14,14,14,173,195,198,240
287 DATA12,32,159,255,165,203,201
288 DATA4,208,3,76,218,194,76,78,192
289 DATA-1
READY.
```

PROGRAMMING: BBC/ELECTRON

Machine code graphics

Francis Botto

Basic graphics are quick and easy to achieve, but if you're ever going to write good graphics programs, which stretches your machine to its outer limits in terms of graphics capability, you'll

need to exploit machine code graphics. That's a transition not nearly as difficult as you might have thought. For using the BBC/electron, machine code programs may be generated in a particularly straight forward manner.

VDU codes to machine code

Machine code graphics on the BBC/electron microcomputer, using the 6502 assembler and the microcomputer's associated machine operating system (MOS), may be implemented in a conveniently simple manner. For example, the VDU codes and related data, written in hexadecimal, often provide an ideal starting point for the creation of a machine code program.

In order to write to the screen using assembly language, use can be made of the *OSWRCH* (or *write character*) routine,

PROGRAMMING: BBC/ELECTRON

which is an obliging driver module and exists within the machine operating system. The call address for the *OSWRCH* routine is &FFE3 (alternatively, &FFEE may be used). The following assembly language listings will demonstrate the use of the *OSWRCH* routine.

To get started, Listing 1 draws a graphics window in the middle of the screen. This program solution is possibly the simplest method of converting *VDU* codes into assembly language. In fact, the integer values could have been treated in decimal form. However, hexadecimal numbers are used for reasons which will become apparent later. Notice, the sixteen bit numbers (dimensions A, B, C and D), are split into bytes (as the accumulator may accommodate eight bits only), the lower byte being processed first. The order in which such bytes are arranged is vitally important.

Listing 1 is an extremely limited and inefficient programming approach, in that, a number of graphics windows would require a vast amount of often too valuable memory space. Also, *JSR OSWRCH* seems to appear too frequently. Naturally, a better program would incorporate an equivalent *REPEAT... UNTIL* or *LOOP* structure together with an appropriate data area. Listing 2 is just such a program.

Listing 2 exhibits a great deal of compactness, and offers more flexibility in terms of program enhancement. For example, if further graphics windows, or any other *VDU* codes were to be incorporated, the appropriate elements could be simply

added to the *data_area*, and the loop count at line 200 suitably adjusted.

Notice the order in which the *data_area* elements are arranged (in comparison with listing 1). The *EQUW* (equate) mnemonic simply reserves two bytes of memory, in order to accommodate the following data word. There is no need to specify vacant memory locations as the assembler kindly obliges. *EQUB* reserves a single byte of memory. Interestingly, no special provisions are included in the program for the processing of the dimensions A, B, C and D, which are 16-bit numbers. In fact the *OSWRCH* routine will process these dimensions in separate bytes.

To say a little about the program. The routine *graphics_window_using_database*, solely depends upon a loop structure; the number of repetitions is determined at line 220, which tests the contents of the loop counter X. However, the X register not only acts as a loop counter, but a *data_area* pointer. That is to say each element of the *data_area* read at line 170, will also be determined by the X register. For example, when the X register contents are zero, the first element of the data area will be read, which is &16. Similarly, when the X register contents are one, the second data area element will be read, which is &01. Consequently, elements of the data area are read in sequence, until the contents of the X register equals &0F or 15 when this condition is satisfied at line 220, the RTS instruction at line 240 will be implemented.

Listing 2 provides an adequate program,

and is without bad habits, but suppose we wanted to draw a number of graphics windows? Well that would be no problem, we could simply add the appropriate data onto the *data_area*. However, there is only one thing wrong with this approach, the (graphics window) *VDU* code &18 and the *CLG* code &10, would repeatedly occur. This is not such good programming practice.

Listing 3 provides a program solution rather less dependent upon mindlessly crunching through a data area, but takes advantage of certain recurring events. In other words there is only need for actual dimensions of graphics windows within the data area.

Once again, the X register is utilised as a data area pointer and loop counter. However, because two separate loops are included, the Y register is also adopted as a loop counter. The Y register determines the number of *inner_loops*, and the X register determines the number of *outer_loops*, both of which are indicated on the listing. The X register is not strictly a loop counter but does determine whether or not to loop.

A similar programming strategy can be adopted to draw a number of triangles. For example, listing 4. As the listing is liberally remarked upon, and we have covered the basic programming ideas, we shall leave it at that, and discuss the area of machine code which is most likely to be of use, in the design of fast graphics. Yes, character definition and animation, which will be discussed next week.

```

10 REM Listing 1
20 REM Graphics window using assembly language.
30 REM F M Botto * 1987 *
40
50 OSWRCH=&FFE3
60 DIM ME% 100
70 FOR rep%=0 TO 2 STEP 2
80 P%=ME%
90
100 [
110 OPT rep% \ Select option (suppress listing).
120 \.....
130 .graphics_window
140 LDA #&16 \ Equivalent to VDU22 or MODE.
150 JSR OSWRCH \ Unconditional jump to OSWRCH routine.
160 LDA #&01 \ MODE 1.
170 JSR OSWRCH
180 LDA #&12 \ Equivalent to GOOL0,
190 JSR OSWRCH
200 LDA #&00
210 JSR OSWRCH
220 LDA #&E5 \ Set graphics colour to red.
230 JSR OSWRCH
240 LDA #&18 \ Define graphics window.
250 JSR OSWRCH
260 LDA #&4E \ Dimension A Least significant byte.
270 JSR OSWRCH
280 LDA #&02 \ Dimension A Most significant byte.
290 JSR OSWRCH
300 LDA #&9A \ Dimension B LSByte.
310 JSR OSWRCH
320 LDA #&01 \ Dimension B MSByte.
330 JSR OSWRCH
340 LDA #&B2 \ Dimension C LSByte.
350 JSR OSWRCH
360 LDA #&02 \ Dimension C MSByte.
370 JSR OSWRCH
380 LDA #&FE \ Dimension D LSByte.
390 JSR OSWRCH
400 LDA #&01 \ Dimension D MSByte.
410 JSR OSWRCH
420 LDA #&10 \ Equivalent to CLG or VDU 16.
430 JSR OSWRCH
440 RTS \ Return from subroutine graphics_window to BASIC.
450 \.....
460 ]
470 NEXT rep%

```

```

480 CALL graphics_window
490 END
>
10 REM Listing 2
20 REM Graphics window using a LOOP
30 REM structure and appropriate data area
40 REM F M Botto * 1987 *
50
60 OSWRCH=&FFEE
70 DIM ME% 100
80 FOR rep%=0 TO 2 STEP 2
90 P%=ME%
100
110 [
120 OPT rep%
130 \.....
140 .graphics_window_using_dataarea
150 LDX #&0 \ Utilise the X register as a loop counter.
160 .loop_graphics_window
170 LDA data_area,X \ Read element of data area determined by X.
180 JSR OSWRCH \ Unconditional jump to OSWRCH routine.
190 INX \ Increment loop counter by one.
200 CPX #&0F \ Have all the elements of the data area been
210 \ read, (can be treated in decimal form -#15).
220 BNE loop_graphics_window \ Loop if elements of data_area
230 \ remain unread.
240 RTS \ Return from subroutine to BASIC.
250 \.....
260 .data_area
270 EQUW &0116 \ Equivalent to MODE1 or VDU22,1 or VDU&16,&1
280 EQUW &0012 \ Equivalent to GOOL0,
290 EQUW &E5 \ Set graphics colour to red.
300 EQUW &18 \ Equivalent to VDU 24 or VDU&18.
310 EQUW &024E \ Dimension A
320 EQUW &019A \ Dimension B
330 EQUW &02B2 \ Dimension C
340 EQUW &01FE \ Dimension D
350 EQUW &10 \ Equivalent to CLG or VDU16 or VDU &10.
360 \.....
370 ]
380 NEXT rep%
390 CALL graphics_window_using_dataarea
400 END

```

continued on page 26 ►

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◀ continued from page 25

```

10 REM Listing 3
20 REM * F M Botto * 1987 *
30
40 OSWRCH=&FFEE
50 DIM ME% 100
60 FOR rep%=0 TO 2 STEP 2
70 P%=ME%
80
90 [
100 OPT rep% \ Select option, (suppress listing).
110 \.....
120 .graphics_windows
130 LDA #&16 \ Equivalent to VDU 22 or MODE.
140 JSR OSWRCH \ Unconditional jump to OSWRCH routine.
150 LDA #&05 \ MODE 5.
160 JSR OSWRCH
170 LDA #&12 \ Equivalent to GOOLO,
180 JSR OSWRCH
190 LDA #&00
200 JSR OSWRCH
210 LDA #&E5 \ Set graphics colour to red.
220 JSR OSWRCH
230 LDX #&0 \ Utilise the X register as outer_loop counter.
240 .outer_loop
250 LDY #&0 \ Utilise the Y register as inner_loop counter.
260 LDA #&18 \ Define graphics window, Equivalent to
270 \ VDU 24 or VDU &18
280 JSR OSWRCH
290 .inner_loop
300 LDA data_area,X \ Read element of data_area corresponding
310 \ to the contents of X.
320 JSR OSWRCH
330 INX \ Increment outer loop count.
340 INY \ Increment inner loop count.
350 CPY #&08
360 BNE inner_loop \ Loop if the four dimensions have
370 \ not been read.
380 LDA #&10 \ Equivalent to CLG or VDU 16.
390 JSR OSWRCH
400 CPX #&18 \ Compare X with number of bytes in data_area.
410 BNE outer_loop \ Loop if all elements of data_area
420 \ have not been read.
430 RTS \ Return from graphics_windows to BASIC.
440 \.....
450 .data_area
460 EQUW&024E \ Dimension A1
470 EQUW&019A \ Dimension B1
480 EQUW&02B2 \ Dimension C1
490 EQUW&01FE \ Dimension D1
500 \.....
510 EQUW&00C8 \ Dimension A2
520 EQUW&0096 \ Dimension B2
530 EQUW&01C2 \ Dimension C2
540 EQUW&015E \ Dimension D2
550 \.....
560 EQUW&0316 \ Dimension A3
570 EQUW&0258 \ Dimension B3
580 EQUW&0352 \ Dimension C3
590 EQUW&028A \ Dimension D3
600 \.....
610 ]
620 NEXT rep%
630 CALL graphics_windows
640 END

```

```

10 REM Listing 4
20 REM * F M Botto * 1987 *
30
40 OSWRCH=&FFEE
50 DIM ME% 200
60 FOR rep%=0 TO 2 STEP 2
70 P%=ME%
80
90 [
100 OPT rep%
110 \.....
120 .draw_triangles
130 LDA #&16 \ Equivalent to MODE or VDU 22.
140 JSR OSWRCH \ Unconditional jump to OSWRCH routine.
150 LDA #&01 \ MODE 1.
160 JSR OSWRCH
170 LDA #&12 \ Equivalent to GOOLO,
180 JSR OSWRCH
190 LDA #&00
200 JSR OSWRCH
210 LDA #&05 \ Set graphics foreground to red.
220 JSR OSWRCH
230 LDX #&0 \ Utilise X register as data_area pointer.
240 \.....
250 .loop_draw_triangles
260 LDA #&19 \ Equivalent to PLOT
270 JSR OSWRCH
280 LDA #&04 \ Move graphics cursor to position determined
290 \ by data_area coordinates.
300 JSR OSWRCH
310 LDY #&0 \ Utilise X as second_loop counter.
320 \.....

```

```

330 .second_loop_draw_triangles
340 LDA data_area,X \ Read element of data_area determined by X.
350 JSR OSWRCH
360 INX \ Increment data_area pointer by one.
370 INY \ Increment loop counter by one.
380 CPY #&04 \ Have all data_area elements
390 \ forming coord B been read?
400 BNE second_loop_draw_triangles \ If not, loop.
410 \.....
420 LDA #&19 \ Equivalent to PLOT
430 JSR OSWRCH
440 LDA #&04 \ Equivalent to DRAW.
450 JSR OSWRCH
460 LDY #&0 \ Reset loop counter to zero.
470 \.....
480 .third_loop_draw_triangles
490 LDA data_area,X \ Read element of data_area determined by X.
500 JSR OSWRCH
510 INY \ Increment loop counter by 1.
520 INX \ Increment data_area pointer by 1.
530 CPY #&04 \ Have all data_area elements
540 \ forming coord B been read?
550 BNE third_loop_draw_triangles \ If not, loop.
560 \.....
570 LDA #&19 \ Equivalent to PLOT
580 JSR OSWRCH
590 LDA #&55 \ Equivalent to PLOT85, (triangle filling).
600 JSR OSWRCH
610 LDY #&0 \ Reset loop counter to zero.
620 \.....
630 .fourth_loop_draw_triangles
640 LDA data_area,X \ Read element of data_area determined by X.
650 JSR OSWRCH
660 INX \ Increment data_area pointer by 1.
670 INY \ Increment loop counter by 1.
680 CPY #&04 \ Have all data_area elements
690 \ forming coord C been read?
700 BNE fourth_loop_draw_triangles \ If not, loop.
710 \.....
720 CPX #&24 \ Have all data_area elements been read?
730 BNE loop_draw_triangles \ If not, loop.
740 RTS \ Return from draw_triangles to BASIC.
750 \.....
760 .data_area
770 EQUW &0370029E \Coordinate A1.
780 EQUW &037003E8 \Coordinate B1.
790 EQUW &013603E8 \Coordinate C1.
800 \.....
810 EQUW &02BC028A \Coordinate A2.
820 EQUW &012C0370 \Coordinate B2.
830 EQUW &012C0190 \Coordinate C2.
840 \.....
850 EQUW &03700118 \Coordinate A3.
860 EQUW &03700276 \Coordinate B3.
870 EQUW &01360118 \Coordinate C3.
880 \.....
890 ]
900 NEXT
910 CALL draw_triangles
920 END

```

```

10 REM Listing 5
20 REM * F M Botto * 1987 *
30
40 OSWRCH=&FFEE
50 DIM ME% 100
60 FOR rep%=0 TO 2 STEP 2
70 P%=ME%
80 90 [ 100 OPT rep%
110 \.....
120 .define_character
130 LDX #&0 \ Utilise the X register as a loop counter.
140 .loop_define_character
150 LDA data_area,X \ Read element of data_area determined by X.
160 JSR OSWRCH \ Unconditional jump to OSWRCH routine.
170 INX \ Increment loop counter by one.
180 CPY #&18 \ Have all data_area elements been read?
190 BNE loop_define_character \ If not loop.
200 RTS \ Return from subroutine to BASIC.
210 \.....
220 .data_area
230 EQUW &0516 \ Equivalent to MODE5 or VDU22,5 or VDU&16,&5
240 EQUW &0112 \ Equivalent to COLOUR.
250 EQUW &05 \ Set text colour to red.
260 EQUW &05 \ Allows text to be written at graphics cursor.
270 EQUW &FF17 \ Define character (=VDU23,255,.....)
280 EQUW &6462321C \ Data forming character
290 EQUW &38666068 \ Data ,, ,, ,, ,, ,, ,,
300 EQUW &0419 \ Move graphics cursor, equivalent to
310 \ PLOT25,04 or MOVE.
320 EQUW &028A \ x dimension,
330 EQUW &01F4 \ y dimension.
340 EQUW &FF \ Defined character.
350 EQUW &04 \ Return to writing text from text cursor.
360 \.....
370 ]
380 NEXT rep%
390 CALL define_character
400 END

```

Big Scroll

R Bibby

Spectrum owners can now have 16 character high smooth scrolling displays of any message typed in, up to 5000 characters long.

Enter the program and run it. If correctly entered it will ask you for the paper and ink colours and then scroll the message until any key is pressed.

```

1 REM **** R.Bibby 1987 ****
10 CLEAR 59999: BORDER 0: PAPER 0: INK 7: CLS
100 FOR f=65000 TO 65119 STEP 20: LET t=0: FOR x=f TO f+19: READ a: POKE x,a: LET t=t+a: NEXT x: READ a: IF t<>a THEN PRINT "ERROR AT LINE ";((f-65000)/2)+1000: STOP
110 NEXT f
120 INPUT "Enter background colour (0-7) ";b
130 IF b<0 OR b>7 THEN GO TO 120
140 POKE 65535,b*8
150 INPUT "Enter foreground colour (0-7) ";f
160 IF f<0 OR f>7 THEN GO TO 150
165 POKE 65534,64+f*8
170 INPUT "ENTER MESSAGE"***a$
180 IF LEN a$>5000 THEN GO TO 170
200 FOR n=1 TO LEN a$: POKE n+59999,CODE a$(n): NEXT n
210 FOR x=(n+59999) TO (n+60004): POKE x,32: NEXT x: POKE x,255
250 PRINT #1:AT 0,5;"PRESS ANY KEY TO START": PAUSE 0: PAPER b: BORDER b: INK f: CLS
300 RANDOMIZE USR 65000: IF INKEY"<>" THEN GO TO 120
310 GO TO 300
1000 DATA 33,96,234,229,126,254,255,40,18,237,91,54,92,111,38,0,41,41,41,25,2056
1010 DATA 205,5,254,225,35,24,232,225,201,17,90,254,1,8,0,237,176,6,8,197,2400
1020 DATA 6,8,33,159,88,17,90,254,213,26,203,39,18,56,26,58,255,255,119,17,1940
1030 DATA 32,0,25,119,25,209,19,16,235,229,213,205,62,254,118,209,225,193,16,215,2619
1040 DATA 201,58,254,255,24,228,33,128,88,6,16,197,229,84,93,35,1,31,0,237,2198
1050 DATA 176,58,255,255,18,225,193,17,32,0,25,16,234,201,0,0,0,0,0,1705
    
```

Window title

Abdul Rahman

Retitle your windows from Atari ST Basic with this short routine. For the *Edit Window* set w to 4, *List Window* set w to 6, *Output* set w to 8 and *Command* set w to 10.

```

10 title$ = " ATARI ST IS THE BEST "
20 input w
30 fullw w
40 a# = gb : gintin = peek(a#+w) : poke gintin,peek(systab+8):
   poke gintin+2,2: s# =gintin+4 : title$=title$+chr$(0) :
   poke s#,varptr(title$) : gemsys(105)
50 end
    
```

User Expander

Gareth L Perkins

When you purchase a disc system for the Amstrad CPC one of the new commands is *User x*, where x is a number between 0-15. With this routine the *User* command can now access numbers up to 255, so allowing you to hide files. A number of 239 will allow you to load erased files on the disc, provided they haven't been overwritten.

```

10 REM ** Improved User **
20 REM by Gareth L. Perkins
30 REM
40 MEMORY &9FFF:CALL &BBFF:MODE 2:PEN 1
50 FOR a=&A000 TO &A020:READ b$:POKE a,VAL("&"+b$)
60 c=c+PEEK(a):NEXT
70 IF c<>&D6A THEN PRINT "DATA Error!":STOP
80 PRINT ":USER,0-255 installed"
90 CALL &A000:END
100 DATA 01,09,A0,21,0E,A0,C3,D1,BC,12,A0,C3
110 DATA 17,A0,06,A5,09,A0,55,53,45,D2,00,DD
120 DATA 7E,00,DD,86,01,32,01,A7,C9
    
```

Attention!

Unfortunately due to the sheer volume of submissions our returns department has been unable to cope satisfactorily. So, from this week onwards we are requesting that you include a suitable stamped addressed envelope for return of your submission. Not enclosing a suitable SAE will mean that your program will not be returned. You have been warned.

The beneficial side of this system is that 90% of submissions will be returned within one week. A small price to pay for such a

service I'm sure you'll agree.

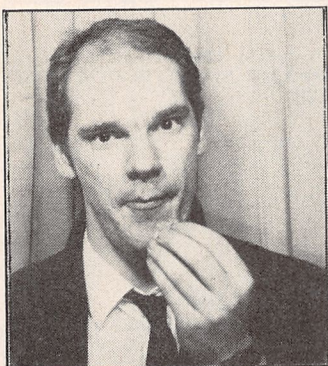
At present we still have a large number of submissions to be returned. These will still be sent back. In fact around half of these have been returned within the last couple of weeks. Bear with us and we'll get the rest back as soon as possible.

With regards to future submissions we are looking for articles on programming in general, utility programs and applications software and lastly, good games. Here are a few types of program we don't want:

Educational, hangman, pools predictors, mastermind, flashing borders, bank accounts, disc catalogues and clocks.

If you can't get a program listing in the magazine to work ring in to see whether it was faulty rather than writing. If there were problems then we'd let you know. Corrections normally appear a couple of weeks later. Thanks.

Duncan Evans
Technical Editor



with Kenn Garroch

Printer	Computer
Sig Ground	Sig Ground
TX	RX
RX	TX
RTS	CTS
CTS	RTS

However, a printer need only be sent data, as there is none coming back. In this situation, a 3 pin connection can be set up with:

Printer	Computer
Sig ground	Sig ground
RX	TX
RTS/Busy	CTS

That is, the computer's data transmission line to the printer's data reception line, the computer's 'clear to send' input to the printer's busy output, and a common ground. The only drawback is, since I don't have any Tandy computers or their manuals, I don't know which pin is which. However, it should be somewhere in the printer manual.

Tandy interface connections

G M Whiston, of Kitwell, Birmingham, writes:

Q I have a Radio Shack TRS-80 CGP-115 colour graphics printer, otherwise known as the Tandy 4.5" Printer Plotter. I use it with the parallel interface of my computer but the CGP-115 also has a serial interface. This is specified on page 31 of the manual as being RS232-C, using the Data and Busy, 600 Baud, 7 bit, no parity, and two stop bits. The connection is in the form of a 4 pin DIN socket.

I cannot find anything related to RS232 taking this form, the nearest thing being RS432 using a 5 pin DIN.

Someday, I would like to be able to drive the CGP-115 via the serial interface while something else is connected to the parallel port of my computer. The manual does mention a cable - a 4 pin to 4 pin DIN - for making connection to a Tandy computer.

How do I connect the serial interface to something else?

A The full specification for RS232C is for a 25 way D connector having the following connections:

1 Ground	Protective ground
2 TX	Transmit data
3 RX	Receive data
4 RTS	Request to send
5 CTS	Clear to send
6 DSR	Data set ready
7 Ground	Signal ground
8 DCD	Data carrier detect
20 DTR	Data carrier/terminal ready
22 RD	Bell detect

For two way communication, the minimum number of connections that need to be made are:

Commodore disc queries

Peter Nunn, of Halesworth, Suffolk, writes:

Q As an owner of a Commodore 64 I have been thinking of buying a disc drive for some time. However, with the cost of a slow disc drive being around £200, I am now intending to buy an Atari 520 STFM. As I've never used discs before, I would be grateful if you could answer some questions for me.

I have read that the making of backup copies of discs is advised. Does this mean that discs are easily damaged or corrupted? How are copies made, eg, how can a program which is continuously being read off disc be copied? Do disc drives need to be realigned regularly? If so, is it necessary to take it to a specialist shop?

A The discs used with the Atari ST are of the 3½ inch variety and are held in a hard case, unlike the 5¼ inch floppies which are in flexible cases. The 3½ inch also has a shutter to cover the surface of the disc when it is not in use. These factors make the 3½ inch disc far more reliable than the older 5¼ inch and even these give very little trouble.

However, there is always the chance that something may happen to the disc. It gets hot, or it is subjected to a strong magnetic field, or it gets crushed or thrown away accidentally. In any of these events, the contents of the disc will probably be lost - hence the need for a backup copy.

Copying discs on the ST is performed either by a specialised copy program that reads each track and copies it to the new disc, or simply by moving one disc icon over the other on the ST's desktop, informing the machine that you wish to copy the disc.

With a single drive machine, you will be told to swap the discs at the correct times until the copy is finished. The only trouble arises from protected discs, which the software company does not wish you to backup. These are set up in such a way that either they are totally uncopyable, or certain sections of the disc cannot be copied.

The usual course of action in the case of protected discs becoming corrupted is for the software house to replace faulty or damaged discs with new ones. Of course, proof of purchase is necessary, so it is best to keep the packaging safe.

On the whole, disc drives are more reliable than cassette recorders. They should work for the life of the machine if they are taken care of. As long as they are not dropped (in the case of the STFM, this means the whole machine) they should remain in alignment forever (well, nearly).

If you do have problems with the drive then any reputable repair shop should be able to fix it, or replace it. If the machine is still under guarantee then Atari should fix it.

I have not heard of any problems with drives so far, and the machine has now been around long enough that if there were a problem, it would be well known.

My thanks to Mr S Burns and Mohamed Mohd Salleh for informing me that it is possible to upgrade the CPC464 and 664 computers to 6128 status. All you need is a Basic 1.1 ROM part No. AM40025 costing £21.64, a 28pin socket, and DK'tronic Ram pack - 64 or 256K - or Vortex Ram pack to get the extra memory. The Rom is available from Combined Precision Components Ltd, 194-200 North Road, Preston PR1 1YF. Tel 0772-555034.

Apparently, what you do is remove the Amstrad chip 40009, with great care, replace it with the new socket, and plug in the new Rom. Note that doing this will invalidate your warranty.

On my 464, the 40009 chip is already socketed so no soldering is needed. It is, however, an older model and it may be that newer versions are soldered in. On the 664, the Rom is numbered 40022 and is not socketed. I presume that this is the one to be changed to upgrade to a 6128.

Tandy printer queries

G A Doyle, of Wolverhampton, West Midlands, writes:

Q I have a Tandy DMP 105 printer which has a graphics facility. The interface specification is quoted as eight bits with strobe. I also have a Tandy Graphics plotter, CGP-115, which is interfaced via eight bit parallel using busy handshaking, strobe and acknowledge.

The problem is this: the plotter works perfectly with my computers, the DMP 105 prints out all text but will not produce any graphics. When graphic mode is selected and programmed, the paper moves but nothing is printed.

I have read that Amstrad computers do not have an eighth bit available for printers yet both of the above printers have eight bits in their specification. I have seen advertised leads to provide an eight bit connection. Can you a) suggest a software routine to enable the graphics facility and b) suggest a suitable lead to do the job and c) explain the apparent anomaly in the whole situation?

I have two computers, a CPC464 and a CPC6128 and the situation vis à vis printers is the same for both. I use the same lead for both.

A If your printer has the Epson compatible control codes, ie, ESC "K" for graphics codes and allows the line spacing to be set then the following should work.

Since there are only seven data bits being sent to the printer, the eighth bit comes out at zero leaving a blank line. To get around this, set the line spacing for seven lines or bits, ie, PRINT #8,CHR\$(27);"3";CHR\$(14);

The printer now has 14/144 inch line spacing. You may have to play around with this to get it right. The escape code for graphics is ESC "K" n1, n2 ie, PRINT #8,CHR\$(27);"K";CHR\$(n1);CHR\$(n2); where n1 and n2 define the number of bits to be printed on the line as $n1+(256*n2)$.

The problem here is that n1 is limited to 0-127 so you will have to print out the bit image in chunks of 127 bits (horizontally). This is fine as long as there is no line feed in between the two chunks.

When setting up the bit image, you are again limited to seven bits so if, for example, you are dumping the screen, you will have to split it up into seven bit lines and not the eight bits that are the normal character sizes. However, the following gives a rough idea of what can be done.

```
5 PRINT #8,CHR$(27);"3";CHR$(14);
10 PRINT #8,CHR$(27);"K";CHR$(64);
CHR$(0);
20 FOR T=0 TO 7
30 FOR S=0 TO 7
40 PRINT #8,CHR$(2XT);
50 NEXT: NEXT
60 PRINT #8,CHR$(13)
70 GOTO 10
```

The lead you have should do this job. If you want to get all eight bits then I think you will have to purchase one of the special leads to do the trick. Which one you get is up to you and since I have never used any of them, I cannot recommend one.

The fact that one printer works correctly and the other doesn't simply means that the printer plotter only requires seven bit codes.

The composite ST

J F Thompson, of Watford, Herts, writes:

Q Some weeks ago, you mentioned in your column that the Atari ST has a composite video output. I use my ST with RGB but do have a composite monitor, so I thought I'd give it a go to see what the difference is. The pin 2 connection on the video output does not give

anything on my monitor (my ST is a 1040 STF). What am I doing wrong?

A You're doing nothing wrong. It seems that the composite output is only available on the ST machines with the M in their title. The inclusion of an RF modulator means that a composite input must be found for it. The upshot is that only STs with RF modulators have the composite output on pin two of the video socket, the others unfortunately, don't.

80 columns

Patrick Wynne, of Walkinstown, Dublin, writes:

Q Could you please inform me if it is possible to get a word processor capable of displaying 80 characters across the screen on an ordinary Commodore 64 with an ordinary TV set.

A In recent months, I have seen *Tasword* advertised in various magazines claiming 80 across but, I have been told that this display is impossible on the C64. I am, therefore, stuck with 40 columns across.

A Theoretically, you are correct in saying that 40 characters is the maximum on the 64 screen. However, there are a number of ways around this.

The 64 can display 320 pixels across the screen, and the 40 character limit comes from the fact that the 64 character set is defined on an 8x8 pixel grid. So by redefining the characters as 4x8 you can get 80 columns, although it will be close to unreadable.

A second method, and one used by many word processing packages, is to use the 64 screen as a window on a larger document. So while the text is stored internally in 80-column format, the screen shows any 40-character portion of it.

A third possibility is the use of an add on card such as Ariola-soft's BT-80 cartridge which effectively reconfigures the hardware to give an 80-column screen.

And so the the display. Ordinary TV sets will not give satisfactory results in anything over 60 columns, and certainly not 80 columns. Word processing is the most demanding of tasks in this respect - you risk serious

damage to your eyesight if you attempt to do much work in 80-column mode on a low-res display.

Therefore you need to buy a monochrome composite monitor; you can get a decent one for well under £100.

Golden oldies or over the hill?

S Travis of Milton Keynes, Bucks, writes:

Q I have been considering buying a micro for the kids for some time now and I would like your advice.

A I don't have a lot of money to spend and I notice that you can buy older computers very cheaply in the shops.

A I am thinking of micros like the Electron, C16, and old Spectrums. Are these computers really a bargain? Is there much software for them, and would one be suitable for my children?

A When buying any new machine, you should consider first what you can

afford and secondly what the computer is to be used for.

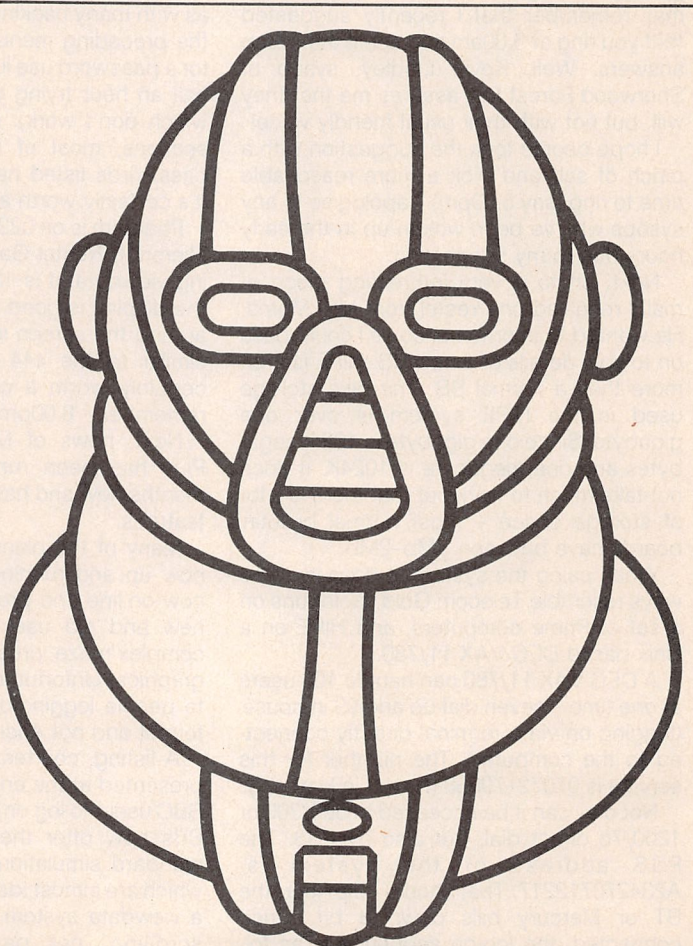
You say that you don't have much money to splash out, and certainly the computers you mention can now be picked up very cheaply.

As for use, I expect your children will be wanting to play games for most of the time, even if you hope they will be using the computer for purely educational purposes.

The Spectrum in particular has a huge software base, and although the machine was first launched five years ago, it seems likely that software will continue to be released for it in quantity for some time to come.

The Spectrum models that you are considering have a poorer quality keyboard than the Plus 2 and 3 versions, less memory (48K as against 128K) and need an external tape deck to load software.

Neither the C16 and Electron were nearly as successful as the Spectrum, and consequently the software base is much smaller, although some companies still release titles regularly for both.



WHO'S BEHIND THE MASK?

WHAT'S NEW ON THE BOARDS

David Wallin returns with news of Bulletin Boards – who's closed down, who's opened up and what's new on the regulars.

This week we'll be looking at Bulletin Boards. I've got news of a new super-board, a new viewdata board, updates on Musictel Plus Bulletin Board, but firstly, sad news of the demise of Prometheus.

Prometheus, Barry Spencer's astronomy board, has been closed down. This saddened many users as it proved a very popular viewdata system. With it go my communications pages, which opened up a large comms. section on the board. However, if Barry Spencer ever starts a new board, I'll be sure to let you all know as quickly as I can.

Before I mention some new BBs to you, a sysop has commented on a suggestion I gave for finding out why a BB is off line. You may remember that I recently suggested that you ring at 3.00am and see if the sysop answers. Well, Kevin Lindley, sysop of Sherwood Forest BB, assures me that they will, but not with their usual friendly voice!

I hope people took the suggestion with a pinch of salt and pick a more reasonable time to ring (say 5.00pm). I apologise to any sysops who've been woken up in the early hours due to my suggestion.

Next, on to a very interesting piece of mail I received on Prestel from Mr I Morris. He wanted to inform me, so as I could pass on to you, details of a new BB. HIPE is a bit more than a normal BB. The disc storage used in the HIPE system is over one gigabyte. Since one gigabyte is 1024 megabytes and one megabyte is 1024K, it does not take much to work out that there is a lot of storage space – most normal bulletin boards have between ½Mb–2Mb.

When using the system, it does in some ways resemble Telecom Gold. Gold runs on a set of Prime computers, and HIPE on a Unix-based DEC VAX 11/780.

A DEC VAX 11/780 can handle 106 users at one time – seven dial-up and 99 in-house (logging on via a terminal directly connected to the computer). The number for this service is 07072–79858 (based in Hatfield).

Not only can it be accessed at 300/300 or 1200/75 direct dial, but also by PSS. The PSS address of the system is; A234270712217. That should help keep the BT or Mercury bills down a bit. Once connected, the log-on sequence is as follows: type *set host 15 (Return)*

There is a username and password which you, as a new user, can log-on with to

become a registered user;
Username: csdidr (Return)
Password: visitors (Return)

The log-on must be in lower case or it won't work! Once you've done this, it's just a matter of registering as a new user. You will be validated and given a higher privilege level and access to more facilities. Considering the system is free, it's certainly worth looking around – especially if you're on PSS!

Another new board which I log on to every now and again is Phantom. Phantom is a viewdata board running between the hours of 8.00pm and 8.00am. It is a popular board with a lot of features, one of which is hacking:

This section has to be hacked into and is, as with many hacking sections, not listed in the preceding menu (one tip; when asked for a password use lower case. Don't spend half an hour trying upper case passwords which don't work). As with many hacking sections, most of it is out of date and passwords listed have been changed but it's certainly worth a look.

Phantom is on 0226 202825 and there is a Micronet/Prestel Gallery devoted to it. Being viewdata, it is 1200/75 7E1 format and the display is good, with text 'popping up' around the screen in an unusual fashion – similar to the 444 demo on Prestel. It's certainly worth a call or two, but please remember – 8.00pm to 8.00am only.

Next, news of Musictel Plus. Musictel Plus has been running for a couple of months now and has one or two interesting features.

Many of the planned 'Plus' features are now up and running. *The Maze of Len* is now on-line and proving popular with both new and old users. This game offers a complex maze, presented to the user in 3D graphics. Unfortunately, it is only available to people logging-on in animation/mode 7 format and not Ascii.

A listing, courtesy of William Holmes, is presented at the end of this article to allow BBC users to log on in Mode 7 format (many BBs now offer the mode 7 format as a standard simulation. It produces graphics which are almost identical to those found on a viewdata system with the advantage of scrolling, not page-at-a-time as with Prestel).

The Maze of Len is by no means easy and there is £25 up for grabs to the first user to

complete it (the prize starts at £25 and will remain there for another two weeks. After that, it will decrease by £5 a fortnight, until it reaches £5 where it will remain until won).

In the near future, many more hazards are planned, possibly including a sysop controlled monster to make completion of the game even nearer to impossible. The maze was designed by computer and there is only one route to the exit that either of us can find!

And for the future, sysop William Holmes is still working on his on-line high resolution adventure, the plans for which have certainly surprised many people and been met by claims of near-impossibility by some. But the game is nearly complete, the only problem is that at 1200 baud it takes a couple of minutes per screen and that's too long – but with algorithms he's working on it!

The 'What's on Tele' feature should return soon once a bug in the control software has been overcome and should include continental television and possibly satellite as well as BBC, TVS (maybe London) and Channel 4.

Musictel Plus is online 24 hours a day, on 0843 590000. It can be accessed at 300/300 or 1200/75, 7E1 or 8N1, Viewdata, Ascii or 'Mode 7'.

```

05 MODE 7
10 REM Mode 7 terminal software by
20 REM William Holmes of
30 REM MUSICTEL PLUS. 0843 590000.
40 REM
50 PRINT "MODE 7 or MODE 3"
60 PRINT "Mode 7 offers 40 column, colour emulation"
70 PRINT "Mode 3 offers 80 column, monochrome
emulation"
80 INPUT "Mode: "mo%
90 IF mo%<<>7 and mo%<<>3 THEN RUN
100 IF mo%=7 THEN GOTO 120
110 MODE 3
120 *FX 2,2
130 OSBYTE = &FFF4
140 REPEAT
150 A%=138: X%=2
160 IF ADVAL(-1)>0 AND ADVAL (-3)>0 THAN
Y%=GET:CALL OSBYTE
170 *FX 2,1
180 IF ADVAL(-2)>0 THEN VDU GET
190 *FX 2,2
200 UNTIL Y%=ASC("Q")
    
```

Terminal software for accessing Mode 7 Bulletin Boards, courtesy Wm Holmes.

This is for manual dial modems. For autodial, add your modem's routine at line 125. For intelligent modems, enter the dial command within the emulation.

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FREEHAND DRAW	✓	✓	✓	✓	✓	✓	✓
DRAW BOX	✓	✓	✓	✓	✓	✓	✓
DRAW CIRCLE	✓	✓	✓	✓	✓	✓	✓
DRAW LINE	✓	✓	✓	✓	✓	✓	✓
DRAW TRIANGLE	✓	✓	✓	✓	✓	✓	✓
DRAW RAYS	✓	✓	✓	✓	✓	✓	✓
PEN THICKNESSES	1	5	5	1	1	4	1
PEN QUILLS	—	3	3	—	—	2	—
PAINT BRUSH	—	—	—	—	—	—	—
TEXT	✓	✓	✓	✓	✓	✓	✓
PIN POINT ACCURACY	✓	✓	✓	✓	✓	✓	✓
ACTIVE BANDING	✓	✓	✓	✓	✓	✓	✓
COPY FUNCTION	✓	✓	✓	✓	✓	✓	✓
WASH	—	—	—	—	—	—	—
COLOURS	27	16	121	121	16	8	4
FILL	✓	✓	✓	✓	✓	✓	✓
FILL PATTERNS	S	11+S	11+S	S	—	7+S	S
ERASE FUNCTIONS	—	✓	✓	✓	✓	✓	✓
SAVE SCREEN	✓	✓	✓	✓	✓	✓	✓
PRINTER DUMP	✓	✓	✓	✓	✓	✓	✓
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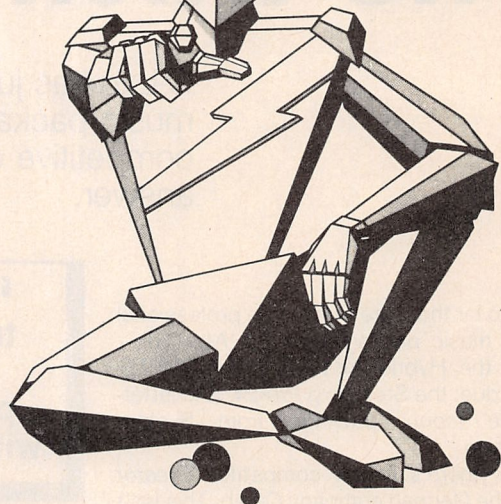
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COMING SOON

The track to Atari music

C-Lab has just released a new professional music package for the ST. Will *Creator* be competitive enough? Mark Jenkins has the answer.

So far there are three main professional music packages on the Atari ST – the Hybrid Arts *MidiTrack/SMPTE-Track* duo, the Steinberg *Pro-24*, and latterly the *Iconix* package from System Exclusive.

Now there's a new competitor, *Creator* from the German company C-Lab. This isn't to be confused with Steinberg's *Pro Creator*, a DX7 voice editing package, C-Lab's *Creator* is a straightforward Midi composer.

You may be familiar with C-Lab's *SuperTrack*, by far the best sequencer for the Commodore 64. *Creator* bears little resemblance to this package although it does have much of its user-friendliness. The ST's built-in Midi ports makes it easy to connect up to a synth or a chain of synths. If you do want to use several synths or a drum machine, which can be used as a master or slave to *Creator*, you may find some kind of Midi switch box useful.

Creator uses an anti-pirating dongle which goes into the cartridge slot and the basic display once this is done shows 16 patterns down the centre of the screen, 14 sections in the Arrange area down the left, and various performance options down the right. This is not the simplest layout possible, but is less cryptic than that of *Pro 24*; virtually everything is labelled in plain English with additional labels appearing at the top of the screen if you use functions such as Quantise, Transpose, Compress or Accent.

Although just 16 tracks are listed in the centre of the display, the package can cope with up to 60 tracks at a time. Midi only has 16 operating channels so these additional tracks will mainly be used for storing alternative 'takes', splitting musical lines up into various sections (although replacing small sections of a line presents no problem) and so on. You can merge tracks together, but of course you're unlikely to ever use all 60 tracks.

Click on the Record box and play away, and you'll find your first piece ready to go. Other boxes for Start, Stop, Continue, Punch In and Drop Out simulate the functions of a tape machine, and you can go on to overdub on the 59 remaining tracks.

“Although just 16 tracks are listed in the display, the package can cope with up to 60 tracks”

XII.	4. Tap-Mode and Manual Sync
	5. Overplaying of other sequencers
	MINI MANUAL
	1. Play parameters and data events
	2. What is being recorded?
	3. Automatic timing control, play algorithm and bus-overflow
	4. Recording of system exclusive data
	4.1 Sound dump
	4.2 Dump request
	4.3 Other exclusive data
	4.4 Exclusive Midi-channels?
	5. Data reduction
XI.	PRINCIPLE OPERATING METHOD



If you try to merge tracks, *Creator* will attempt to keep playing, the whole package being designed along a priority multi-tasking format. You can often carry out two or more operations at once, and most importantly, you can load a new song while the current one is still playing.

Maximum song length is "1040396 1/768th notes", or roughly 45 minutes of music at 120 beats per minute, up to 99 patterns remain in memory simultaneously and can be selected by number and played at will. In the Arrange mode these patterns can be called up in any order automatically.

Next week we'll go on to look at the remaining functions of *Creator* and see how it measures up to *Iconix*, *Pro-24* and *MidiTrack*.

First a few words about the Yamaha CX5 Music Computer, which as some of you may know has recently been discontinued.

The CX5 was the first dedicated music computer, but it was dedicated in rather a peculiar way. Although the machine was part of the MSX standard, its musical properties weren't transferable to other MSX micros, since Yamaha initially refused to sell the SFG-01 sound module separately from the micro itself.

The initial Yamaha software releases for the CX5 were poor – the basic step time polyphonic composer slowed down on playback if too many notes were assigned, and the Midi input/output capabilities were severely limited.

However, some demo pieces were very impressive – the SFG-01 acted as a multi-

timbral FM synthesiser module similar to the Yamaha DX9, and provided some complex imitative, abstract and even percussive sounds. Independent companies released some software for the CX5, but no progress was made until around a year ago.

At this time Yamaha released the new SFG-05 module with improved Midi capabilities, keyboard split abilities and, above all, availability independently from the CX5. At the same time a 128K CX5 was introduced, and this remained the best bet for micro musicians since the SFG-05 physically and electronically remained incompatible with MSX micros from many other manufacturers.

It must be said that Yamaha's X-Series Owners' Club backed up the CX5 ferociously, but all the support in the world couldn't make up for the world-wide failure of the MSX standard. Having said that, Yamaha's failure to come up with an FB-01 synth editor or other handy software did nothing to improve the CX5's usefulness.

Ironically, many local education authorities had invested heavily in the CX5, and it's too late now for many of them to turn to the Hybrid Technology Music System on the BBC or even to small Midi systems... a great shame. Whether the CX5 contributed much to awareness of micro music we'll never know, but if there is anybody out there using the machine, we'd be pleased to listen to any demo tapes.

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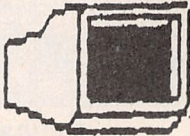
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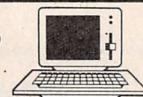
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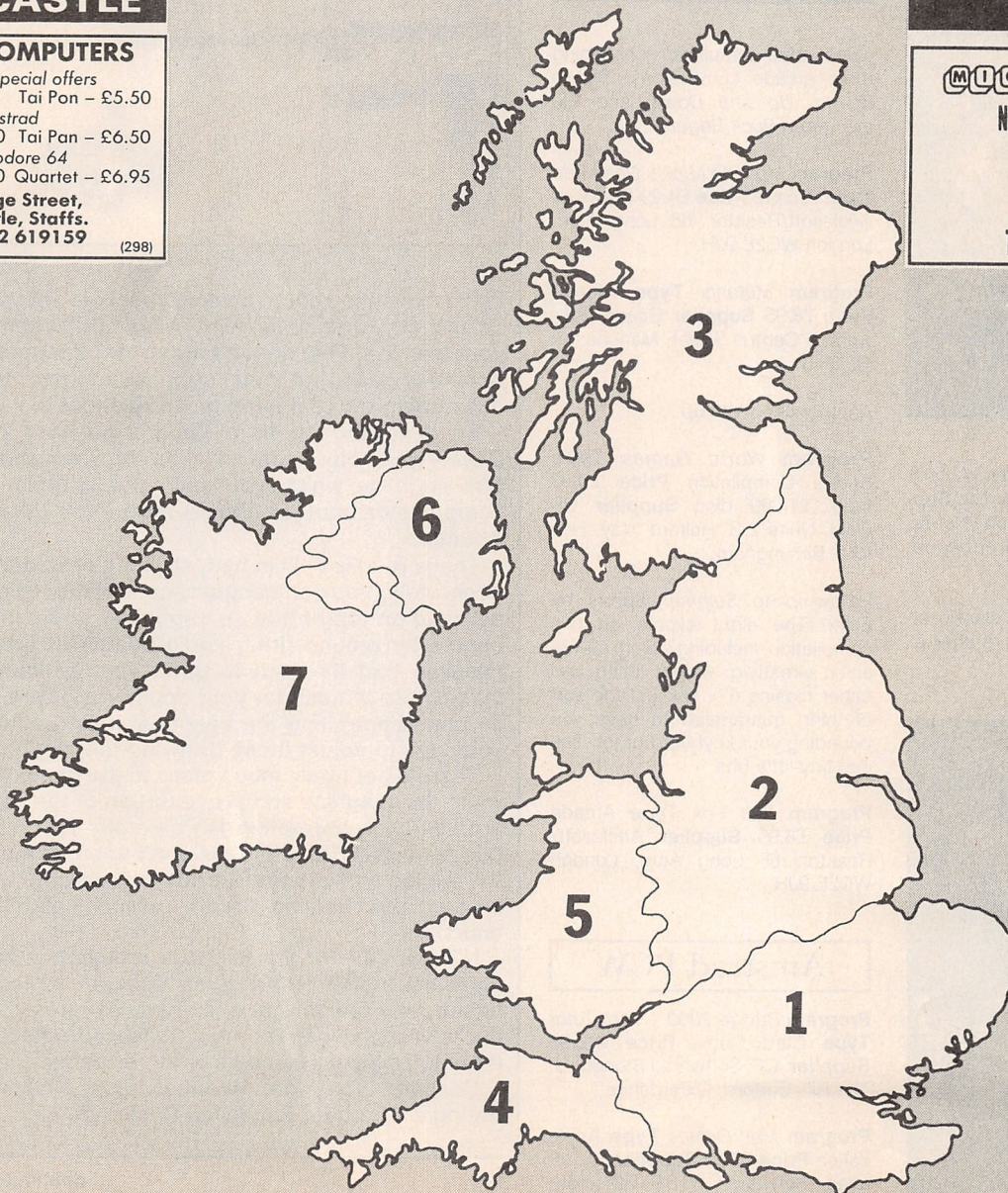
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NEW RELEASES

Your complete guide to all the software released this week

Amstrad CPCs

Program *Transatlantic Balloon Challenge* **Type** Arcade **Price** £7.95 tape, £12.95 disc **Supplier** Virgin Games, 2 Vernon Yard, Portobello Road, London W11.

See panel for comment.

Program *Brain Ache* **Type** Arcade **Price** £1.99 **Supplier** Codemasters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.

Program *Spy Hunter* **Type** Arcade **Price** £9.95 tape, £11.95 disc **Supplier** Amsoft, Brentwood House, 169 King's Road, Brentwood, Essex.

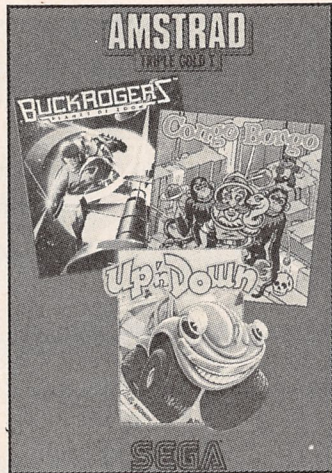


Program *Zaxxon* **Type** Arcade **Price** £9.95 tape, £11.95 disc **Supplier** Amsoft, Brentwood House, 169 King's Road, Brentwood, Essex.

CPC version of Sega's classic arcade game. Still addictive after all these years.



Program *Triple Gold* **Type** Arcade Compilation **Price** £9.95 tape, £11.95 disc **Supplier** Amsoft, Brentwood House, 169 King's Road, Brentwood, Essex.



Good value compilation containing three arcade conversions; *Congo Bongo*, *Up and Down*, and the evergreen *Buck Rogers*.

Program *Moutie Mick's Deathride* **Type** Arcade **Price** £4.99 **Supplier** Ariolasoft/Reaktor, 68 Long Acre, London WC2E 9JH.

Program *Mutants* **Type** Arcade **Price** £8.95 **Supplier** Ocean Software, 6 Central Street, Manchester M2 5NS.

Another shoot'em up...

Program *World Games* **Type** Sports Compilation **Price** £9.99 tape, £14.99 disc **Supplier** US Gold, Units 2/3, Holford Way, Holford, Birmingham.

Follow-up to *Summer Sports* by Epyx. The eight events on this compilation, including slalom skiing, sumo wrestling, weight lifting and caber tossing (!?), are just the sort of thing guaranteed to have you pounding your keyboard or joystick into tiny little bits.

Program *Star Fox* **Type** Arcade **Price** £8.99 **Supplier** Ariolasoft/Reaktor, 68 Long Acre, London WC2E 9JH.

Amstrad PCW

Program *Bridge 2000 - With Tutor* **Type** Card Game **Price** £19.95 **Supplier** CP Software, Stonefield, The Hill, Burford, Oxfordshire.

Program *Mail Genius* **Type** Application **Price** £9.99 **Supplier** Endurance Software, 80 Ravenscroft,

Bank Farm, Holmes Chapel, Cheshire CW4 7HJ.

Address database for label printing, but with additional features, such as a calculator, clock and alarm. Not bad for the price.

Rock Road, Alum Rock, Birmingham.

Program *Shortcut* **Type** Utility **Price** £29.95 **Supplier** Vogler/Software Express, 514 Alum Rock Road, Alum Rock, Birmingham.

Atari ST

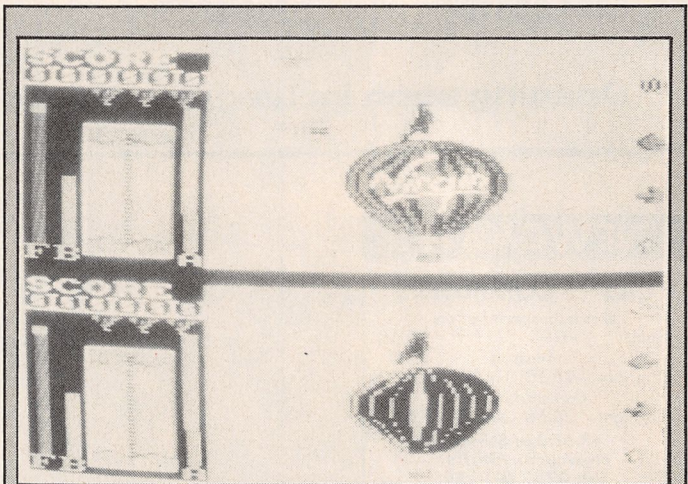
Program *Bridge 2000 - With Tutor* **Type** Card Game **Price** £19.95 **Supplier** CP Software, Stonefield, The Hill, Burford, Oxfordshire.

Program *Jackfont* **Type** Font Generator **Price** £49.95 **Supplier** Vogler/Software Express, 514 Alum

Atari XL/XE

Program *Universal Hero* **Type** Arcade Adventure **Price** £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC1.

Program *Invasion* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC1.



The nice thing about owning your own software company is that you get to have lots of computer games based on your own life. That doesn't mean that the games are going to be any good, but then I suppose Richard Branson is too busy doing the real thing to worry about the game.

So, following on from Virgin's not-very-good *Atlantic Challenge*, comes the release of *Transatlantic Balloon Challenge*, in which you and your opponent (either the computer or another player) race each other across the Atlantic.

The screen is split in half, showing each player's balloon separately. You don't actually control the balloon itself, but perched on top of it is an eagle that you can control. The eagles fly around firing sonic beams at the aircraft and missiles that threaten to burst your balloon, as well as making life difficult for your opponent. There is also a row of icons controlling the balloons' height and course, and you have to adjust these by flying the eagle over them.

There's not really much more to the game than that, and while the graphics and presentation of the game are fairly professional, the action isn't exactly fast and furious (is this realism?). The balloons don't seem to move at all, and the eagles and various aircraft waft gracefully from side to side without seeming to work up much enthusiasm for their tasks.

If it weren't for the Branson connection I doubt if any software house would even think of releasing a game based on a balloon race, and you're really just paying for the privilege of generating a bit more Branson hype rather than getting your money's worth of game.

Coming soon from Virgin Games, Richard Branson's *Eating a Cornbeef Sandwich Challenge*...

continued on page 43 ►

A quality effort

Level 9's long standing claim to be Britain's premiere adventure house (which conveniently takes the American Infocom out of the running) has come under challenge recently from Magnetic Scrolls, producer of *The Pawn* and *Guild of Thieves*. With both companies now publishing under Rainbird's banner, there is the potential to make for some interesting rivalry.

Level 9's latest, *Knight Orc*, is a development for the team in a number of ways. For the first time, a Level 9 adventure is being produced first on 16-bit machines, before being converted to 8-bits. Secondly, past critics of Level 9's graphics will see that the pictures have, well, grown up, with *Knight Orc*. Indeed, the style of the pictures and the cryptic nature of the plot/cause/quest in *Knight Orc* reminds me of *Pawn* and *Guild of Thieves*, though I guess Level

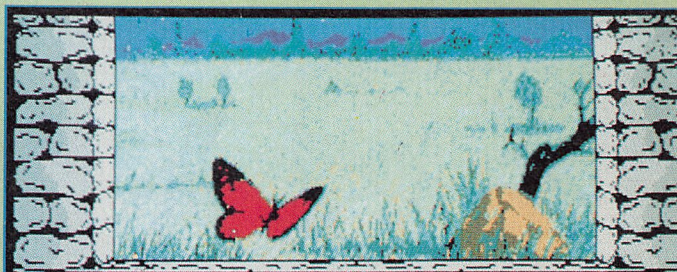
9 may not thank me for saying so.

Afficionados will be pleased to note that not too much of the Level 9 style has changed, however. It uses the familiar L9 parser, there are lots of locations and objects to visit and collect, and spells to be cast, in the latter part of the game.

Knight Orc is a three part adventure, comprising *Loosed Orc*, *A Kind of Magic* and *Hordes of the Mountain King*.

Your overall task is to travel the lands, meeting, interacting with and recruiting other characters you meet, and to eventually escape from the world you begin in.

In many adventures of this type, interaction is made easier by the fact that you are generally cast as some young innocent and not everyone is automatically hostile. But in *Knight Orc*, you are, as an orc, pretty un-



As you waken, you see a group of orcs standing around. "Who'd a thought it," snorts a pig-like individual, "Stupid Grindleguts didn't even bring us any food. I vote we eats him." Luckily, the other orcs are too busy rifling your possessions to listen.

After fighting over who gets what, the orcs jostle their way south towards the archway to the orc lair, leaving you penniless.

You are just south of a glowing gate on a grassy plain. Exits lead south, southwest and west. You can see a silver loaf.
> kick the loaf

popular. Your very first task in part one should be to find some sort of semi-disguise, so that you don't get beaten up as soon as you move.

The first part is really there to acquaint you with the game, its characters and the way it works. Basically you must survive through a number of locations, collect ten essential objects, and arrive at Orc Mountain in more or less one piece. It shouldn't take *too* long.

In *A Kind of Magic*, you start getting to grips with learning spells and casting them. Here too you will begin to be able to interact with other characters, recruiting them to your cause and getting them to help you solve puzzles.

What your cause actually is becomes apparent in part two, because it turns out that 'things are not what they seem', as they used to say in mystery stories, in part one.

Part three follows roughly the same storyline and sequence as part two, but because of things not being what they seemed, it's not the same as simply retracing your steps. I can't say more than that without giving away the plot.

One nice feature of *Knight Orc* is that all the tedious mapping (and finding out that your piece of paper isn't big enough, or you started your diagram at the wrong edge of the sheet) is done away with. You can go to any location you choose, simply by typing *Go to forest/cave/castle*, whatever, and Rainbird have thoughtfully included a map with the packaging.

The 'Oops' commands saves much unnecessary and time-consuming dying - it'll take you back to a couple of moves before your demise - although in part two, you need to die in

order to solve one of the puzzles.

The parser is as sophisticated as we've come to expect with Level 9, and will cope with most relevant 'Adventurish' noun-verb constructions you wish to use, even if the response - *You don't need x to finish the game*, when you type in a word it doesn't recognise, gets annoying after a while - particularly if you've only just started.

Knight Orc is not easy. You can initially wander around, collecting objects and visiting places without any real sense of purpose (confirmed when you press Score and 0 out of 1000 comes up on screen). The instruction book is deliberately vague, and the accompanying novella, while quite fun (and a distinct improvement on previous Rainbird novellas) doesn't appear to be of much use in solving the game.

Knight Orc is good fun, and compared with most releases, a high quality text and graphic adventure - and for once with Level 9, the graphics are quite meaningful, although we haven't seen the 8-bit graphics yet, due to its initial release on the ST and Amiga.

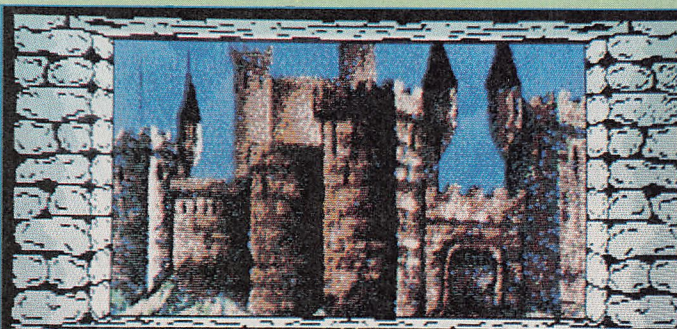
Eventually it'll be out for just about all micros: CPCs, PCWs, the Apple II and Mac series, Atari XL/XEs, Commodore 64, PCs, MSX and Spectrums. Adventurers should certainly check it out; while it runs to a fairly conventional adventure format, it's a quality example of the genre.

Christina Erskine



Then there must now my challenge face.
Rush shall my axe, I strike him for him.
I'll let them strike first. Now a pig!
He indicates his mighty axe.
A male voice in the distance shouts, "How do I get a drink out of the Innkeeper?"
What now? take the axe

Level 9's graphics in *Knight Orc* are much more detailed than in previous releases, at least on the ST versions shown here. The castle (below) is one of the first obstacles you meet in part one. Left is a woodland used to illustrate a number of locations.



A male voice in the distance shouts, "How do I get a drink out of the Innkeeper?"
What now? run to castle
You are outside an ugly castle in a hornbeam tangle. Exits lead in all directions and inside. You can see a drawbridge. The drawbridge is closed.
A female voice in the distance shouts, "Stop attacking me!"
He won't bother with "What now" from now on.
> knock on the drawbridge

Program *Knight Orc* **Type** Adventure **Price** Atari St £24.95 **Supplier** Rainbird Software, 64-76 New Oxford Street, London W1.



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◀ continued from page 40



Program 221b Baker Street (64K)
Type Mystery **Price** £14.99 **Supplier** US Gold, Units 2/3 Holford Way, Holford, Birmingham.

Import of an old Datasoft game from the US. It's based on the Sherlock Holmes board game, but British buyers might find it similar to Cluedo.



BBC series

Program Acornsoft Hits Volume 2 (Master series) **Type** Arcade Compilation **Price** £14.95 tape **Supplier**



Acornsoft, Cambridge Technopark, 645 Newmarket Road, Cambridge.

Every new machine goes through a phase where lots of old *Space Invaders/Asteroids* type games are among its early software releases, and here are four of 'em on one tape for the Master. At least it gets them all out of the way in one go (hopefully).

Program Grand Prix Construction Set **Type** Racing Simulation **Price** £9.95 tape **Supplier** Acornsoft, Cambridge Technopark, 645 Newmarket Road, Cambridge.



Commodore 64

Program Thunderbolt **Type** Arcade **Price** £1.99 **Supplier** Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.

Program Super Robin Hood **Type** Arcade **Price** £1.99 **Supplier** Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.



C64 conversion of a successful Amstrad platform game. Old fashioned but fun.

Program Dead Ringer **Type** Ar-

cade **Price** £4.99 **Supplier** Ariolasoft/Reaktor, 68 Long Acre, London WC2E 9JH.

One of those futuristic sports game jobs. A bit tricky to get the hang of, but quite good for the price.

Program Killer Ring **Type** Arcade **Price** £1.99 **Supplier** Ariolasoft/Reaktor, 68 Long Acre, London WC2E 9JH.

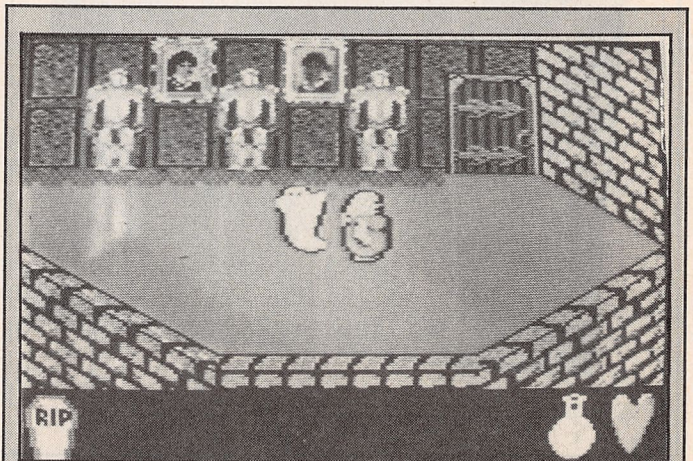
Program IQ **Type** Strategy (of sorts) **Price** £8.99 tape, £14.95 disc **Supplier** Nu Wave/CRL, CRL House, 9 King's Yard, Carpenter's Road, London E15 2HD.

A strategy/board game from the rather odd Nu Wave label. Probably one for the serious thinkers out there.

Program Revs + **Type** Racing Simulation **Price** £8.99 tape only **Supplier** Firebird, 64-76 New Oxford Street, London W1.

Follow-up to the successful *Revs*, with new tracks and additional features. Probably one of the best racing simulations around.

Program Bride Of Frankenstein **Type** Arcade **Price** £8.95 **Supplier**



The course of true love never did run smooth, especially when you're a monster made out of other people's spare bits and pieces.

In *Bride of Frankenstein*, published by Ariola label 39 Steps, the monster is trapped, comatose, in a tower, and needs help in recovering parts of his body before he can be revived. Fortunately, the bride of Frankenstein is free to wander around the castle and its grounds in search of a new set of heart, lungs, kidneys, etc, for her boyfriend, and once he has been reunited with his giblets the two of them can live happily ever after (*Bride of Frankenstein* refreshes the parts other monsters cannot reach).

The castle is made up of about 60 locations, some of which are locked, dark, or haunted by other deadly monsters. But as the bride explores she may find keys and other objects which will help her on her way.

There are torches to light the darker rooms, spades and pickaxes for digging up dead bodies for the odd spare part, as well as bottles of elixir to prolong her life. These are important since bumping into other monsters puts a bit of a strain on her heart, shown by a frantically pumping heart just below the main screen.

Graphically, the game reminds me of CRL's *Rocky Horror Show*, as the rather plump bride wanders around a 3D representation of the castle. Sometimes your point of view changes as you move from one room to another, which can be a bit irritating, but it's not likely to be fatal. However, it is a little bit too easy for the bride to get killed, since some of the monsters home in on her and seem to prevent her from moving away, so that you just have to sit and wait for her heart to give out and then start a new game. A couple of extra lives would help make things a bit more interesting.

Although the game isn't especially amazing I did enjoy playing it. The action is just fast and complex enough to keep you busy, but not difficult enough to be off-putting. One of 39 Steps Ariolasoft's more enjoyable efforts.

Cliff Joseph

continued on page 45 ▶

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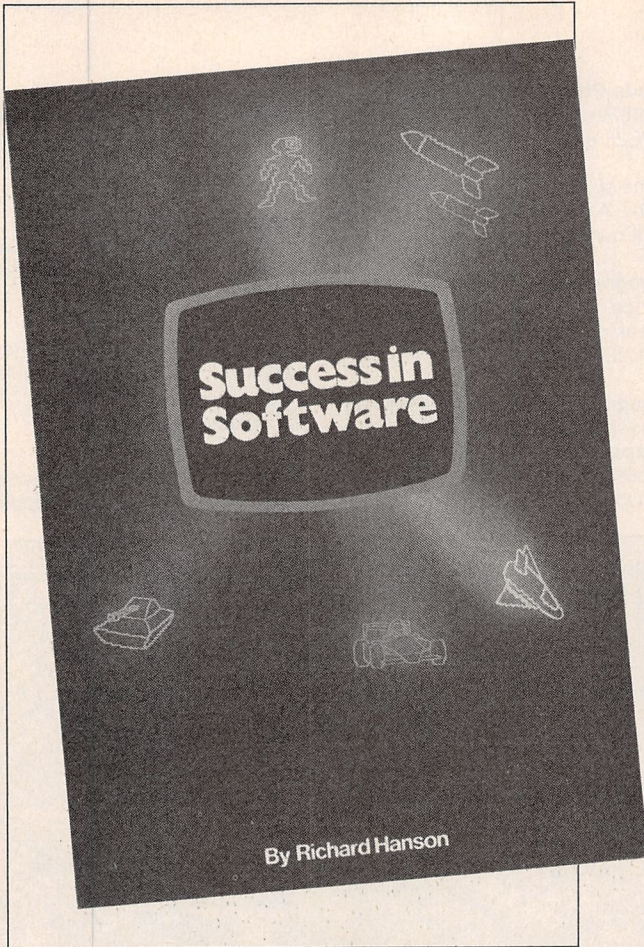
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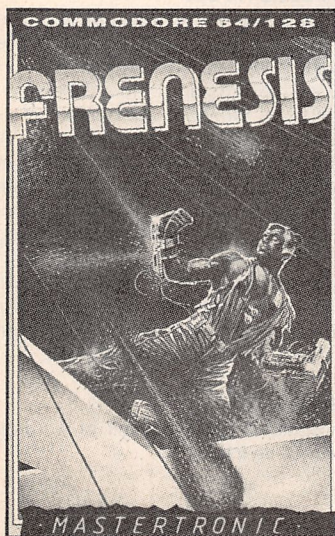
◀ continued from page 43

Ariolasoft/Reaktor, 68 Long Acre, London WC2E 9JH.

See panel for comment.

Program Kik Start 2 Type Arcade
Price £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC2A 4JH.

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that Realtime has been rewriting for the past year or so.

Program Super G-Man Type Arcade
Price £1.99 **Supplier** Code-masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.

Program Dead Ringer Type Arcade
Price £4.99 **Supplier** Ariolasoft, 68 Long Acre, London WC2E 9JH.

Program Micronaut One Type Arcade adventure
Price £9.95 **Supplier** Nexus Productions DSB House, 30 High Street, Beckenham, Kent BR3 1AY.

Program Slap Fight Type Arcade
Price £7.95 **Supplier** Imagine, 5 Central Street, Manchester M2 5NS.

Another arcade shoot'em up conversion. Completely unoriginal of course, but quite good fun nonetheless.

IBM PC

Program Bridge 2000 - With Tutor Type Card Game
Price £19.95 **Supplier** CP Software, Stonefield, The Hill, Burford, Oxfordshire.

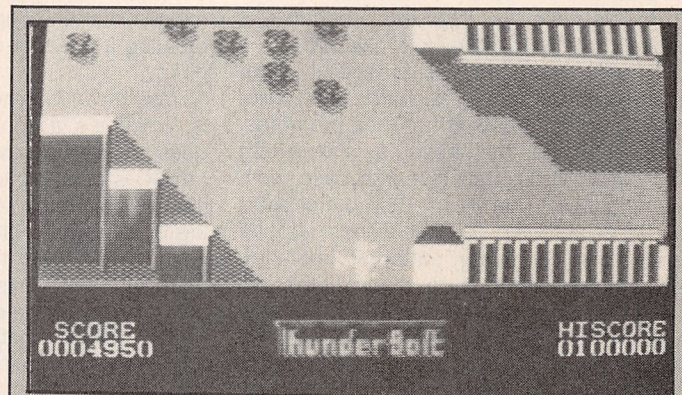
MSX

Program Milk Race Type Cycling Simulation
Price £1.99 **Supplier** Mastertronic, 8-10 Paul Street, London EC1.

Spectrum

Program Starfox Type Arcade
Price £8.99 **Supplier** Ariolasoft, 68 Long Acre, London WC2E 9JH.

The graphics are getting better, but this still seems like yet another variation of the *Star Strike* formula



Code-masters say that they liked this game so much that they actually fought to keep it out of Mastertronic's greedy little mitts. My first reaction, when I loaded the game up was to wonder why they bothered, but I soon found out.

When the game starts, you are given an overhead view of a small aircraft which takes off from a runway and flies over a landscape dotted with various buildings. The plane doesn't look very impressive until you pick up the joystick and start to play, at which point you discover that although the plane doesn't look all that good, it can certainly move!

There's not really a plot behind the game, your only real task being to fly across the screen, trying to strike a number of targets on the ground and blasting the daylights out of anything that stands in your way. Until you reach another runway and attempt to land. If you make it that far you go on to another, harder, level full of more of the same.

Obviously it sounds like just another shoot'em up, but what makes it stand out is the speed and smoothness with which the game plays. The hordes of enemy aircraft, and various other defenses, come sweeping across the screen at high speed, yet your Thunderbolt jet dodges and loops just as quickly, without going so fast that you can't control it.

The smoothness of the animation and the manoeuvrability of the aircraft remind me very much of Hewson's *Uridium*, the only real difference being that *Uridium* has an outer spacesetting, while *Thunderbolt* is much more earth-bound, the action taking place over land and sea. There are a couple of other points that mark it out as a budget title - the graphics aren't nearly as clear and detailed as in *Uridium*, and you only get one life, which is a minor detail, but it could easily have been remedied. The overall 'feel' and playability of the game are the equal of many full priced shoot'em ups, and there's also some nice, tense music on the soundtrack - I may invent a new review category - 'budget game of the week' - and make *Thunderbolt* the first one.

Correction

Last week's Commodore 16 listings should have appeared under the Commodore 64 releases. We apologise for any inconvenience this may have caused.

CHARTS

Top Twenty

Rank	Change	Title	Supplier
1	(2)	The Last Ninja	System 3
2	(4)	BMX Simulator	Code Masters
3	(1)	Barbarian	Palace
4	(6)	Paperboy	Elite
5	(5)	Football Manager	Addictive
6	(3)	Milk Race	Mastertronic
7	(8)	Gauntlet	US Gold
8	(9)	Four Great Games	Microvalue
9	(11)	Stormbringer	Mastertronic
10	(7)	Feud	Bulldog
11	(14)	Army Moves	Imagine
12	(12)	Six Pack	Elite
13	(15)	Leaderboard	Access/US Gold
14	(-)	Olympic Spectacular	Alternative
15	(-)	Ollie and Lisa	Firebird
16	(18)	Tournament Leaderboard	Access/US Gold
17	(16)	Konami's Coin-op Hits	Imagine
18	(-)	Enduro Racer	Activision
19	(13)	Around the World in 40 Screens	Superior
20	(10)	I Ball	Firebird

All figures compiled by Gallup/Microscope

Just an idea

By now we are all well aware of, and probably bored silly with, the continuing cries of the software houses on piracy.

Until recently, however, one side of the business that seems to have escaped from media attention was the pirating of ideas. A recent court case held in favour of the Lotus Corporation that another program did have the 'look and feel' of Lotus 123 and was therefore a copy. No evidence was submitted to show that any of 123's code was actually copied or that the other people had copied any of 123's manuals or literature. The sole case was that the program just looked and behaved exactly like 123.

It will be interesting to see if other manufacturers come forward and claim 'look and feel' copyright to their programs. The evidence is they might, as shown with the Apple vs Digital Research case, concerning Gem. This was settled out of court with DR agreeing to alter Gem's appearance. If a completely different operating environment, running on a completely different machine can be got at, in this way, you have to wonder who's next. Could Apple bring a claim against Microsoft's Windows or the Amiga's Wimp front end? Or further down market, Geos on the Commodore 64/128 or, even closer, the AMX mouse system running on the BBC and Amstrad micros?

The Spectrum may have made it off the Sinclair drawing board, but how would it have fared if virtually none of its first generation of games would have been allowed? As most games, even now, are pretty derivative of all that has gone before, just how many companies would have bothered with their Enterprises, New Brains, Memotechs, Dragons, Orics, Genie's and more?

However, we all know that in reality Atari priced themselves out of the market and Commodore and Sinclair, with the help of a

good few third parties, took all the good ideas and inherited the earth.

The basic point I'm trying to make is that, at first sight this 'look and feel' copyright thing seems outrageous.

Yet arguments that implementing it will restrict the industry just won't wash. If a company is truly interested in expanding the frontiers then it should be writing its own software based on its own ideas. By all means create programs that can share data between themselves and other programs but not if it means churning out clone after clone of an original. If a program is too expensive then people won't buy it. Simply creating a cheaper copy is straightforward piracy.

When is an idea not an idea? The answer is, when it's a concept of course! When does an idea become a concept? That one, I think, is best left to the courts to decide. It's this difference which is crucial in deciding if a program is a copy or a different variant. The main thrust of opposition to 'look and feel' is based on the thinking that a concept can't be copyrighted.

But maybe that's the problem with spreadsheets. How do you go about making a spreadsheet produce the same results, but not look or behave like a spreadsheet? Maybe you can't. If that's the case then, if Visicalc could raise itself from the dead, it too would probably have a good case against Lotus (I've no doubt that somebody will write in and point out that Visicalc was based on some preceding program as well!).

The point is that somewhere there is always an original and it should be protected.

Just to round this off with a last note of controversy. I still think it's a pity that the 'look and feel' ruling wasn't about when programs like Planetoids and Killer Gorilla first came out.

Mark Annetts

Puzzle No 265

If I take a standard set of dominoes I would find 28 pieces, ranging from double six down to double zero. If I were then to count the total number of spots which appeared on these pieces I would find that there were 168 in all.

If I were in China, where, I am told, sets of dominoes extend up to a double nine, I would find that there were 55 pieces in each set, with a total spot count of 495.

In theory, it is possible to devise a set with the highest double set at any value that one liked. Assuming this is the case, can you determine the size of the set for which the spot count is just in excess of one million, and say what is the value of the highest double in such a set, and the number of pieces that it contains?

Solution to Puzzle No 260

There are 28 numbers in the chain of amicable numbers. These are listed in sequence below the program given.

The heart of the program is found between lines 20 to 50. This routine finds the sum of all whole number divisors of a given number (N). Excluding the factor one, all others are found in pairs, one member of the pair having a value below that of the square root of the number under test, and the complementary factor being greater than the square root.

The product of these two factors will, of course, equal the number itself. In the case of a perfect square, these two factors will both converge to the square root of the number.

Winner of Puzzle 260

This week's winner is E W Fothergill, of Warrington, who will receive £10.

Rules

The closing date for Puzzle 265 is July 29.

```

10 START=83328:N=START:C=0:PRINT N
20 T=1
30 FOR F=2 TO SQR(N)+.5
40 IF N/F=INT(N/F) THEN T=T+F+N/F
50 NEXT
60 C=C+1:PRINT T
70 IF T=START THEN 100
80 N=T:GOTO 20
100 PRINT"Number of steps: ";C
>
83328      177792      295488      629072
589786     294896     358336     418904
366556     274924     275444     243760
376736     381028     285778     152990
122410     97946      48976      45946
22976      22744      19916      17716
14316      19116      31704      47616
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>
    
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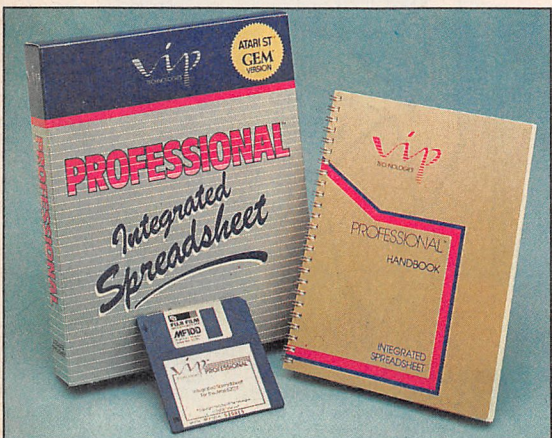
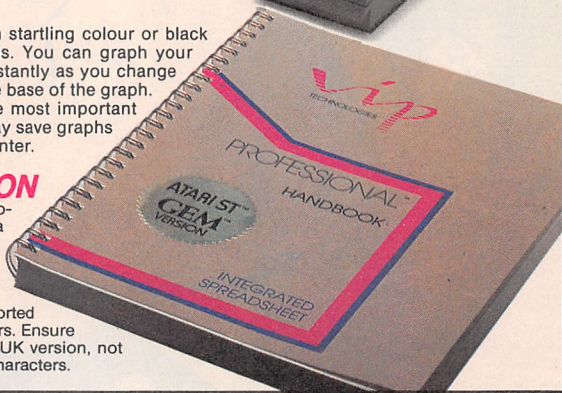
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