

YOUR COMPUTER

June 1987 £1.20

Denmark	DKr	36.00
France	Fr	52.50
Germany	DM	8.00
Greece	Dra	460.00
Holland	DFI	8.90
Italy	L	4400
Spain	Pts	425.00

ADAMS' APPLES

GALACTIC
HITCH-HIKER
AND HIS
COMPUTERS

TRANSPUTER POWER
FOR THE ATARI ST

PC PROGRAMMING:
THE TSR EXPLAINED

10 PAGES OF SOFTWARE REVIEWS: SPECTRUM, CBM64, AMSTRAD



MONSTER MEMO

GET YOUR HANDS ON THE NEW SINCLAIR 128K +2. BEFORE EVERYBODY ELSE DOES.



The new 128K ZX Spectrum +2 is more than just a monster memory. It's the ultimate family computer. With a built-in datacorder for easier loading, superb graphics capability, two joystick ports, a proper typewriter keyboard and more games available than you can shake a joystick at (well over 1000 software titles, in fact). Better get your hands on the new 128K ZX Spectrum +2 soon. Before they do.

£149

MEMORY • MONSTER VALUE

Available from: Alders, Boots, Clydesdale, Comet, Connect, Co-op, Currys, Dixons, Electric Supreme, Laskys, John Lewis, John Menzies, Power City, Rumbelows, Ultimate, WH Smith, Wigfalls, and good independent stores.

We recommend Sinclair Quality Control Software.

To: Sinclair, P.O. Box 462, Brentwood, Essex C14 4ES.
Please send me more information about the Sinclair 128K ZX Spectrum +2.

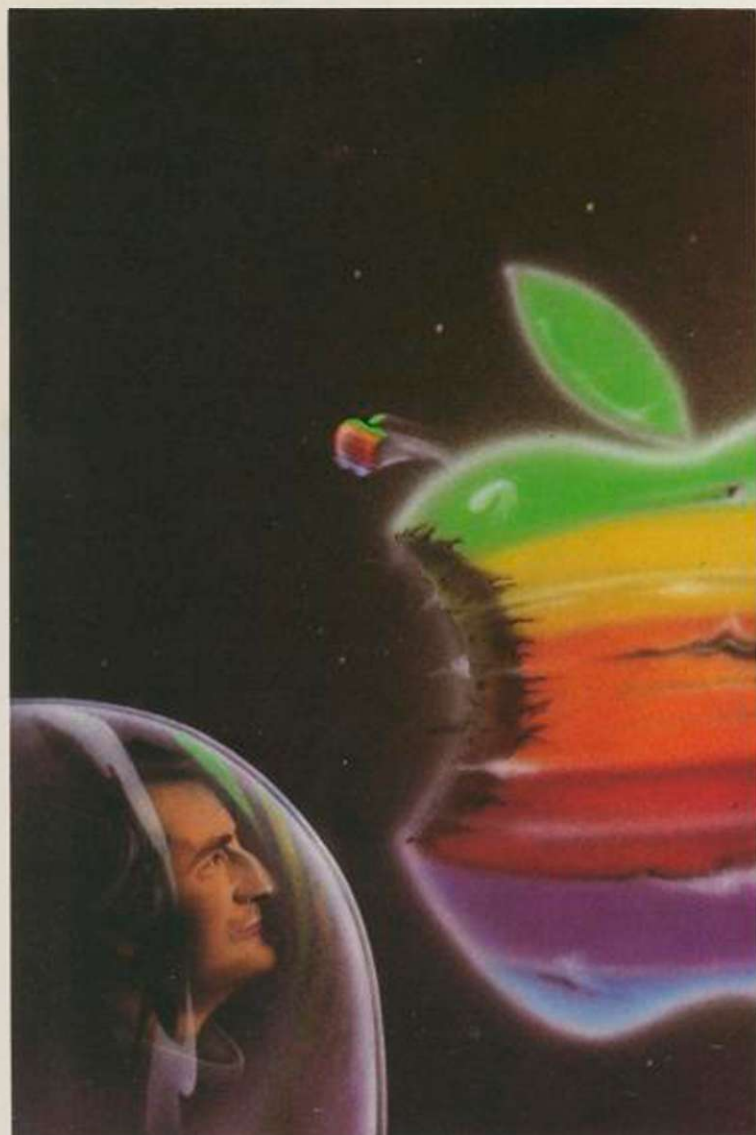
Name _____

Address _____

sinclair

contents

JUNE 1987



COVER FEATURE

ADAMS' APPLES 28

Since writing *The Hitch-hiker's Guide to the Galaxy*, author Douglas Adams has become hooked on micros. He talks to *Your Computer* about the books, adventure games and music his Macintosh collection makes possible.

GHOST WRITING 59

Dirk Gently's Holistic Detective Agency mixes science fiction, fantasy and today's computer world in equal proportions. Steve Mansfield goes into analysis.

**Your Computer,
Greencoat House,
Francis Street,
LONDON SW1P 1DG
TELEPHONE: 01-834 1717
FAX: 01-828 0270
TELEX: 9419564 FOCUSG**

ISSN 0263 088S

© 1987 Focus Magazines Limited.
Printed by The Riverside Press,
England.

Typeset by Time Graphics Ltd.,
Northampton.

Distributed by Quadrant Publishing Services, Quadrant House, Surrey, SM2 5AS. Telephone 01-661 3239.

Reasonable care is taken to avoid errors in this magazine but no liability for any errors which may occur. No material in this publication may be reproduced in any way without the written consent of the publishers. The publishers will not accept responsibility for the return of unsolicited manuscripts, listings, data tapes or discs.

We will assume permission to publish all unsolicited material unless other-

wise stated. We cannot be held responsible for the safe return of any material submitted for publication. Please keep a copy of all your work and do not send us original artwork.

Unfortunately we are unable to answer lengthy enquiries by telephone. Any written query requiring a personal answer MUST be accompanied by a stamped, self-addressed envelope; please allow up to 28 days for a reply.

Subscriptions: U.K. £15 for 12 issues, Overseas (surface mail) £25 - airmail rates on request. Please make

cheques/postal orders payable to Focus Magazines (allow 5 weeks from receipt of order to delivery of first subscription copy). Send orders to Your Computer Subscriptions, Oakfield House, Perrymount Road, Haywards Heath, RH16 3DH. Telephone (0444) 459188.

Back issues of the magazine from January 1986 onwards are available for £1.50 (U.K.), £3 (Overseas) from the Back Issues Department, Greencoat House, Francis Street, London SW1P 1DG.

REVIEWS

DEFENDER OF THE CROWN 26

The latest Amiga games concept brings the Middle Ages to life in glorious colour.

WORDSTAR 4 56

The latest rejuvenation of the long-running word processing series.

BOOKS 18

Carol Attack rounds up the month's batch of bedside reading.

SOFT RELEASE 66

Our joystick-weary reviewers file their combat reports.



REGULARS

NEWS

6

The latest from your favourite software houses, Apple gets a bigger bite, plus a better image from your PC clone.

LETTERS

12

Your opinions on the new look *Your Computer* and more.

LINE NOISE

14

The latest reports from the communications front.

ADVENTURE PLAYGROUND

22

Mike Gerrard offers some advice to novice adventure gamers.

MUSIC MAESTRO

42

Stereo sound for your Amstrad CPC.

FEATURES

MACHINE LEARNING

34

How can a computer learn from its own mistakes? Marcus Jeffrey examines the programming concepts involved.

TRANSPUTER TRIAL

40

The K-Max board is claimed to turn an Atari ST into a Transputer software development system. Adam Denning evaluates its usefulness.

DATA SOLVED

44

For some people computers are not just sophisticated toys but essential means of communication. Datasolve wants to show how computers can help the disabled.

ATARI SHOW

47

The latest PC clone arrives and a low-cost laser printer is promised.

ADVENTURE BUILDING

48

Further exploration of the gentle art of adventure programming accompanied by your guide Pete Gerrard.

POP-UP PROGRAMS

60

Sidekick, Word Finder and Turbo Lightning are all examples of TSR programming. Adam Denning examines the principles and details a type-in program.

COMPETITION

54

Free copies of those all-time classics *Starglider* and *The Pawn* to suit all popular computers.

NEXT MONTH

Space Max is an innovative space station construction simulator for PC owners. It faithfully reproduces the economic and technical pressures of running a space program, selecting a crew and managing all the resources at your disposal to get the NASA space station into orbit.



COMMENT

When will computers disappear? A popular debating point in the *Your Computer* office this month has been the Douglas Adams' suggestion that over the next few years computers will become as much a part of the furniture as refrigerators and electric motors.

The actual hardware is only interesting as long as it fails to live up to people's expectations – most computer users look forward to each new announcement with bated breath, hoping that each new machine will at last answer all their needs. Once personal computers reach a respectable state of development they will become inherently boring. The interesting element will be not the computer but the *computing* – the amplification of individuals' native abilities.

FOCUS MAGAZINES

Editor

Simon Craven

Staff Writer

Carol Atack

Sub Editor

Harold Mayes MBE

Production Editor

Nick Fry

Design

Chris Winch

Neil Tookey

Cover

Andrew Sullivan

Art Editor

Jim McClure

Group Advertisement Manager

Dory Mackay

Acting Advertising Manager

Tim Seymour

Classified

Paul Williams

Editorial Secretary

Sheila Baker

Managing Editor

Brendon Gore

Publisher

Paul Coster

Financial Director

Brendan McGrath

Managing Director

Richard Hease

NEWS

Fantasy games evolve from sublime to ridiculous

The world of fantasy games is taking further steps into the ridiculous with every new release. Programmers no longer seem to be satisfied with the traditional scenario – you know, the one where the shining young hero marches around slaying trolls and collecting elvish treasures to take to the captive princess.

Barbarian, a recent release from Palace Software, takes the less obvious option of having more muscles on its hero and basing the princess on the well publicised charms of Page Three model Maria Whittaker. Palace claims that *Barbarian* is the most realistic combat game ever, so perverts among you can get excited now; your £9.99 also gets you a dark sorcerer to rescue Maria from and a hideously deformed dwarf, presumably to satisfy minority tastes.

Gore freaks are catered for by a decapitation scene and riveting music is promised from the maestro of *The Sacred Armour of Antiriad*. You don't get a wig like model Michael Vanwigg or a 53 inch chest but this is a fantasy game and you are allowed to pretend.

Where Palace is content to write camp versions of reliable cliches, the latest offering from the Ladies of St. Brides School is an adventure based on the real life historical Jack the Ripper murders. For those of you who don't believe in the Ladies of St. Brides, they are an adventure writing team based in Ireland and run and establishment where people can relive their schooldays. Apart from providing welcome relief for sensation-starved journalists they also produce adventures like *Bugsy*, about a three foot high blue rabbit who becomes a gangster.

This is quite a departure for the ladies in terms of subject matter. Priscilla Langridge,



● No prizes for guessing which is the programmer . . .

who wrote the game, explained that they were reflecting the centenary of the murders recently as speculation about them has linked black magic and freemasonry to them and bizarre theories have sprung up as abundantly as bizarre adventure games seem to do.

"Nobody knows who committed the murders. It could have been a madman or a secret society practising ritual magic. This is all in the game so I'm not going to say any more, except that we've researched the case very thoroughly and it's all in there

somewhere."

In the game you are cast as an innocent passer-by who stumbles across the first of the Ripper's victims and reports it to the police. That, you soon discover, was your first mistake as you are drawn into the ghoulish events and are forced to prove your innocence – this can only be done by finding the real culprits. Corrupt authorities and black magic conspire to make this far from easy.

Gory graphics are provided to enhance your enjoyment of the horrible happenings. Are these crimes suitable material

for a fantasy game? Is the pleasure derived by players going to be slightly dubious in terms of taste? Ms Langridge defends the subject matter; "I don't think a computer game is any different to any other media. It is just as appropriate as any other form, just another way of telling a story."

The game is serious in its intent and perhaps playing this terrifying adventure will give brave enthusiasts unexpected insights into police corruption and sadistic murderers. It is certainly a long way from magic lands and lost princesses.

Low cost EGA display

Enhanced graphics will become slightly more affordable with the launch of Opus' upgrade. For £399 plus VAT you get a super high resolution monitor and EGA card combination, suitable for the IBM PC/XT and compatibles.

The card is equipped with 256K of display memory, a light pen interface and a special screen save feature. Soft scrolling, panning and windowing are also possible. The monitor can handle 16 screen colours from a palette of 64 and offers 640 x 350 pixels resolution for enhanced graphics operation. The card emulates the IBM enhanced graphics and colour graphics adaptors, its monochrome display adaptor and the hercules monochrome graphics board.

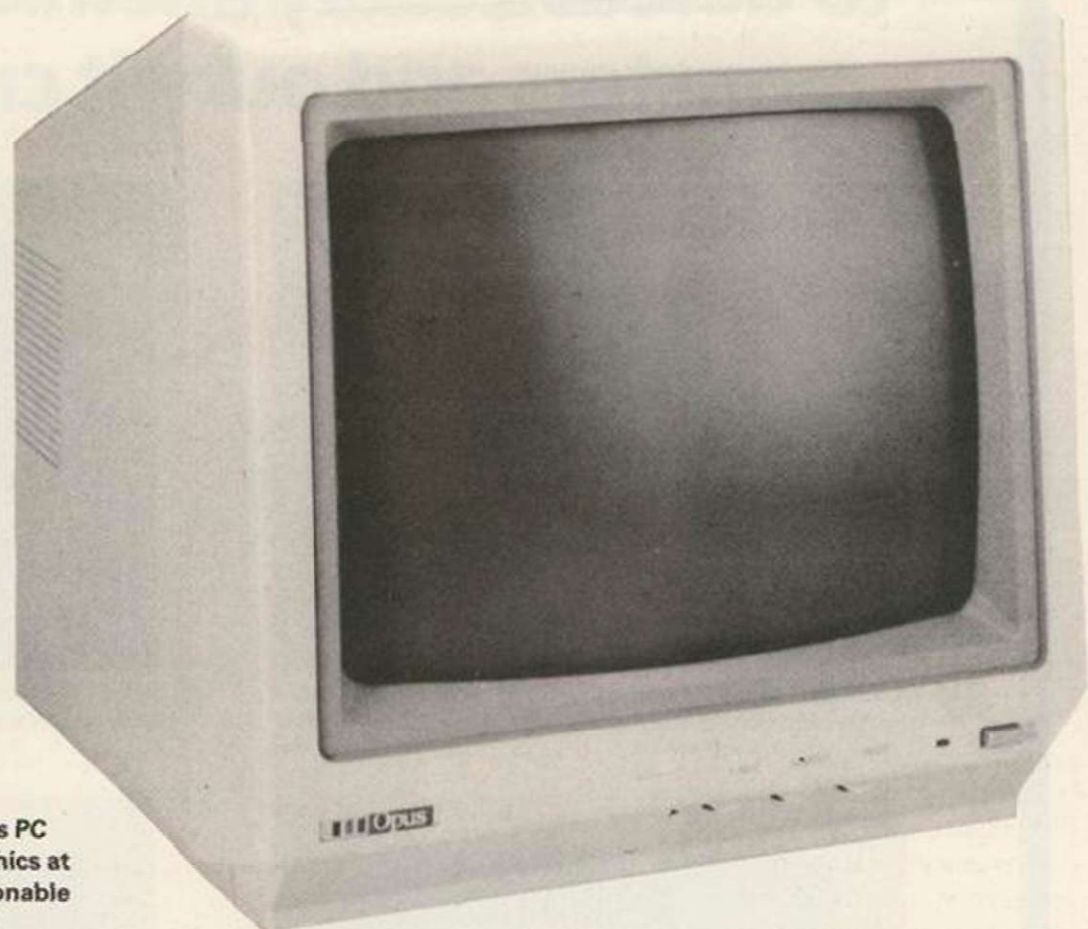
In addition to offering the EGA upgrade Opus is incorporating the system into the PC II Turbo model which it also makes. This is accompanied by a £200 price cut across the range which leaves the introductory EGA model at £799 plus VAT, making it the cheapest machine of its type.

Budget disk development

At last the trend towards budget software has spread to the disk-based games market. Players, a company based at Aldermaston, has released a series of games at hitherto quite unthinkable prices – £4.95 for BBC, Atari and CBM 64/128 and £6.95 for Amstrad versions.

A feature of the series is the newly designed packaging.

YOUR COMPUTER, JUNE 1987



● Hi-res PC graphics at reasonable cost.

Disks are notoriously boring to look at and elaborate packaging is usually employed to disguise this fact.

Players is relying on a simple blister pack and extremely loud graphics to drag your eyes to its products; it hopes you will find it hard to ignore the rows of Zap-paks currently being crammed into your favourite shops.

Each Zap-pak contains two

games. None of them seems particularly novel but for the price you will not be expecting anything other than retreads of classic concepts.

The covers helpfully include screen illustrations so if you can see exactly what you're getting, though with names like *Killapede* you can probably guess. Most of the other games in the first wave of releases employ the all too familiar jumping around the

screen to collect things though with intriguing plots; in one game you are a bubble of water bursting to escape from a tank.

Twee as this may be it makes a change from shooting down the invading alien hordes and Players are probably to be respected for this. The first releases in this series hit the shops on April 15 and more are to follow in the near future.



● Zap-paks... cheap disk games.

The Atari 520 ST gives you the power to defeat deadly enemies, slaughter monsters and outwit cruel captors.



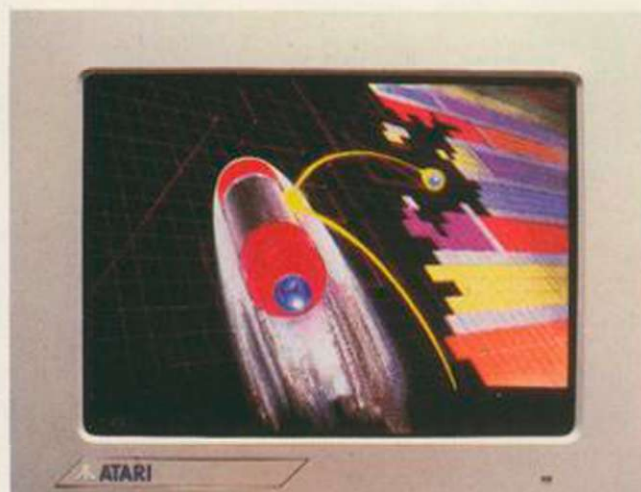
Gauntlet - U.S. Gold. Enter a world of monsters, mazes, mystery and combat in the ultimate role-playing fantasy game.



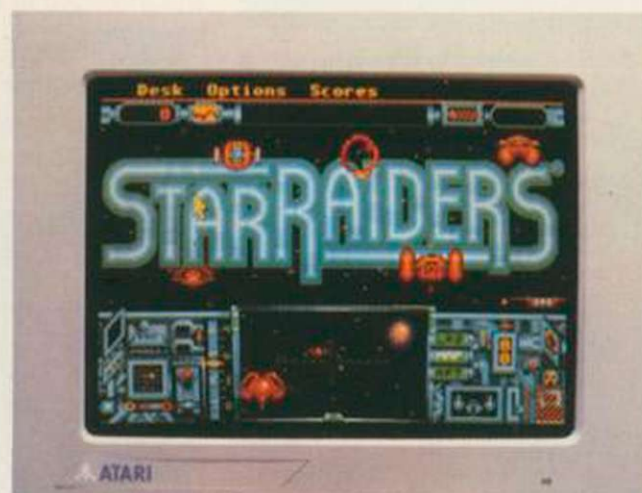
Tai Pan - Ocean. Voyage to 19th Century Hong Kong for action and excitement with pirates, smuggling and mutiny.



Metrocross - U.S. Gold* It takes lightning reflexes to get past the potholes, obstacles and forbidden zones to reach the other side. And that's just the beginning!



Arkanoid - Imagine* The latest smash-hit coin-op game! Are your reactions quick enough to handle 33 different play screens?



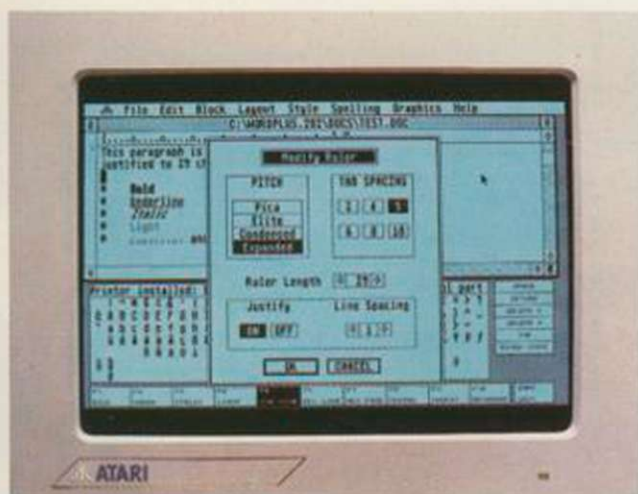
Star Raiders - Atari. Star Raiders are the only force strong enough to hold off the Zycroids. Your task is to command the Starcruiser - are you up to it?



Flight Simulator II - Sublogic. Take the controls of a Cessna 182 or Learjet 25G. With high speed 3D graphics for take-offs, landings and acrobatics, it's just like the real thing!

*Screenshots are from the Atari 520 ST.

But it's not all fun and games.



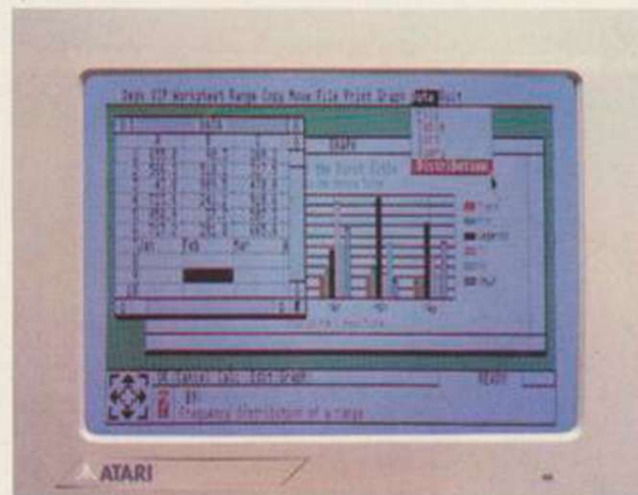
1st Word Plus – G.S.T. Professional word processor featuring U.K. spellings and integration of graphics including 1st Mail for full control of form letters etc.



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



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



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

Mixing business with pleasure is no problem with an Atari 520 ST. Not when you've got over 1,000 software titles to choose from.

You'll find all the latest games and a huge range of business titles from the top business software houses. And the range is growing all the time.

You won't be short of power, either. The Atari 520 ST is twice as powerful as most business micros.

So you'll be able to create spectacular colour graphics. Even animate them to make your own films.

If you're musically minded, you can compose and play a full symphony.

Or, for those who'd rather write programs than music, the 520 ST supports over thirty programming languages.

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

ATARI 520 ST
WORKS HARD · PLAYS HARD

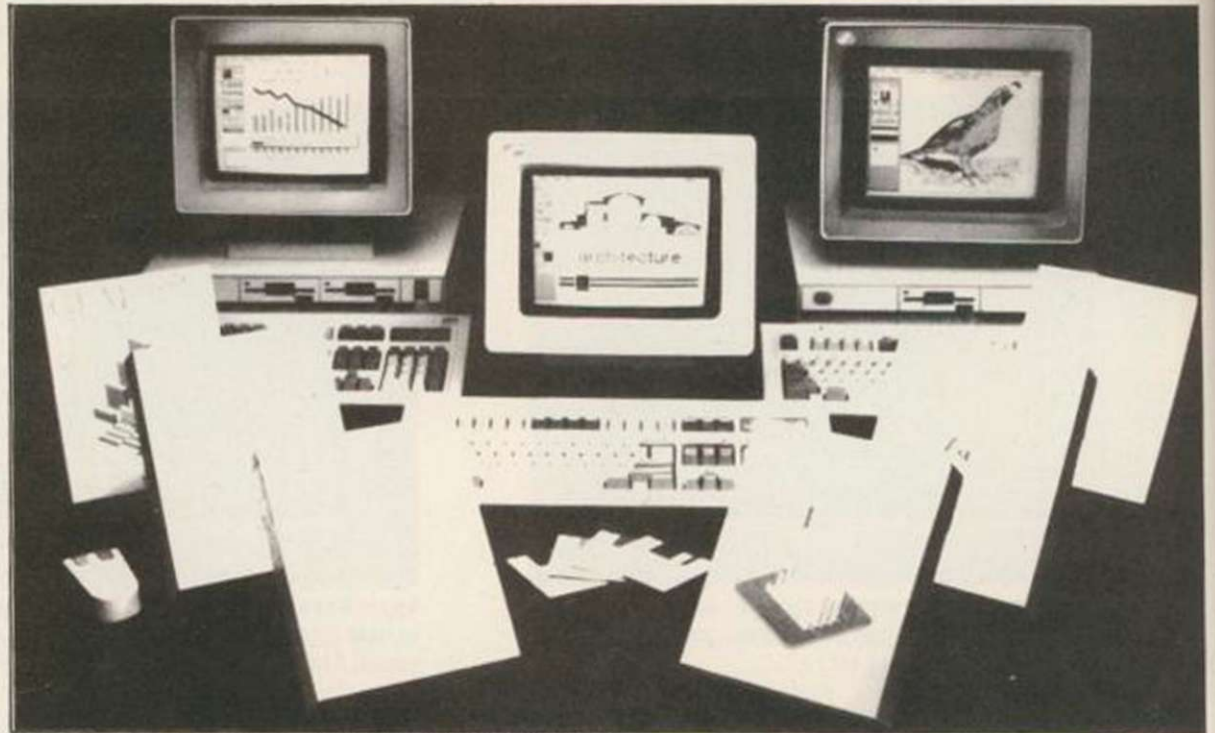


PS/2 hype

Following the recent IBM announcement of the Personal System/2 range, software manufacturers have been falling over themselves to announce versions of their product compatible with the new machines, and to endear themselves to IBM in fantastic adulation of the long-awaited new system. Only New System Persil can have received so much hype and excitement in the public relations industry.

First to arrive at the *Your Computer* offices was a missive from Micropro, makers of the mighty Wordstar. Wordstar 4.0 and Wordstar 2000 Plus 2.0 will be made available and eventually adapted to run under the new operating system. They will make use of features of the new system including MicroSoft Windows and multi-tasking. Of course with the new system the programs will run faster and better than on your mouldering old PC. Probably, anyway.

Digital Research will be making the entire family of GEM presentation graphics applications available from June in the new 3.5 inch format. They will be the same price as the current versions, and again the manufacturers



● Digital Research jumps on the PS/2 bandwagon.

claim to be delighted by the improved running of their programs on the new models.

Gold freebie

Tandy customers who buy a new Tandy business or portable computer will be offered free registration with Telecom Gold. This usually costs £40 and will be particularly useful to owners of the 102/200 portables which come equipped with a modem and communications software suitable for use with Telecom Gold. Although this equipment is not standard to the business models the offer

of membership of Telecom Gold can hardly reduce sales of the add-on components.

To qualify customers will be given an application form by their Tandy dealer, and Telecom Gold will allocate a mailbox number and password free on receipt of this. Purchasers of Tandy colour and pocket computers will not qualify for this offer.

Ripe Apple

Following the success of the new Macintosh and the revamped Apple II families of computers, Apple Computer Inc reports a 41 per cent

increase in sales in the first quarter of 1987 compared to the same period last year. Although sales totalled \$575.3 million net income was \$33.9 million, a growth of only six per cent. This discrepancy is attributed to increased spending on an extensive research and development programme. These costs rose sharply over the last year as the company developed and launched new products.

Marketing costs were also high, almost trebling from the 1986 figure. Those self-consciously lustrous TV ads evidently cost Apple a lot of money.

MAN LOGIC



By NEIL BRADLEY

To help you destroy
the aliens



and defeat the
taxman,

we've massacred
the price.



For a limited period, the Atari 520 STM is even more of a knockout than usual. We're offering it for just £449.95 (inc. VAT) complete with SF354 disk drive, SM125 mono monitor,* a mouse worth £24.95 and 1st Word, worth £49.95.

So as well as saving you from the enemy, the 520 STM will also save you £184. You'd better hurry though, because it won't be long before our stocks are wiped out.

ATARI 520 STM
WORKS HARD · PLAYS HARD

*Offer includes mono monitor. The 520STM plugs into a standard colour TV.

Letters

Green green grass of JFK

I am writing to you about the review of *Flight Simulator II* for the Atari ST featured in your March issue.

I have bought this on your recommendation and enjoy it very much although I note that some airports, notably John F Kennedy, do not have tarmac runways and are virtually indistinguishable from their environs. I sent the disk back to the shop which replaced it with another with exactly the same problems.

Is this common to the program or am I getting a raw deal?

**Michael Hall,
Lochboisdale,
Isle of South Uist.**

Editor's reply: This feature is common to all versions of Flight Simulator II, not just the Atari ST variant. Big, complicated airfields are shown the same colour as the ground whereas some simpler runways, often those which one would assume to be grass strips, are shown in bold black. This apparent paradox has never been explained, though it may well be that the complex outlines of big airports can not be manipulated sufficiently quickly if they are shaded in fully.

Congratulations

This is an almost unique occasion as I am not given to writing to magazine editors, but I am compelled to let you know how pleased I am with the new format of *Your Computer*. Several years ago I started subscribing to the magazine which at that time consisted of many pages full of information, news, listings and material of general interest. Over the years it became more and more games oriented, with fewer



and fewer pages and so much less interesting that I most certainly would not have renewed my subscription.

Now here let me say that as a pensioner, I own a computer purely for the pleasure I get out of programming routines and data handling programs, for my own satisfaction in solving the associated problems, and generally to marvel at the fascinating things which can be accomplished with a computer. I have not the slightest interest in games of the shoot-em-up or adventure variety.

I prefer games where the computer provides a worthy opponent in a game of non-fantasy basis, such as chess. So the articles I enjoy in your magazine are the news items on the latest hardware including peripherals, utility software, programming techniques, program listings and items on modems and inter-communication.

What I am trying to say is that I heartily approve of the new format and will be renewing my subscription when the time comes. Please, never fall back into being just a games review magazine; there are enough of those around already.

**D. F. Gordon,
Calver,
Sheffield.**

Protest

I read with interest the article in the April issue on *Protext*. I bought this word processor program on the strength of similar raving reviews of it and much regretted it. Your review reads like a list of unobtainable goodies. My copy has one major drawback: it does not print. Or, more accurately, it usually does not print. A print command is answered by either "unknown command" or when it does recognise "print" as a command it limits itself to asking for paper and moving to starting point.

Occasionally it goes as far as printing, though without form enabling. I have not been able to find out what triggers these different responses to the same command and frankly I am tired of trying: I have never seen a program like it.

I wrote to Arnor asking for help in this matter, but I have had no response whatsoever. *Locoscript* has a great advantage over *Protext* for me: it works, and works always.

**Chantal Hamill,
Livingston,
West Lothian.**

WACCI times

I am writing to tell you about WACCI, a rapidly growing Worldwide CPC user group based at 75, Greatfields Drive, Hillingdon, Uxbridge, Middlesex UB8 3QN. WACCI is in its eighth month now and we pride ourselves on producing the best amateur magazine on the market. It is A4 format and includes illustrations and advertisements every month, along with articles and columns on all the popular subjects, as well as a few on the less popular ones.

The club covers the length

and breadth of the UK and has spread, so far to Spain, Germany, Norway and Australia. Benefits of membership include a 20 per cent discount on all full-priced CPC software, many hardware discounts and a free software library. There is also at least one competition each month—in fact, last month we had no less than 14 games up for grabs including *Starglider* and *Rasputin*.

Annual membership costs £12 (UK), £18 (Europe), and £24 (Overseas), half these amounts for a six month subscription. Mention *Your Computer* and you will receive a 10 per cent discount on your annual subscription.

**Jeff Walker,
Hillingdon,
Middlesex.**

Pinball rip off

Please pass on my congratulations to Mr D K Huff whose program *Pinball* you published in the March issue. By sheer coincidence he has managed to write a program exactly the same at a Mr Cromwell in the December 86 issue of *Amstrad Computer User*, although Mr Cromwell has put REM statements in his version. Hopefully you did not part with any money for this work of art.

**R. G. Allan,
PIU,
BFPO 32.**

Editor's reply: This is a perennial problem with program listings. The impossibility of keeping tabs on every listing printed in every magazine, together with some readers' unfortunate propensity for stealing the work of others and passing it off as their own, is one of the reasons why we now place less emphasis on readers' programs.

Something to say about personal computing?
Why not share it with other readers? Write to
Readers' Letters, Your Computer, Greencoat
House, Francis Street, London SW1P 1DG.
Letters may be edited for length. Don't forget
to include your name, age and full address.

Byte back

On March 31 I purchased a copy of your magazine. I am not a regular reader and I only occasionally purchase a magazine other than my regular *Byte*, if there appears to be anything worthwhile. I purchased this copy because I noticed a competition for an Atari 520 STFM while browsing at the newsagents. I checked the front of the magazine and the issue was dated April 1987.

After I got home, having paid £1.20 I found that the closing date was the end of March. There is nothing in this magazine which I do not already know or is of any use whatsoever – the price seemed OK for a competition entry. I have therefore returned your magazine for a refund of my wasted money.

**B. D. Johnson,
St Leonards on Sea,
Sussex.**

Editor's reply: There's no escaping the fact that we made a blunder. The closing date was originally intended to be the end of April, not March. To give everyone a fair crack of the whip we re-ran the competition in last month's issue with an extended closing date – the last working day in May. Sorry for the inconvenience.

Rainbird to the rescue

I would like to devote this letter to a brief, but heartfelt thanks to everyone at Rainbird Software, who have graciously saved my bacon! Never let it be said that British Telecom are penny pinchers; I have proof that they are anything but.

In my work as a supply teach of music I usually take my faithful CPC 6128 into school with me, and use

Rainbird's *The Music System* to show off the capabilities of machine and software to pupils and fellow teachers.

At one school where I taught recently some of the little darlings decided to have a go at re-writing my disks, including the TMS disk itself. The result was the TMS disk was damaged and most of my music files would be lost if I hadn't had back-up copies at home.

As I only teach intermittently I was unable to replace the disk and was at a loss what to do, so I finally decided to put print head to paper and write to Rainbird, asking them to help me. The result was that I received a new copy of TMS by return of post and a voucher worth £3 towards any Rainbird game. I would like to thank Rainbird for their extreme kindness, not to mention their sheer speed in helping me out.

**M. J. Lyons,
Burnage,
Manchester.**

Amiga apology

I want to thank you for printing my letter in the March issue of *Your Computer*. I did think, however, when reading the letter over again that my wording of the letter was a little strong and I apologise for it. I do think you were correct in saying that there is a definite lack of coverage.

I think that all us Amiga users who enjoy our computers very much and



● Above: The Commodore Amiga inspires devotion from its users.

read *Your Computer* every month would enjoy reading news about the Amiga and reading about the new software titles as they come out.

That's all for now and thanks again.

**Nathan Singer,
Safed,
Israel.**

Editor's reply: Thanks for the letter, Nathan – more Amiga coverage will be coming soon.

Disk trouble down under

I hope the drastic broom which swept your editorial staff to their present positions has left some links with the past and the stories and moves behind cold published facts. I wonder why Singapore drops off the cover after 1985, leaving New Zealand the sole readers' representative in the southern hemisphere.

The Hardware Hitlist article (*Your Computer*, May 1985) contains the best of the tenuous leads we have traced on the mysterious Triton Quick Disk Drive for 3in. floppy disks. That was a well-written review – alas, all too brief.

In the West Coast region of Wellington I represent a club of mainly Spectrum 48K users. Recently a small computer firm went out of business with a sale where we purchased a few Triton Quick Disk Drives, each with an interface and one floppy disk.

The firm knew nothing about Sinclair Computers but the box labels show that these Triton devices were probably from Hongkong and were intended for use with Spectrum computers. Experimentally, we found that the drives worked very well with some Spectrums but not with upgraded models.

Perhaps the promotion of

the Microdrive in 1985 made it politic to go for that and to suppress the other but that is water under the bridge now. People are progressing from tape to Microdrive but there is a bigger hurdle to more substantial disk drive systems. We find these cheap floppy jobs a useful and educational interim stage, leading to more effective use of the Spectrum and better appreciation of the later generations of Z-80 descendants.

We do not seek to raise any awkward questions but we are desperate to find a source for the 3in. floppy disks and for a Triton centre or agency. Could anyone direct us to them?

We have been faithful followers of *Your Computer* for some years and hope to continue to find guidance from it.

**Denis McMahon,
14 Gear Terrace,
Porirua,
New Zealand.**

Editor's reply: Anyone who can help Mr McMahon and his friends in New Zealand, please write to him and help him find his floppies.

Disgruntled of Chertsey

I have taken computer magazines regularly for the last few years and find that whenever I stop taking a particular magazine, it ceases publication in a short period.

I have a complete set of *Your Computer* magazines from Vol 1, No 1 to date. You may be interested to know that in view of its poor content I have now stopped taking this magazine.

**D. O. J. Hiscock,
Chertsey,
Surrey.**

line noise

Communications news

There are many ways of crossing the Channel. You can get seasick on a ferry or spend half your life in what are ironically known as departure lounges at airports. For others there is the option of sitting in some Kentish field waiting for someone to dig a tunnel.

Alternatively you could stay at home and leave the hard work to your computer, your modem and your bank account. The point is that it is possible to enjoy the atmosphere of life on the European continent by accessing Teletel, the French equivalent of Prestel, once you have the proper software.

What is more, doing it will soon have you thinking about the type of service the French are being offered, compared to what the British companies are providing.

To start, it is worth looking at typical Teletel and Prestel users. Prestel was having a bad time trying to get off the ground before the likes of Viewfax and Micronet arrived. The vast majority of Prestel users are travel trade and computer users.

Teletel, on the other hand, has a far wider range of users, and for one very good reason—most Teletel users were given their equipment. It all started about five years ago when the French state telephone company decided to put its directories on-line, where they would be easier and cheaper to update. The company then gave a large number of its subscribers terminal sets known as Minitels, worth about £300 each, rather than printing-out paper copies of the directories. There are a reported 2.5 million Minitel users now.

As well as saving the cost of printing and distributing thick wedges of paper, the company also gains revenue from the on-line system by selling advertising space and charging customers to use it.



● Above: Teletel offers a guided tour to new users.



● Above: the emulation software from Aldoda is largely self-explanatory.

At least Minitel owners have to use their telephones to find a number. The system grew from there. It expanded, with hundreds of information providers setting-up their own databases. Now directory enquiries account for only about one-third of all Teletel accesses.

Like Prestel, most of the system is free, which is why you can access it from the U.K. without first having to open a French telephone account. Unlike Prestel, the system is not run from a central base. The general videotext system, known as Teletel, consists of hundreds of independent systems —

about 1,200 at the last count — all conforming to the Teletel standard and linked to form a vast network. Some of them are available by direct dialling but most are accessed through three main exchanges, or Videotex Access Points.

The hosts range from micro-based, home-grown systems to large commercial operations. Some demand that you take a subscription but that can often be done on-line with a credit card number.

The information supplied is also varied, from train time-tables to assistance with personal problems.

All the hosts are available from the three main VAPs, known imaginatively as Teletel 1, 2 and 3. The last, known as The Kiosk, has the most popular areas. Charging varies according to which VAP you use. With Teletel 1, for example, some of the data connection charges are billed to the hosts, which is why many of them require a subscription.

A recent article in *The Observer* colour supplement highlighted some of the more salacious activities on Teletel. The system has a chat mode where you can converse directly with one or more users. The facility is even



usual viewdata software. The system uses different codes and protocols, so you need special software. Aldoda International produces a software package called 'T' for the BBC micro and is working on versions for IBM PC-compatibles and the Apple Macintosh.

The simplest way to get on to Teletel is to telephone France. But if the thought of making international calls makes your hair stand on end, the answer is to get yourself a PSS account.

For those who do not know what PSS is, it is a way of making long-distance data calls cheap. The idea is that BT takes all the data emanating from various people, squeezes it into packets and then puts together the packets, so there is very little idle time on the system.

You have to pay a £25 joining fee, plus quarterly subscription and usage charges. For the vast majority of people the telephone call you make is charged at local rates, no matter where in the world your data is going. For international calls, and even some trunk calls inland, you save money eventually.

The PSS system connects to the French equivalent, Transpac, which is also used for linking the hundreds of hosts on the Teletel network, although that part of the operation is invisible to the user.

Once you are on, you will face the next problem – it is all in French. That is not wholly unreasonable but there is some good news. First, it will help you improve your command of the language; and, second, there is an increasing number of English-language sections scattered about the network.

The English content could increase, too. When Aldoda introduced Teletel software in the U.K. the company

mentioned a scheme to open a London-based node for the system, probably using PSS for the link with France. A London node is already up and running. The problem is the French. They have not determined how to organise billing but once that is sorted out the U.K. node should swing into action.

By this time you could be forgiven for wondering whether it is worth the trouble. If your French is good – and with the cost of international calls you do not want to read too slowly – Teletel has much to offer.

There is little benefit for the casual user but for anyone interested in comms it is a worthwhile experience. The range of the systems on offer will make the average Prestel user weep. It is the diversification of the system which makes it interesting. It has been made easy for people who have no real interest in computers to take part in the world of information technology in a painless and entertaining way. If only that could happen in the U.K.

Software for Teletel
Teletel software for the BBC B and Master micros is available at £27.50 from:
Aldoda International, 201 Haverstock Hill, London NW3 4QG. Tel: 01-794 0991.
Telecom Gold: 72:DTB10179.
Prestel: 017944999.

Accessing Teletel
You can dial direct on the following numbers using 1,200/75 baud:
Teletel 1: 010 33 36 13 91 55
Teletel 2: 010 33 36 14 91 66
Teletel 3: 010 33 36 15 91 77
The main services available via PSS on 1,200/75 baud at the moment are the telephone directory on A9208035000613 and Infotel which has a chatline and on-line romance service. It is on A9208076001663.



being used for the kind of dialogue more usually found in blue movies.

You are never sure to whom you will be talking. Many people live their fantasies through their computers. It is a little like playing *Leather Goddesses of Phobos* with real people.

It is the oldest game in the electronic book. That kind of thing happens with any system offering chat facilities. I know of one Telecom Gold user who made his dates that way.

There is one other major difference between Prestel and Teletel. Prestel, and most other viewdata systems, are

based on a page numbering system. In the early days many Prestel sets had single numeric keypads. The system was designed so that it could be used from a push-button telephone.

Only recently, and in half-hearted fashion, has Prestel allowed you to move around by typing-in words. Teletel, on the other hand, started with sets equipped with full alphanumeric keyboards and so, in addition to the customary menus, keywords are used extensively – there are no page numbers.

The catch with this is that you cannot log-on with your

line noise

Hackers appeal

Steve Gold and Robert Schifreen, who were both prosecuted successfully in April last year for hacking Prestel, are to have their appeal against the convictions heard on June 29. They were arrested in March, 1985, soon after the national press went into top gear regarding the hacking of the Duke of Edinburgh's Prestel mailbox and other embarrassing security breaches at Prestel.

They were eventually fined £1,250. It is understood that the appeal relates to the action of BT in attaching data taps to the telephones of both defendants without a warrant, as would have been required if the tap was for monitoring voice conversations. The appeal is expected to last up to three days.

Translation

The European Centre for Automatic Translation has announced a new on-line language translation service, Cotel. Accessible via PSS, text in English, German, Italian or French can be entered via a standard comms terminal and in a short time the text will be translated into any of the selected languages.

On-line translation services are not entirely new but what makes Cotel special is that the service is automated and translations are usually completed in just a few minutes. The computerised translation system, Systran, has a 100,000-word dictionary and a special technical vocabulary.

ECAT admits that the translations produced by Systran are not so good as human versions but speed and convenience outweigh the disadvantages. Price is also competitive, from between 10 and 30 pence per

word according to text size. More details on Cotel can be obtained from the company's Luxembourg base: Tel: 010352 438 388.

Speed approval

The new director of the BT telecoms approvals board, David Clarke, has re-affirmed the need to speed equipment approvals at BABT. Clarke is committed to recruiting more engineers to carry-out technical testing and unspecified improvements to testing procedures are also mooted. There is no indication that test standards will be reduced to ease the flow of test applications.

Gold fax

BT Gold has begun experimenting with a fax-style messaging system whereby subscribers submit typed pages to a special BT Gold fax bureau top be digitised and then sent as normal electronic mail.

Unlike true fax, where the whole document is scanned at one end and reproduced at its destination, the Gold system can understand only typed script, though within that limitation Gold is claiming good flexibility and both Roman and Arabic characters are legal.

Obviously the system cannot cope with custom fonts, drawings, diagrams or letterheads. Unrecognised characters are marked by a padding character. BT Gold claims one of the advantages of the system is that it should be more accurate than a manually-transcribed service.

So far the service is available only to limited number of Gold users. The system effectively is undergoing trials, though for the record Gold fax items cost £2 per 1,000 characters, with a minimum charge of £4.

Viewfax closes after six years

Long-standing Birmingham-based Prestel Information Provider Viewfax has closed. The popular area aimed at microcomputer users on Prestel had been on-line for six years and was one of the forerunners of Micronet.

Although Viewfax had a big-time image on-line, it was run as a small private venture by Lindsay Reid, often with a staff of only two or three but with the generous help of a customised BBC Econet network and several legendary Technalogs viewdata computers.

Reid, who admits that Viewfax was really more of an expensive hobby, will now devote more time to his more lucrative ventures, a bustling

BTI launch Text Direct

The newly-set-up BT division, British Telecom International, has unveiled a new Telex service for electrical mail users. Most commonly-used electronic messaging systems interface to the national and international Telex network, usually by utilising one central Telex centre forwarding Telex messages between the e-mail system subscribers and the outside world.

Prestel and BT Gold have offered the system for some time, though its disadvantages are that a special answer-back code, usually your e-mail mailbox number, must be placed strategically on the document being transmitted for it to be forwarded successfully to a subscriber's mailbox.

The BTI TextDirect service still requires an answer-back code but BTI claims that its new system is now much

wine bar and restaurant and a computerised sound system.

Micronet is negotiating to keep certain independent Viewfax areas operating.

Dacom Quad

Dacom have unveiled a £599 plus VAT state-of-the-art PC card modem, the Quad. The device runs all the popular data speeds from V21 – 300 baud – up to V22bis – 2,400 baud. An important feature of the Quad is that it has its own V24 port, permitting RS232 connection to a local data network when the modem is not being used on-line externally. Therefore you can either save on an extra RS232 comms card or avoid the need to unplug your printer every time you need to access your local network.

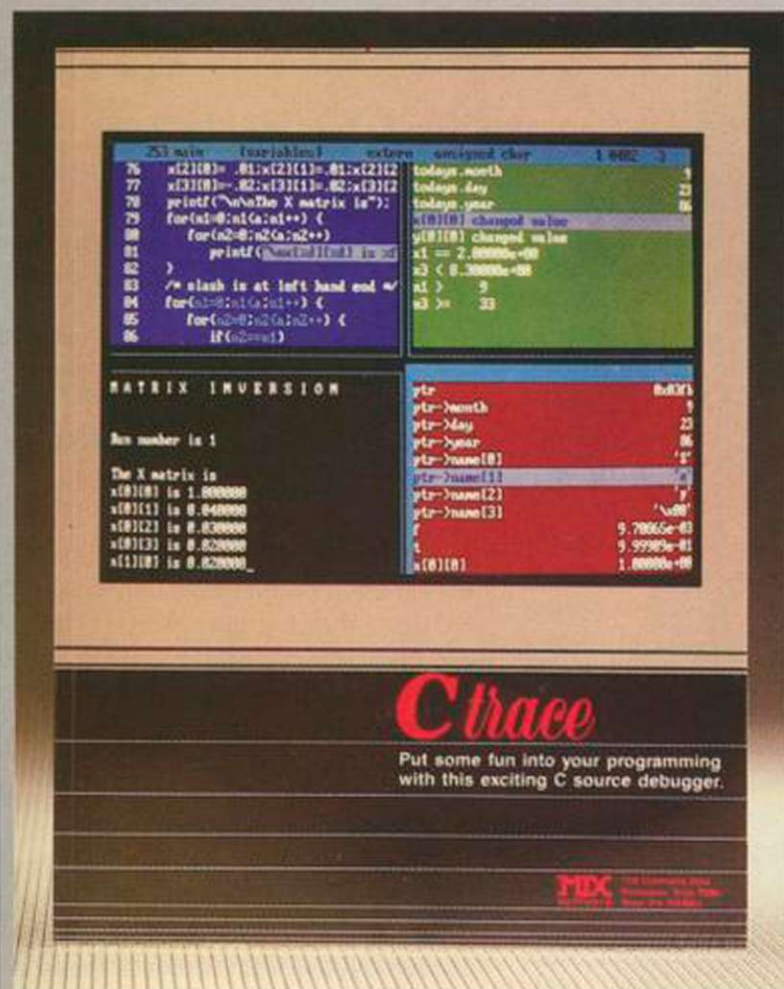
Ctrace

Find your programming errors the fun way with Ctrace. MIX Software's exciting C source debugger makes it so easy to track down bugs that you'll love doing it.

Your MIX C programs will come to life on the screen. You'll see your variable values change as you watch your source code execute. A unique animated trace feature highlights each C statement as it executes. It's like watching the bouncing ball as the cursor moves from one statement to the next. The internal workings of your program are revealed through 6 windows: source, output, variables, watch, memory, and symbols. View up to 4 of these windows at the same time.

You have complete control of your program. Execute one statement at a time, or run the program at trace or full speed. Insert an unlimited number of break points to stop execution at selected statements. Insert watch points to stop execution when selected variable values satisfy your defined conditions. Interrupt the program at any time, even in the midst of reading input from the keyboard. You can even change variable values, alter the execution path or trace the flow of control backwards.

Ctrace is so simple to operate. You can almost use it without thinking. No complicated commands to remember, just press a key. Help screens list the keys and pop-up windows list the options. After 30 minutes, you'll be using Ctrace like a pro. Your productivity will improve dramatically and your programs will work more reliably. What was once a dreaded chore becomes an enjoyable experience. Debugging is fun when you have Ctrace doing all the work! So order your copy of Ctrace today and start working smarter instead of harder.



Only **£29.95**

UPGRADE
PC1512 → 640K Kit
only £12.95 if you buy
MIX C!

MIX C Compiler £29.95

You can see that Ctrace is not your typical debugger. It's powerful but easy to understand and simple to operate. MIX C is designed the same way. Unlike other C compilers, it's small and fast. In fact it's the only standard, full featured C compiler that can be operated comfortably on floppy disks. And as you would expect MIX C is easy to use. It produces a complete program listing with all errors clearly identified and explained.

Although it's small, MIX C is not a subset. MIX C supports the full K&R standard, including the extensions that are often omitted in other C compilers. MIX C comes complete with a fantastic 450 page book, a library of more than 175 functions, a blazingly fast linker, and tools for optimising your programs for minimal space or maximum speed. All this is yours for little more than the cost of most C books alone.

The combination of Ctrace with MIX C makes C programming a real joy. MIX C provides the power of a compiler while Ctrace provides an execution environment that's better than an interpreter. Now you can have the best of both worlds at a very down to earth price.

Split Screen Editor £19.95

Another great companion to the MIX C compiler is MIX Software's split-screen editor. It makes writing programs even faster and easier. With the MIX editor you can compile, link, and execute or trace your programs at the touch of a key. Compiling is fast because the MIX C compiler reads the program directly from memory. Correcting errors is easy because the editor automatically positions the cursor to the first error in the program. The editor is similar to Micropro's WordStar but with additional programming features like split-screen, macros, and much more. Together with the C compiler and Ctrace, the editor forms an integrated programming environment.

ASM Utility £6.95

MIX Software's ASM utility is available if you want to link assembly language functions to your programs. It works with Microsoft's MASM or M80 assemblers. Call assembly language functions just like C functions. Call C functions from assembly language. Lots of useful assembly language functions are included as examples.



The Complete MIX C-Works Only £69.95 includes Editor, C Compiler, Ctrace, Examples, and ASM Utility.

30 Day Money Back Guarantee. Not Copy Protected. MIX C is the perfect choice for the Amstrad PC1512 and other PC Compatibles. Enquire about PCW/CPC, CPM & Apricot formats.

MIX Software, 1132 Commerce Drive, Richardson, Tx, USA (214) 783-6001 have appointed Analytical Engines as their UK Distributors and Technical Support Agents. Discounts for educational establishments. Trade enquiries.

YES! MIX C is fabulous! Please rush me:-

- Comprehensive FREE 12 page colour brochure on the fabulous MIX C programming environment!
- C Compiler £34.44 inc. VAT! Blazingly fast powerful linker! Massive 450 page typeset book! FULL library source code! Optimising tools! The best tutorial available!
- Split Screen Editor £22.94 inc. VAT! Compile, link, and executive at the touch of a button in six seconds! Positions cursor to first error! 112 page book! Execute DOS commands! RUN other programs! Macros! Variables! Customise! Split screen horizontally or vertically between two files! Online help! Temporarily EXIT to DOS and return exactly where you left off! WordStar compatible!
- Ctrace £34.44 inc. VAT! The friendliest, most powerful, State of the Art, C Debugger in the World! 112 page book! SIX Windows! Full colour! Unlimited break points! Watch points! Customise! Expand variables to 16 levels! Much, much more! Absolutely amazing!!!
- C-Works £80.44 inc. VAT! The world's friendliest, most powerful, most complete C programming environment! More than 670 pages of documentation!
- ASM Utility £7.99 inc. VAT! Assembly language interface! Packed with examples!
- Examples Disk £6.84 inc. VAT! Nearly 70 examples from the brilliant tutorial! FULLY tested! Give your fingers a break!
- Amstrad PC1512 → 640k Memory Upgrade £14.89 inc. VAT! FULL instructions! 150ns chips! Create a 360k RAM disk! Supercharge your PC1512! No VAT on export orders! Postage £3 inc. VAT per order UK, £5 to the rest of Europe. Worldwide AirMail £20 for C-Works!

PCW June

Name _____

Address _____

I enclose cheque/Eurocheque for £ _____ made payable to: Analytical Engines Ltd

Analytical Engines Ltd., PO Box 35, Eastleigh, Hampshire,
England SO5 5WU
Telephone 0703 262099

books

Mastering the Atari ST

Author: John M Hughes

Publisher: Sigma Press

This is another of those books which pictures you as the new owner standing there with your brand new computer in front of you and, the authors hope, their book in your hand. Your ignorance is catered for: "You don't need the natural caution with which most people approach computers for the first time" states the introduction, and the sensible ordering of topics leads you through setting up to making real use of the machine. In the opening pages you are wondering where on earth all those wires can possibly go and 200 pages and twelve informative chapters later you are zipping around spreadsheets as if it was a basic human activity.



This book aims to provide a guide to the small business, home and educational uses of the ST which comes down to lots about word processing and an introduction to databases and spreadsheets. Before this however there is an introduction to using the machine and the GEM system. This includes the manipulation of windows and how to move and size them. Everything you need to master the GEM environment is outlined and each point is labelled clearly enough for easy reference.

Two more chapters cover organisation of disks, start-of-day disks and exploring ways of working. The emphasis is on speed and efficiency. Naming and renaming files, putting them in folders is covered again with the intention of getting the most efficient performance out of the system.

After a quick run through operating systems, accessories and more general hints on running programs there is a look at the

vital element of choosing a printer. The obvious differences between daisy-wheel and dot-matrix printers are pointed out. This is all a prelude to the main strength of this book which is the four chapter guide to *1stWord*.

By this point Hughes has introduced quite complex operations and all aspects of word-processing, printing, composing and editing text with *1st Word* are covered in enough detail and depth to make this a very useful guide. The book is well organised with detailed chapter headings and a comprehensive index so whatever your difficulty help should be close at hand. Finally there is a less detailed look at databases and spreadsheets, based on *Laserbase* and *VIP Professional*. Good design and a chatty but informative style make the book a pleasure to use and Atari owners whether experienced or bewildered should be able to benefit from it.

Carol Attack

Electronic circuits for the computer control of robots

Author: R A Penfold

Publisher: Bernard Babani

£2.95

"Robots and robotics offer one of the most interesting area for the electronics hobbyist to experiment in" says the blurb on this little book, a companion to the book about controlling train sets we reviewed last month. A recurring fantasy for most of those with an interest in computing and circuitry is to build a robot, if not to the specifications of sci-fi or Flat at least to the extent that it will scuttle round the floor to your satisfaction and amusement.

This booklet may not show you how to create the rather disturbing tin man on the cover but it does provide a wealth of diagrams to overcome the sticking point the author has identified in amateur robot builders' attempts. This is the interface of the computer and the motors, and the feedback from robot to computer. The circuit diagrams included in the booklet are all designed to address this problem and get the computer and the robot talking to each other.

It is assumed that you have already acquired a robot, perhaps by means of a kit, and the opening chapter tells you what sort of motor should drive the beast. Your computer will need to be equipped with a user port or parallel port, and a standard RS232C or RS423 will suffice.

The information given is all very clear and the diagrams simply drawn. The lack of an index could be a problem if you are faced with a reluctant robot and need specific advice to get it moving. Building a circuit and controlling a robot could, as the author says, prove extremely interesting and add a new dimension to your computing activities.

Carol Attack

Mastering View, ViewSheet and ViewStore

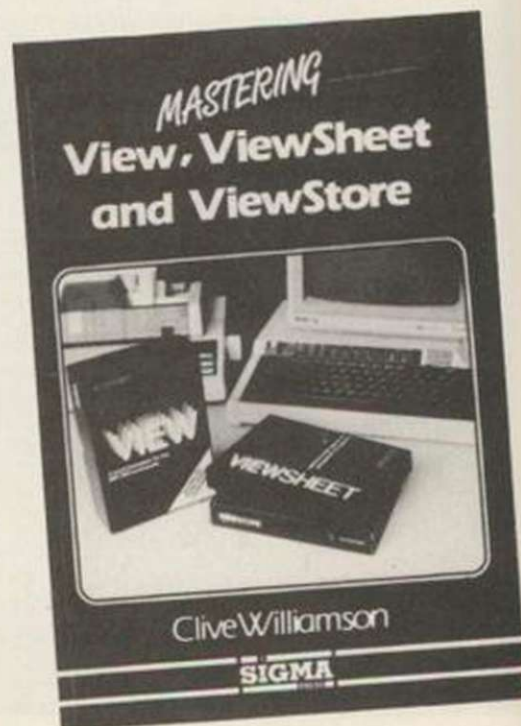
Author: Clive Williamson

Publisher: Sigma Press

£12.95

This is another of the *Mastering* series of guides and covers the View range of software for Acorn computers. It is intended to be of use to both newcomers to the programs and those who want to improve their usage and get more out of View. It is based on version 3, and the total advice offered to those possessing earlier copies is to upgrade; in the author's opinion the superiorities of version 3 are such that no lesser action will suffice.

The book is sensibly laid out with a setting-up section preceding a detailed run through the three areas in which View operates. Installing program and printers on both the Electron and the BBC Micro is covered, including changing screen colours. A printer menu program for Epson models is given, as is more shopping advice, urging you to acquire a disk drive should you still be struggling on with cas-



ettes. Here is a suggestion for a very useful guide – mastering your computer without lavishing every last penny on it.

Buying a guide to a program to be told that your version is yesterday's thing and all you can do is buy a new one isn't much good when what you want is to get the most out of what you've already bought. With new versions of programs succeeding each other more and more rapidly not everyone is going to rush out and upgrade every time they're expected to by greedy publishers and opportunist guidebook writers who get these things free.

Back to *Mastering View, ViewSheet and ViewStore*. The word processing section begins with a guide to all the commands for moving text, deleting and altering the format. The next chapter covers page layout, commands for altering said layout, line spacing and headers and footers. Printing and problems come next, with the most space devoted to running out of memory. Two solutions, using separate files and continuous processing are offered. As an afterthought a software patch to improve the operation of View 2.1, which the author claims is dogged by compatibility problems, is included, as are techniques for speeding up the operation of version 3 and search and replace commands.

The section on ViewSheet includes simpler explanations of the purpose of spreadsheets and using ViewSheet, with useful examples such as calculating gas bills. Other examples given to explain the role of the spreadsheet as a database, if that isn't too confusing, include home insurance listings. The chapter on advanced use includes windows and setting their parameters, expanding the spreadsheet and what to do if small problems such as a rogue % sign appear on the screen.

Viewstore is introduced by a consideration of what is a relevant use for a database in a home environment. The examples given involve personnel records and library catalogues, and the section concentrates on office uses. No mention is made of the Data Protection Act; so perhaps you should stick to the library applications.

Finally a section explains how to integrate the three sections of View which is especially useful if you want to perform calculations on information held in a database. If you've any cash left, Viewplot, a graphics add-on, and Overview, an integrated version with ViewSpell and extra help sections, are temptingly described.

Carol Attack



Success in Software

Author: Richard Hanson

Publisher: Superior Software Ltd

If you are a whizz-kid programmer anxious to get your games on the market you would be very silly to ignore this book. It goes through every step of the procedure for turning your programming skills into hard cash via a top selling computer game. The market for games software is increasingly sophisticated and this book will provide you with the inside knowledge to create a game you can sell.

Additionally it describes the pitfalls which await the unwary, such as rip-off payments. You are advised to settle for a fixed royalty rate rather than anything as nebulous as a percentage of profits or a one-off payment. This is quite sound though it has to be added that whatever your agreement you should ensure that it is made with a thoroughly reputable company or that you have independent advice. *Success in Software* covers legal aspects like signing contracts and points out the agreements you should be wary of. Of course if you are under 18, as the enticing examples of high achievers in the book are, you shouldn't sign anything unless you want to commit yourself to months of legal action in the future.

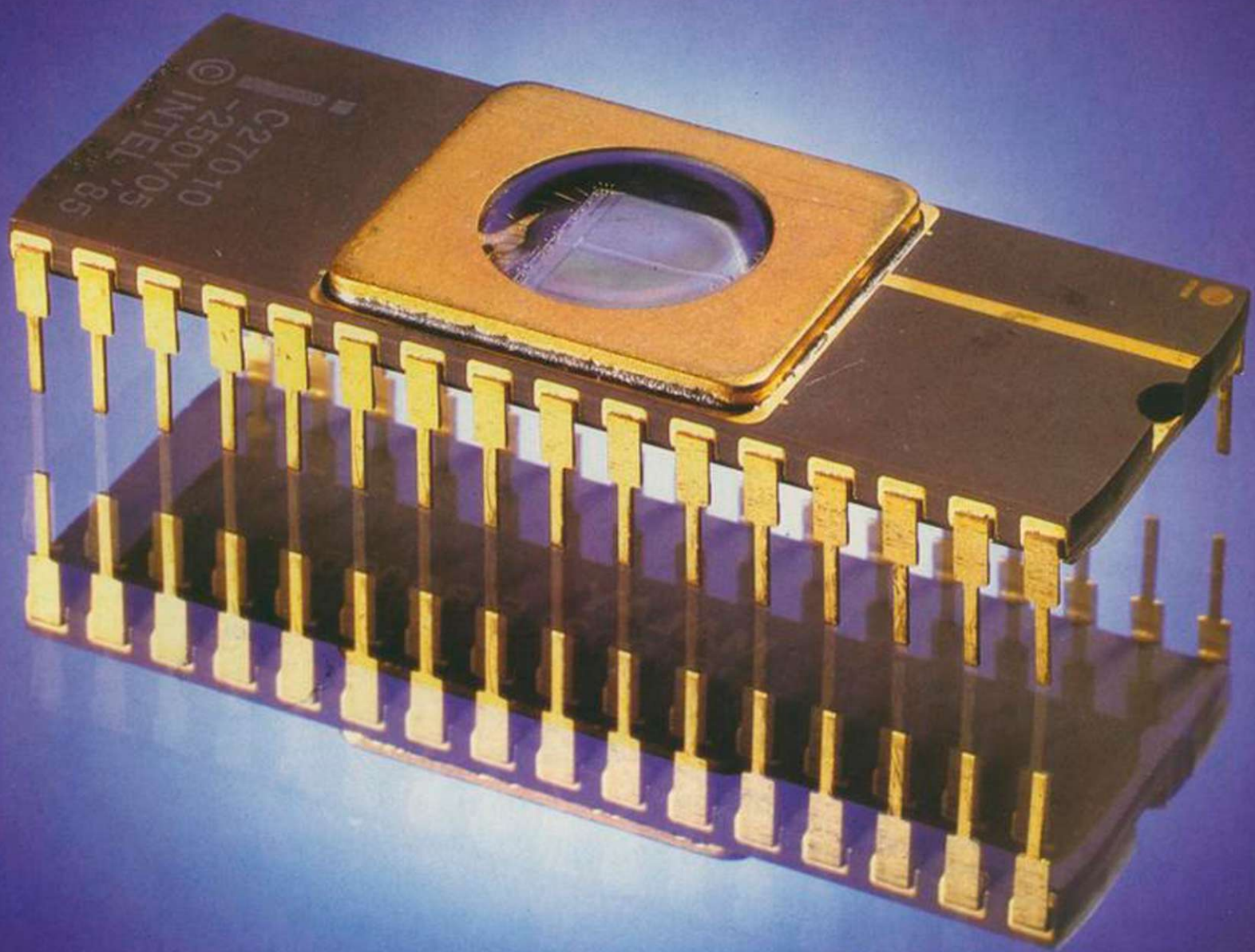
It may be irresponsible of books like this to suggest that there is a fortune to be made in the games software market. Com-

petition is such that all margins including author royalties have been cut. That doesn't mean that you should sign for less than your work is worth, simply that you may have inflated ideas about the worth of games programs in the first place. You are wisely advised by this book to seek professional advice at every juncture and a good accountant is a necessity once your program is out and selling.

In addition to financial and legal advice *Success in Software* provides useful advice on how to bring your work to the attention of software houses in the first place. The first chapter shows the dedication to programming that is needed; about thirty hours is reckoned to be the minimum. The book provides a list of guides to individual machines to help you overcome programming problems, though if you're working with a software house their experts, the book suggests, will be there to help you iron out the difficulties.

Although this book includes ideas to boost your creativity (basically, read de Bono on lateral thinking) it is down to you to come up with the original concepts from which games are created and clones of existing games are unlikely to bring you fame or wealth. Unfortunately imagination and creativity cannot be side-stepped or ignored and whatever advice how-to books like this can offer without these characteristics your programming time will be wasted.

Carol Attack



SPELL
Master ✓

Spellmaster contains 59,536 separate English words
stored in 131,072 bytes in one chip

- Compatible with all BBC models
- Works with INTER-WORD, WORDWISE PLUS and VIEW
- Checks spelling at up to 10,000 words per minute.
- Checks text as it is entered

SPELL-MASTER ROM

This is the first completely ROM based spelling checker in the world. As a result it out-performs all known spelling checkers on this machine or any other micro-computer. The single 128K EPROM contains over 59,000 separate words and 22K of program.

Compatible with all BBC Micros

Special switching techniques ensure that the 128K ROM appears to the machine as one single 16K ROM - this guarantees that it is completely compatible with the ROM sockets in all versions of the BBC Micro-computer.

Compatible with all the major word processors

SPELL-MASTER has been designed to fully integrate with the most popular word processors on the BBC, WORDWISE and WORDWISE PLUS, VIEW and of course INTER-WORD. While editing in these word processors all that is necessary to control SPELL-MASTER is to press one CTRL key (Usually CTRL-J). This causes a menu to appear listing a variety of options such as 'Check entire text', 'Check word at cursor', 'Continuous check - on/off' etc. Text is checked directly in memory while in the word processor. There are even short-cuts to the menu, for example, pressing CTRL-V in any of the above word processors will start checking the text immediately from the current cursor position. Compare this with the process of checking text in the most highly rated competitive product - VIEWSPELL.

VIEWSPELL	SPELL-MASTER
<ul style="list-style-type: none">• Save text from word processor.• Enter spelling checker.• Load text into spelling checker.• Check the text.• Go back to word processor.• Load marked text.• ...finally, make corrections.	<ul style="list-style-type: none">• Press CTRL-V• make corrections.

Check entire text

In a word processor, SPELL-MASTER can check at up to 10,000 words per minute. Whenever a word is indicated as misspelt the user is given three simple choices. Replace the word with another selected from the dictionary, ignore the word altogether or add it to a user dictionary.

Check as you type

Because the dictionary is ROM based it is possible to check words as they are typed. This feature works with all the above named word processors and does not slow the operation of the word processor at all. Whenever an

incorrect word is entered the computer will beep; the word may then be corrected or simply ignored.

User Dictionaries

SPELL-MASTER supports extensions to the main dictionary in sideways RAM or ROM. This has the advantage that there is no speed degradation when checking against user dictionaries, since there are no disc accesses required at all. Once a word is added to a user dictionary it is treated as if it is present in the main dictionary.

SPELL-MASTER can support a number of separate dictionaries at once, each sideways RAM or ROM holding up to 3000 additional words. Once a dictionary has been created it can be 'burned' into an EPROM to form a permanent extension to the main dictionary.

Provision is made for editing any dictionary extension, for adding or deleting words in bulk, and directly loading or saving user dictionaries from or to sideways RAM.

Additional star commands

These can be issued from any language ROM such as spreadsheets or BASIC (they can even be included into BASIC programs). Some of the 8 commands are:

***CROSSWORD** - Will search the entire dictionary for words that exactly fit the search pattern. For example *CROSS. ##M#U#ER would list ARMOURER, COMMUTER, COMPUTER. It takes about 8 seconds to check against all 59,000 words.

***ANAGRAM** - Will list all the words in the dictionary that contain the same letters as those specified.

***FUZZY** - Will list all words that sound something like the one you are searching for. If you are not sure of the spelling of a word then entering the approximate spelling here will generally list the word you are looking for.

Price: £59.00 incl.

Upgrades

Owners of the older two chip versions of SPELL-MASTER can upgrade to the single chip version for £25.00. However this new version is functionally equivalent and so it should not be necessary to upgrade.

2nd processors

Due to its unique design SPELL-MASTER will not work with word processors running on the 6502 2nd processor, although there are facilities provided for checking long text files.




Computer Concepts



ADVENTURE PLAYGROUND

Newcomers to adventuring can be disenchanting before they reach their first game problems says
Mike Gerrard

One thing it is easy for old hands at adventures to forget is that new people are discovering adventures every day. It is more difficult for me to forget it because in the various magazines for which I write; readers are constantly reminding me not to overlook the needs of absolute beginners. This has been particularly true in our sister publication, *Putting Your Amstrad to Work*, where I have had many letters from people just buying Amstrad PCW and PC machines and asking me to recommend adventures for beginners, or asking how to solve problems which seem reasonably straightforward to the more experienced player.

I knew one reader was getting into the spirit of things when he wrote to me about *Aftershock*, in which he was having difficulty getting a ramp away from an elephant. He said that he had tried everything of which he could possibly think, even to the extent of hitting the elephant with a pickaxe he had found, but he had to report that the elephant was not amused.

That is partly what adventuring is about – and I mean hitting elephants with pickaxes, along with all the other crazy things you try when you are desperate to solve a problem. Incidentally, I told the reader the answer to the problem was glaringly obvious, as the elephant liked what all elephants like. He wrote to say that he had been forced to go to friends doing a Les Dawson to find what this was: "If I am going to get a ramp off an elephant I have to give it a BLANK or BLANKETY-BLANK." He discovered that everyone in the world, except him, seemed to know that elephants like buns.

The co-operation you can get from other people is one way of learning about adventures. If you are stuck on a problem, you should not hesitate to send a letter to me, or to any of the many helpline services

available. You will find on the whole that adventure players tend to be very friendly. I know of many people who seem to spend all their spare time answering other people's problems and, if you subscribe to one of the specialist adventure magazines, you will discover addresses and advice galore.

If you are a newcomer to adventures, I recommend that you start taking at least one adventure magazine. Since the demise of *Micro Adventurer*, there has been no magazine from a commercial publisher devoted exclusively to adventure games but enterprising adventurers have started publishing their own magazines.

The most professional-looking, and hence the most expensive, is *What Now?* and costs £1.50 from H&D Services, 1338 Ashton Old Road, Higher Openshaw, Manchester M11 1JG. It was originally under the title of *The Adventurer's Handbook*, and the latest issue is 80 pages long. It includes reviews and general articles and is rapidly expanding to take in almost every aspect of the adventure world but, like many magazines, it will always be centred on the hints, solutions and maps it publishes. The most recent issue includes no fewer than eight excellent professionally-drawn full maps, for games as small as the budget title *Zacaron Mystery* on the Spectrum, and as large as Infocom's *Enchanter*.

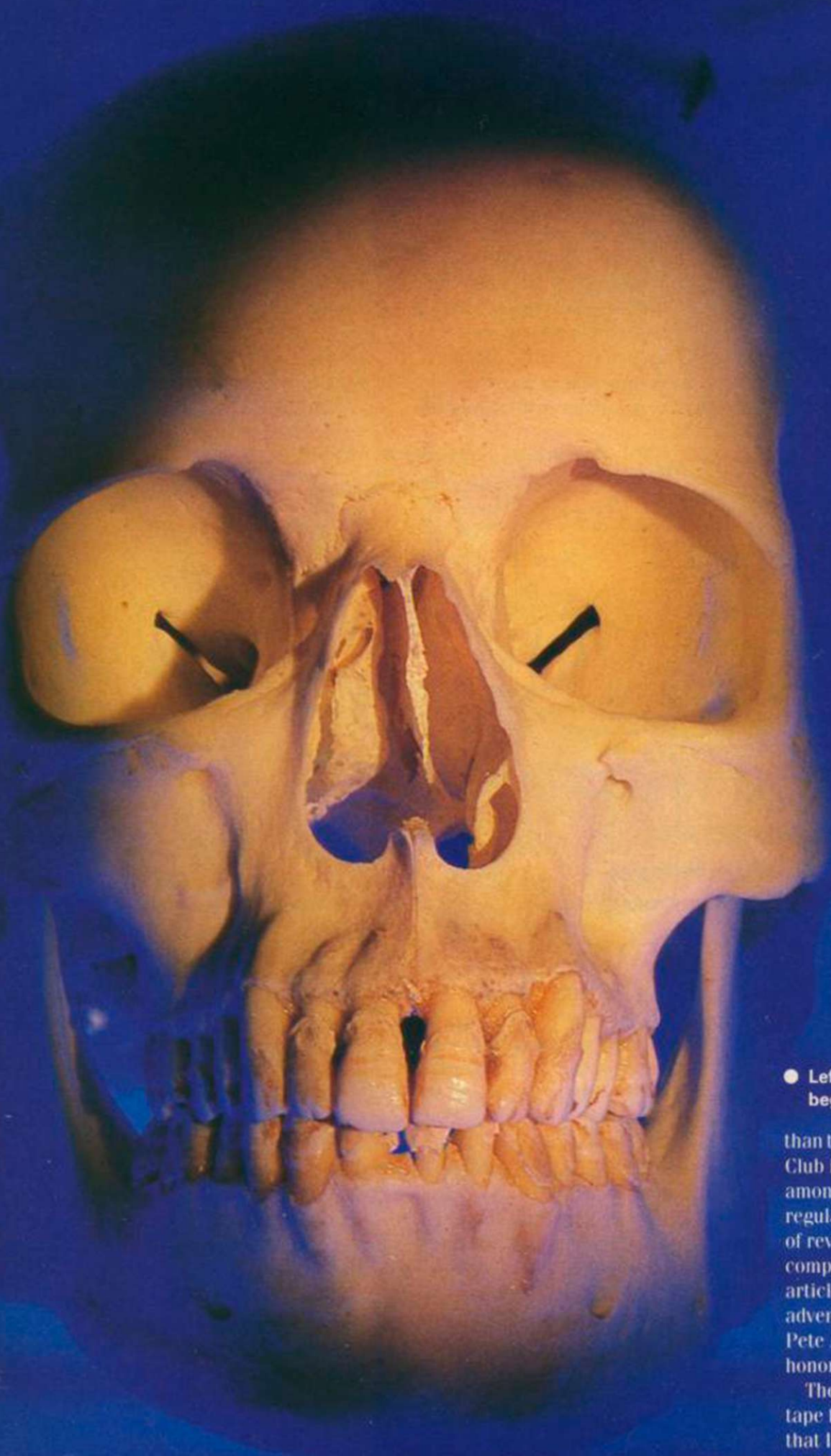
Do not be ashamed to look at the answers to problems if you are just starting adventure games and feel you need help, as it will not be long before you will be solving everything yourself – well, almost everything. The reason you are in difficulty may be that you are not typing-in the exact phrase needed to solve a particular problem. The parsers of some adventure games are more limited than they should be, and *Aftershock* is an example. I know many seasoned players

who were stumped by an early problem, in which you had to get out of a lift by climbing on a chair, removing a panel in the ceiling and then climbing out of the lift. Having got on the chair and removed the panel, the only command which will work is CLIMB OUT OF LIFT.

That might seem straightforward with hindsight – the solutions to most problems are glaringly obvious once you see them – but it took me half an hour to hit on the correct combination of words. Commands like GO THROUGH PANEL, CLIMB THROUGH CEILING, CLIMB INTO HOLE and even CLIMB OUT OF THE LIFT would not work; it had to be those precise four words and nothing else. That is bad programming, so do not take it as meaning that you are a poor adventure player if you are stumped by something like that.

Back to the magazines, and *Insight*, which is only 28 pages or so each issue, concentrates exclusively on hints and solutions and costs £1 from Ron Dawson, 41 Union Court, Westgate, Otley, Leeds LS21 3AS. It is also fairly well-established, in a field where some magazines appear for a few issues and then disappear, and is well supported by avid adventurers like John Barnsley and John Wilson, who have each solved more than 100 adventures.

Two more excellent publications emanate from Wigan; I suppose I could say they are magazines with no peer but I will not. It is noticeable that all the magazines I have mentioned are published in the north of England. The two Wigan magazines are both very different and if you think you will be interested in adventure writing, whether programming them yourself with advice from the likes of my little brother or using a utility like *GAC*, *Quill* or *PAW*, *Adventure Contact* will be an essential buy. It concentrates on the writing, publishing and marketing of adventures and a sample issue costs £1



● Left: This is what to expect when you begin adventuring.

than the few best-sellers, the Adventurers' Club includes an adventure sales service among its offerings. It also publishes a regular dossier containing the usual mix of reviews and solutions, plus competitions. It manages to attract articles from leading names in the adventure field, like Fergus McNeill and Pete Austin of Level 9, who is the club's honorary president.

There are other magazines, some on tape for loading into a micro, but the ones that I have mentioned cover all computers and I also see them regularly so can recommend them in the knowledge that they do arrive in the post month after month.

I mentioned that one of the adventure-solving hurdles is the parser in the game. It is the part of the program which interprets what you type-in. In the example given, the parser for *Aftershock* has been told to accept only CLIMB OUT OF LIFT at that point in the program before taking the player to the next location. A better parser would accept a much wider range of inputs, provided the

from Pat Winstanley, 13 Hollington Way, Wigan WN3 6LS.

The companion magazine is *Adventure Probe*. It is much more the general adventure magazine, with reviews, maps, letters, software swaps, a telephone helpline service and several pages containing the addresses of people prepared to offer help on a bewildering variety of titles. A sample issue costs £1

from Sandra Sharkey, 78 Merton Road, Highfield, Wigan WN3 6AT.

Striking a rather solitary blow for the south of England is the Adventurers' Club Ltd, 64-c Menelik Road, London NW2 3R11. A stamped addressed envelope to that address will bring an outline of the club's many services. If you have difficulty obtaining copies of adventures, with some shops seeming reluctant to stock more

ADVENTURE PLAYGROUND

player could show the right intention, had climbed on the chair, removed the panel, and was trying to get through the hole in the ceiling.

Newcomers to adventuring have to become accustomed to parsers, though, and their occasional limitations. Despite the ever-improving parsers, like those of Infocom, Magnetic Scrolls and Level 9, the majority of adventure games published will still work on a simple VERB-NOUN basis. You have to get used to thinking in those terms and that causes many a newcomer to come to grief, or at least to a temporary halt. Where in normal English you would expect to say something like GO THROUGH THE DOOR or WALK THROUGH THE DOOR, in the two-word adventure language that often becomes the rather ungrammatical GO DOOR.

If it is the door to a cottage you might also try GO COTTAGE or ENTER COTTAGE. A frequent irritation, to me at least, is when a program will accept a simple S (for SOUTH) to take you out of a location, but insists on ENTER LIBRARY instead of just N (or NORTH) if you want to return there.

When you are used to adventure games you accept these things as the minor nuisances they are but beginners may well be baffled and feel the fault lies with themselves. Even worse, they may be disenchanted by adventure games forever by an unlucky choice of game as a first attempt.

What should you choose as your first attempt? Many people have heard of Scott Adams as being the first man who brought

the large-scale mainframe adventure to the humble 16K home micro, as they then were, and therefore feel that for historical reasons they will start with a Scott Adams game, perhaps also thinking that those old games must automatically be easier and smaller-scale than more recent titles.

That is not so and I would never recommend a Scott Adams game for your first foray into adventures. I would be reluctant to recommend any of them to anyone at any stage, as I find the screen layout to be confusing, some of the problems to require needlessly complicated solutions, and the location

had received many letters complaining that its adventures were too difficult, so it decided to publish one tailored more to the beginner, with early problems being fairly easy but increasing in difficulty without suddenly confronting you with an almost impossible problem in the early stages. Some adventures take that approach, incidentally, so be wary of those which begin by placing you in a sealed room with no objects to help you and expecting you to provide some obscure command like SMASH HEAD AGAINST BRICK WALL if you are to escape.



descriptions so brief that there is no sense of reality or atmosphere about them.

"You are in a room" is about the extent of a typical Scott Adams piece of text. It is not even "You are in a purple room" for lovers of purple prose.

If you have a Spectrum, Tartan Software has just released what the newcomer needs. It is a tape of adventures called *Six-in-One*, which includes six adventures aimed specifically at beginners, along with an introduction to adventure playing generally. The adventures increase in difficulty and have a range of settings, also making use of typical adventure problems like how to climb down a cliff or how to use magic spells.

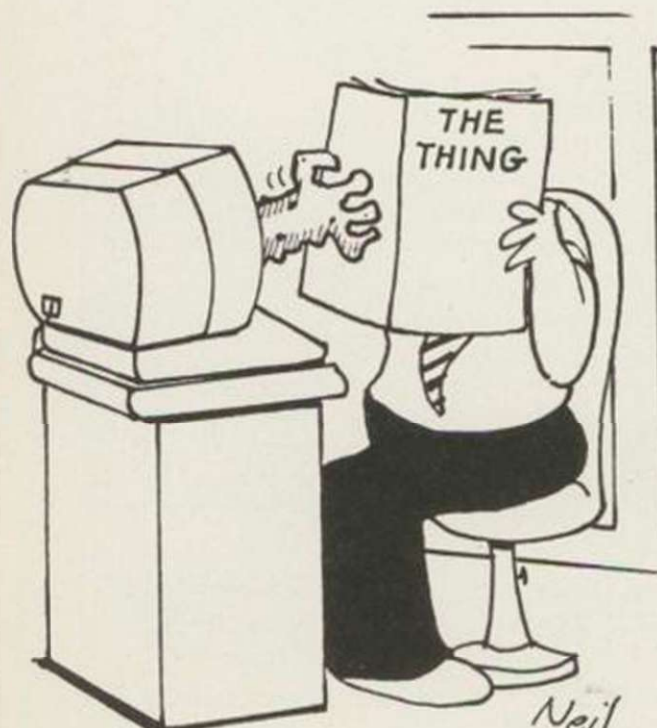
The first two titles have complete solutions built into the program, which you can call up a section at a time by typing HELP. Recommended at £4.95, mail order only, from Tartan Software, 61 Bailie Norrie Crescent, Montrose, Angus, Scotland DD10 9DT.

Another excellent introduction, I feel, is the Level 9 *Red Moon*, which is available for most machines. It allows you to explore many locations without necessarily having to solve problems or suddenly finding yourself killed for no apparent reason.

Emerald Isle, from the same company, was issued specifically because Level 9

Never forget that everyone has to start somewhere and it is important to go back to basics from time to time. Those who have been adventuring for a time and are keen to know more about the latest state-of-the-art game will be well catered for in the next few issues. With the Infocom 256K of *Bureaucracy* soon to be inflicted on us, followed closely by *Guild of Thieves* from Magnetic Scrolls and the Level 9 *Knight Orc*, there is certainly plenty of excitement in the offing.

I have received several letters from readers complaining that they have sent £1 to Rainbird for hint sheets on *Jewels of Darkness* and *Silicon Dreams*, as requested in the packaging, and have then heard no more about it despite follow-up letters, including SAEs. I have now written twice to Rainbird asking about the delay and have had no reply. Someone who is always courteous enough to reply is Pete Austin of Level 9 and even he cannot find from Rainbird what is happening with the promised solution sheets. He has asked me to tell anyone waiting for clue sheets on either of the Level 9/Rainbird trilogies that they should just send a 9in. x 6in. stamped addressed envelope direct to Level 9 with the details and proof of purchase if possible, and the Level 9 normal full solution sheet service will fill the gap.



Cut-Price Disks from Direct Disk Supplies

from only £9.99 for 25 disks delivered to your door

Offer 1 New Premium Universals

Not only are all our universal disks individually certified to 96tpi but they are now prepared to an even higher specification to ensure fewer problems, high reliability and value for money. Plus, of course, our Lifetime Warranty. Disks are packed in 25s complete with envelopes, labels and write protect tabs.

£ 14.99	25 disks	★ Full spec Higrade disks, made to 75% clipping level
£ 26.99	50 disks	★ Life-time no quibble warranty
£ 49.99	100 disks	★ Hub-rings on 5.25" disks
£ 96.99	200 disks	★ Label sets and envelopes included
£119.99	250 disks	★ No extras - VAT and delivery included
£219.99	500 disks	
£379.99	1000 disks	



Bargain Box.

Have no doubts - these prices are the business.

Price per order (SSDD 48 or 96tpi please specify)	Approx price per disk ex-VAT (inclor only)
20 disks	£ 10.99
40 disks	£ 19.99
60 disks	£ 28.99
80 disks	£ 36.99
100 disks	£ 42.99
200 disks	£ 82.99
500 disks	£199.99
1000 disks	£389.99

DDS do it again.

DDS offer you branded SCOTCH (made by 3M) at prices below other people's plain label disks. They're certified & tested error free by 3M; branded disks in tyvek envelopes with re-inforced hubs, labels & WP tabs are also included. We only have a limited stock, and so it's first come, first served. A saving not to be missed!

Offer 3 MEDIA 3.5" LIFE

Don't settle for less-get the best disks in FREE plastic library boxes.

Quantity	SS (includes plastic library box)	DS
10 disks	14.99	16.99
20 disks	28.99	33.49
50 disks	69.99	79.99
100 disks	129.99	149.99
200 disks	249.99	289.99
250 disks	299.99	359.99
500 disks	589.99	699.99

Made in Japan by a leading manufacturer, our single and double sided disks are fully tested and certified to 135tpi.

Don't forget - the price includes VAT, delivery and library boxes!

N.B. If you don't need boxes on quantities of 100 or more, then phone and ask for our special trader prices for BULK disks.

Offer 2

New from DDS

Total Price (No extras!)

£ 9.99	25 disks
£ 19.48	50 disks
£ 37.99	100 disks
£ 74.99	200 disks
£ 93.99	250 disks
£185.99	500 disks
£299.99	1000 disks

Don't forget - No extras

Super Savers on Single Sided

It'll twist your tongue, but not your pocket!

Cash 'n Carry prices on disks from Direct Disk Supplies

Offer 4 'Rainbows'

25 Universal 96 tpi coloured disks, 5 disks of each of five different colours.

Code your files and programs using DDS 'Rainbows'. Without doubt the best quality and value coloured disk on the market.

£ 18.99	25 disks
£ 35.99	50 disks
£ 69.99	100 disks
£129.99	200 disks
£149.99	250 disks
£279.99	500 disks

How to order

ALL PRICES INCLUDE VAT & DELIVERY TO YOUR DOOR! NO HIDDEN EXTRAS

1. DIAL-A-DISK ON 01.979 7811, and give your ACCESS or VISA number and expiry date.
2. Send your cheque etc. to Direct Disk Supplies Ltd.
3. Official Orders, Bona-fide orders from Universities, Colleges, Schools, Charities, etc are very welcome.
4. Cash orders, no minimum value. Account orders, minimum value £30.



Direct Disk Supplies Ltd.

FREEPOST, 129 High Street, Hampton Hill, Middlesex TW12 1BR

DIAL-A-DISK 01-979 7811

WARGAMES DIRECT

452 STONEY STANTON ROAD, COVENTRY, CV6 5DG, ENGLAND
Telephone: 0203 667556

AMSTRAD	Cass.	Disk.	SPECTRUM 48/128K	Title	Price
Annals of Rome	£12.95	£17.95	ALL SPECTRUM WARGAMES ON CASSETTE ONLY		
Arnhem	£9.95	N.A.	Air Defense	£5.95	
Battle for Midway	£9.95	£14.95	Annals of Rome	£12.95	
Battlefield Germany	£12.95	£17.95	Arnhem	£9.95	
Battle of Britain	£9.95	£14.95	Austerlitz	£9.95	
Conflict 1 (PSS compilation)	£2.95	£7.95	Battle for Midway	£9.95	
Desert Rats	£9.95	£14.95	Battlefield Germany	£12.95	
Johnny Reb	£9.95	N.A.	Battle of Britain	£9.95	
Johnny Reb II	£9.95	£12.95	Bismarck	£9.95	
Kaiser	£9.95	N.A.	Conflicts 1 (PSS compilation)	£2.95	
Legions of Death	£9.95	N.A.	Confrontation	£6.95	
Redcoats	£9.95	N.A.	Desert Rats	£9.95	
Silent Service	£9.95	£14.95	East Front	£5.95	
Theatre Europe	£9.95	£14.95	Falklands '82	£7.95	
The Fourth Protocol	£9.95	£14.95	Insurgency	£5.95	
Tobruk	£9.95	£14.95	Iwo Jima	£7.95	
Waterloo	£9.95	£14.95	Johnny Reb	£6.95	
			Johnny Reb II	£9.95	
Austerlitz	£9.95	£14.95	Legions of Death	£9.95	
			Napoleon at War	£8.95	
ATARI	Cass.	Disk.	N.A.T.O. Alert	£9.95	
Decs in the Desert	£9.95	£14.95	Ovenhuds	£6.95	
Field of Fire	N.A.	£14.95	Pacific War	£5.95	
Knights of the Desert	£9.95	£14.95	Panzer Attack	£9.95	
Silent Service	£9.95	£14.95	Redcoats	£9.95	
Theatre Europe	£9.95	£14.95	Silent Service	£9.95	
Tigres in the Snow	N.A.	£14.95	Swords of Bane	£7.95	
Vietnam	N.A.	£14.95	Theatre Europe	£9.95	
			The Bulge	£9.95	
COMMODORE 64/128	Cass.	Disk.	The Fourth Protocol	£9.95	
Annals of Rome	£12.95	£17.95	Their Finest Hour	£9.95	
Battle for Midway	£9.95	£14.95	Tobruk	£9.95	
Battle of Britain	£9.95	£14.95	Vulcan	£9.95	
Bismarck	£9.95	£17.95	War 70	£5.95	
Conflicts 1 (PSS compilation)	£2.95	£7.95	War Zone	£5.95	
Crusade in Europe	£9.95	£14.95	Waterloo	£9.95	
Decs in the Desert	£9.95	£14.95			
Destroyer	£9.95	£14.95	TO ORDER		
Falklands '82	£7.95	N.A.	By Phone: Call 0203 667556		
Field of Fire	£9.99	£14.99	By Credit Card: We will accept Barclaycard, Eurocard, Visa		
Germany 1985	£9.99	£14.99	By Post: Send a cheque or PO, made payable to Wargames Direct.		
Iwo Jima	£7.95	N.A.			
Johnny Reb	£6.95	N.A.	Postage and Packing		
Johnny Reb II	£9.95	£12.95	Within the UK or Europe, please add 70p for 1 item, £1.00 for 2 items, 3 or more items post free.		
Knights of the Desert	£9.95	£14.95			
Legions of Death	£9.95	N.A.			
Norway 1985	N.A.	£14.95			
Silent Service	£9.95	£14.95			
The Bulge	£9.95	N.A.			
The Fourth Protocol	£9.95	N.A.			
Theatre Europe	£9.95	£14.95			
Tigres in the Snow	N.A.	£14.95			
Tobruk	£9.95	£14.95			
Vietnam	£9.95	£14.95			

For a fully detailed catalogue or any queries TELEPHONE: 0203 667556



1A QUEENS ROAD, NUNEATON, WARCS CV11 6NN
IBM COMPATIBLES FROM £449

AMSTRAD PC 1512 SD + Mono Monitor	£449
AMSTRAD PC 1512 SD + Colour Monitor	£619
AMSTRAD PC 1512 DD + Mono Monitor	£559
AMSTRAD PC 1512 DD + Colour Monitor	£729

HARD DISC VERSION

20 Megabyte PC 1512 H20 + Mono Monitor	£899
20 Megabyte PC 1512 H20 + Colour Monitor	£1069

★ WIDE RANGE OF BUSINESS SOFTWARE AVAILABLE

- ★ TECHNICAL SUPPORT TEAM
- ★ HIGHLY COMPETITIVE PRICES
- ★ AFTER SALES SUPPORT SERVICE
- ★ REPAIR SERVICE ON AMSTRAD PRODUCTS

£100 WORTH OF SOFTWARE OF YOUR CHOICE WITH EVERY AMSTRAD PURCHASE

CREDIT CARD HOT-LINE



0203-382049

All prices exclude VAT
Export Enquiries Welcome

UK Delivery FREE



● Fanfare to rival any brass section.



C R O W N G L O

CINEMAWARE IS THE LATEST GAME CONCEPT FROM MINDSCAPE. THIS FIRST TITLE MIXES ARCADE AND ADVENTURE THEMES IN A WORLD OF STUNNING GRAPHIC DISPLAYS

● An Englishman's home is his castle.

Take yourself back to a time when men were men, and women loved it. A time when heroes reigned supreme, and baddies were hanged, drawn and quartered (and that was if they were very lucky). All this and more can be experienced in the comfort of your own living room, providing that is you have a Commodore Amiga and a copy of *Defender of the Crown*, by Mindscape (distributed in this country by Mirrorsoft).

Defender of the Crown is the first in a series of Mindscape games to be released under a sub-label called Cinemaware which, as its name suggests, is intended to be a new generation of games more similar to

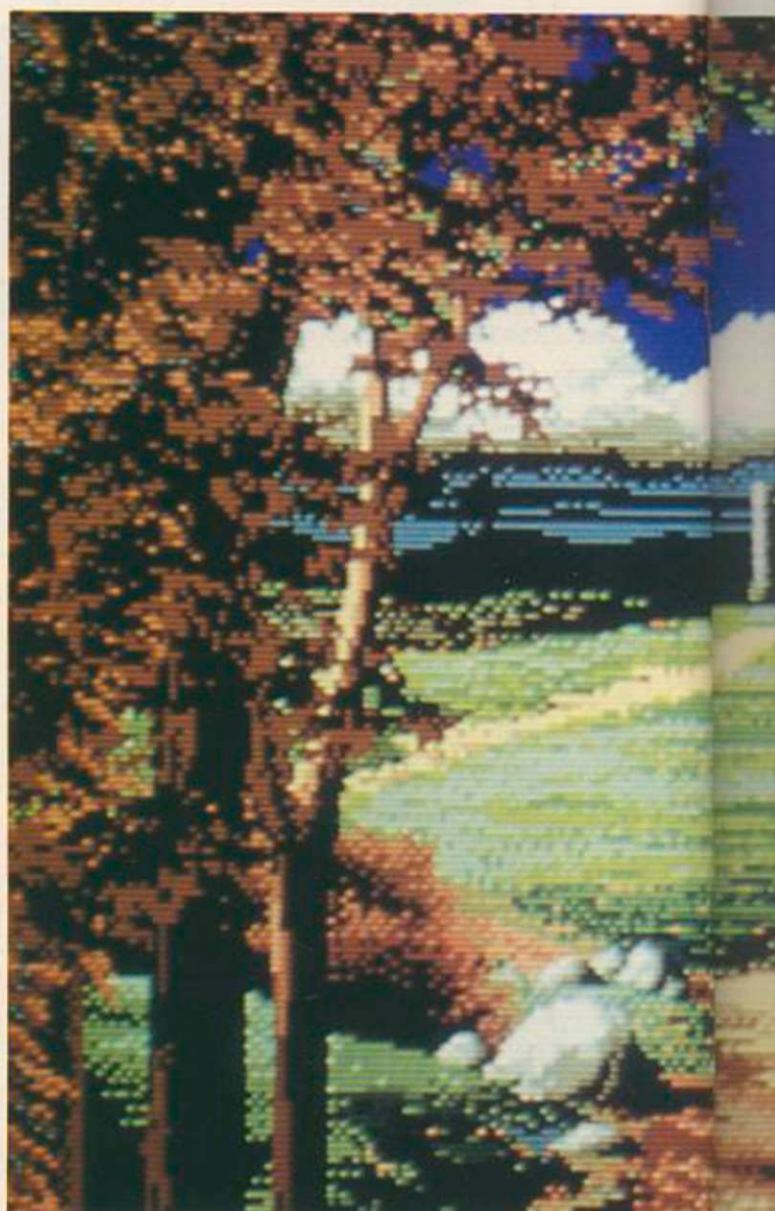
interactive movies than *Space Invaders*. To make sure the game created a real stir, Mindscape spared no expense in its development, hiring two of the most outstanding Amiga programmers around, R. J. Mical and James Sachs. To put things into perspective, Mical was hired to take over the graphics side of the program, something he ought to be good at, considering he was responsible for designing and programming the Amiga graphics chip.

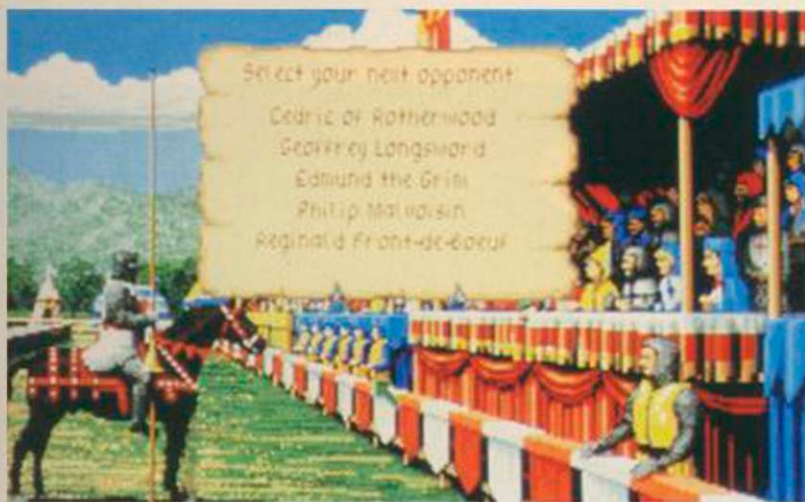
Like most recently released games, it requires you to have version 1.2 of Kickstart, and twin disk drives unless you want to be continually interrupted by disk change requests. Almost immediately upon loading it becomes clear that *Defender of the Crown* is

something very special indeed. The game starts with an orchestral fanfare, and continues to tell the storyline of the game. You take on the role of a good Saxon who must gain as much land as possible while defending your castle from restless Normans.

To help you in your goal you can call upon Robin of Sherwood to aid your troops in times of dire need. But be warned, you can only use Robin three times, after which he will politely tell you to "Go away!!!!".

As with most Amiga games, *Defender of the Crown* is





● Making your choice of opposition and weapons.

for fame or, more profitably, for land. As with the game in general, the graphics in this section are stunning, with charging horses, waving maidens and animated exchanges.

If you win all three of your jousting matches, you can accumulate a large amount of land, which in turn soon starts bringing in enough revenue to hire more soldiers, and buy more castles and equipment.

If you are the daring type you can always instigate a sortie on one of your

Once you are past the first group you must penetrate the inner section of the castle, and here your swordmanship is really put to the test. Again, the graphics are of an incredibly high standard, with flickering torches illuminating your passage and reflecting off your blade as you fight.

Red-blooded males are also catered for in *Defender of the Crown* with a fair maiden who must be rescued from the devilish grasp of some Normans. If you are successful in your rescue, the gentle lady falls head over heels in love, and devotes herself to you for eternity.

For sheer quality of animation, the castle-raiding section is unbeatable. Using glorified catapults to hurl huge rocks at the enemies castle, you must successfully create a hole big enough for your men to charge in and wreak destruction on all the inhabitants.

Overall, *Defender of the Crown* is a spectacular game. The graphics are incredible, and unsurpassed by any other game yet released. In technical terms too, the game is remarkable. Very few programs of any kind have taken advantage of the multi-tasking abilities of the Amiga, but *Defender of the Crown* really does, with screens loading at the same time as you are playing a game, and screens switching in and out almost instantaneously.

One criticism that can be levelled is the lack of gameplay. Sometimes there is almost no player participation for minutes on end, and this does become slightly tedious. Nor is it cheap, at around £40. However, Amiga fans who want the finest games for what can only be described as the finest machine will find it hard to avoid buying this classic.



N I N G R Y



played completely using the mouse, although there are times where this becomes annoying. Generally it is preferable to deplorable microswitch joysticks.

In play, *Defender* has five 'games within a game', and it is this which makes the game so long-lasting. The first action

that confronts the unwary player is a tournament. These are held all over England, and are essential to any plans of empire building.

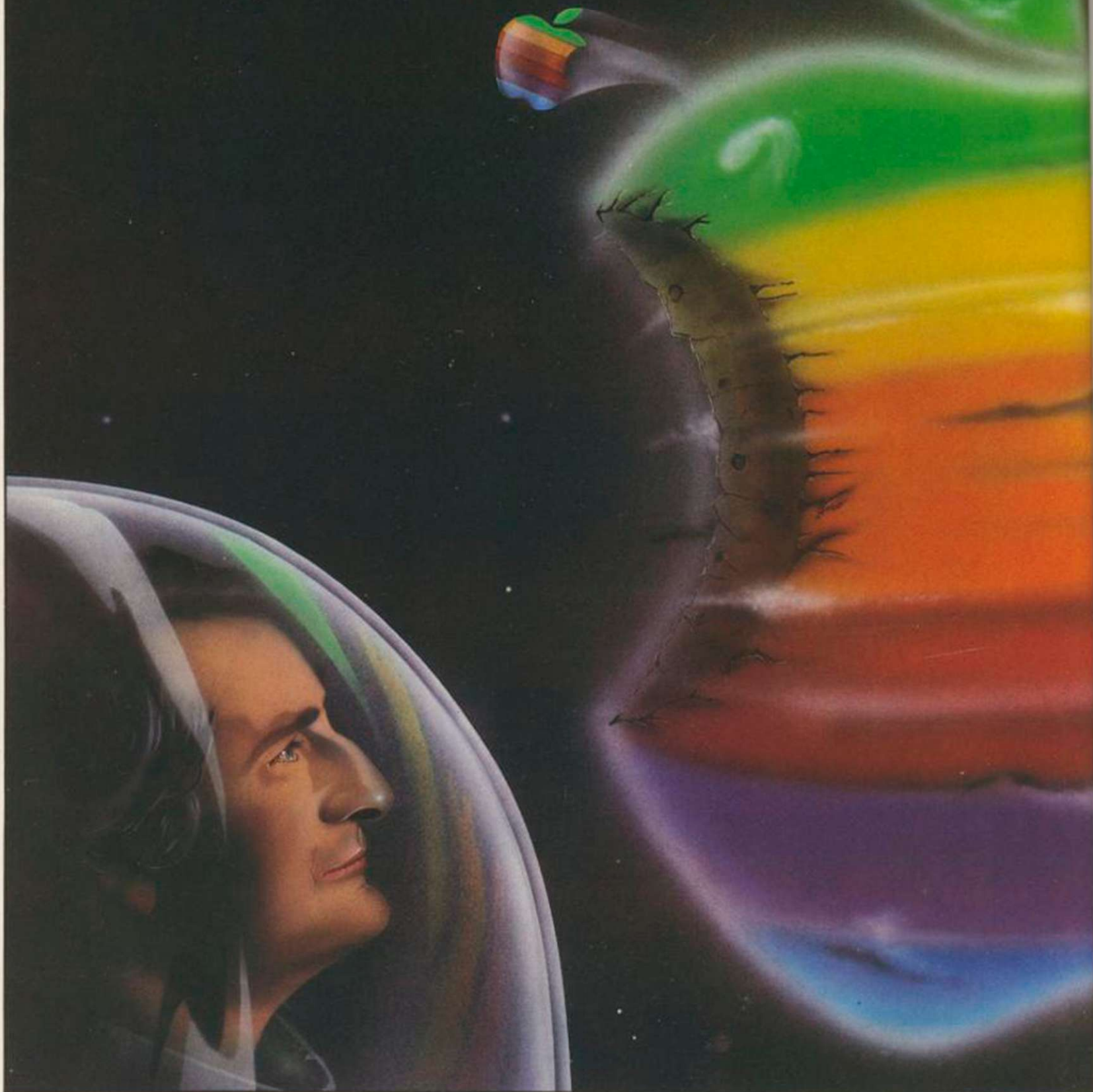
All a tournament really consists of is a series of jousting contests against various opposition. Each individual joust can be either

opponent's castles which, if successful, will earn you a fortune in gold. Anyone familiar with Errol Flynn as Robin Hood will immediately feel at home on these raids, as you and your merry men use all your skill and determination to battle past some resilient baddies.

l you
ps in
hich
"Go
nes,

ADAMS' APPLES

Author of books, software, radio and TV comedy, Douglas Adams has firm ideas about the best personal computer for writing.



"BEING A PERFECTIONIST IN A WORLD WITH DEADLINES MEANS THAT A LOT OF YOUR OUTPUT IS OVER-WRITTEN AT THE EXPENSE OF THE REST"



Douglas Adams' latest book features a character who owns no less than six Apple Macintosh computers. When rumours reached us that this was the same number owned by Adams himself, we decided to investigate further. How can anyone make use of six identical machines?

"Actually, I have only five at the moment, but I see your point. I keep four here and one in New York. One is for my secretary, one for my girlfriend, and I need two on my desk. I'm working on the sixth; it's going to be a Mac II when I can get hold of one. I need two machines on my desk mainly because of number of times I find myself doing two things simultaneously.

"Most of the different types of music-making software are incompatible with each other; they each have different editing capabilities and structures – and the best way to get music from one sequencer package to another is to play it over the MIDI, which is laborious. There's no equivalent in music to the straight ASCII text file which enables you to port documents between different word processors, and until there is one you are really going to need two computers for music applications. But I would probably still need them anyway: as well as the sequencer programs there are patch editing programs, library programs, sound wave programs for sound sampling, and it's actually beyond the ability of the Switcher to keep them all co-habiting happily at once."

The rows of compact disks adorning one wall of the room would not disgrace a record shop but don't declare any particular bias. What is your musical background?

"I have been something of a musician all my life. I began, oddly enough, in the school choir. One of the advantages of being male is that if you stick at choir

singing for the right years you end up singing all the different parts, from treble to alto to tenor to bass. If you work through a large proportion of Bach, as we did, you can't help but learn from the experience, the harmony and the counterpoint. At the other end of the scale I taught myself the guitar pretty thoroughly. The one thing I was never very good at was keyboard playing, because I never wanted to practise when I started at the age of eleven. I'm extremely left-handed, without much dexterity in my right hand, and I kept getting it wrong. I've always retained the ability to read and write music, but much as I read and write French – slowly, with a dictionary, and being drunk is extremely helpful!"

Have computers made the process easier?

"One of the breakthroughs with music applications for computers is that if you have the ideas and the basic skills, it doesn't matter if you happen to lack the dexterity. You write on the computer, and it does the playing for you. That was a revelation. Computers can relieve you from doing things you can't do very well. I found that I had a certain ability to write music, but that the mechanical nitty-gritty of writing it all down and playing it had prevented me developing what talent I had. The moment I started writing music on the computer screen I started learning very fast. In the past I would write down a rhythm and never be sure if I had got it quite right. The only way of checking was to read over the notes, and naturally in a situation like that you hear what you think you have written rather than what's really there. If you write it on the computer screen you get instant playback; it stops you making silly mistakes. It's a very good illustration of the way computers can help in all kinds of learning, simply because the feedback is instantaneous."

Do you have any plans to unleash your music on the public?

"I'd like to, though I don't know where I'd fit it in. Time is always a problem.

When I was writing *Dirk Gently* I was collecting the synthesizers and music programs. Sometimes I would decide to spend half an hour on them as I was settling down to write, and I'd suddenly find it was midnight. Eventually I had to dismantle it all and put all my synthesizers in the wardrobe. Then I wrote the book, and I've only just been putting them back together again. The thing I've had the most difficulty with is the two networks; there's the MIDI network which deals with information and the audio network which never works. There are always a variety of crackles and hums on the audio side which irritate me greatly. I prefer the computer side."

You started writing *Hitch-Hiker* in 1976 – before word-processing on a microcomputer had become possible. When did you first become interested in the idea of using a computer for writing?

"When I started writing *Hitch-Hiker* I was taking the mickey out of technology, writing a kind of anti-science fiction. I spent so much time writing and re-writing that I would frequently get to a stage where the first ten per cent of the script was absolutely perfect but there was only ten per cent of the allotted time left over to do the rest."

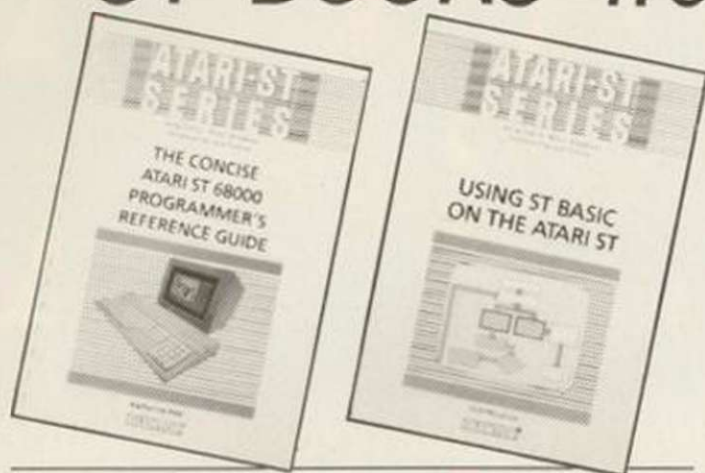
Is that the price of being a perfectionist?

"Being a perfectionist in a world with deadlines means in the end that a lot of your output is if anything over-written at the expense of the rest. You quickly encounter a law of diminishing returns, with a huge amount of time making a tiny difference to the good parts, and then the need to meet a deadline forces you to leave some passages a great deal less than perfect. The balance is never exactly right.

"In theory using the computer should save me a lot of time. I would frequently retype a whole page just to make a minor change to a speech. Somehow, though, the work still expands to fill slightly more time than I have available."

ST BOOKS from

GLENTOP



THE CONCISE ATARI ST 68000 PROGRAMMER'S REFERENCE GUIDE

Katherine Peel

This book is a complete reference manual for the ST computers. It is designed to be used both as a quick reference manual and as a source of detailed technical material. Topics include machine-code programming, details of GEM, and the operating system. Much of the material included is unlikely to be available from any other source, making the book an essential reference manual for every Atari ST owner.

Price £15.95 ISBN 1 85181 017 X

USING ST BASIC ON THE ATARI ST

Dick Meadows

This book explains Atari ST BASIC to both the newcomer to programming and to the programmer unfamiliar with ST BASIC. It covers many features of ST BASIC, including ideas and methods for programming, beginning to write programs, the input and output of information, making decisions, repetition, special functions, processing strings of text, and using arrays, procedures and user defined functions. The book contains many worked examples.

Price £7.95 ISBN 1 85181 051 X

Other titles in the series

Using LOGO on the Atari ST
Practical LOGO on the Atari ST
Practical BASIC on the Atari ST

All titles available from your local dealer or bookshop. However, in case of difficulties they can be obtained direct from Glentop—postage & packing £1 (UK) £2.50 (Overseas).

The Glentop Press Ltd
Standfast House
Bath Place
High Street Barnet
Herts EN5 5XE

Tel: 01 441 4130



MAKE YOUR INTERESTS PAY!!

Train at home for one of these Career Opportunities

More than 8 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 90 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert 'personal' tutors. Find out how we can help YOU. Post or phone today for your **FREE INFORMATION PACK** on the course of your choice.

Introduction to Computer Programming	Programming in BASIC
Programming in COBOL	Electronics
Electrical Engineering	Electronic Engineering
Elec. Contracting/Installation	Radio, Audio and TV Servicing
GCE over 40 'O' & 'A' level subjects	

Course of Interest

Name

Address

P. Code



International Correspondence Schools, Dept. ET557
312/314 High St., Sutton, Surrey SM1 1PR.
Tel: 01-643 9568 or 041-221 2926 (24 hours)

YC 5/87

ATARI COMPUTERS



All All ST computers come with mouse and software. Atari 1040STF without monitor £542 (E529) £569. Atari 1040STF with b/w monitor £637 (E638) £728. New Atari 520STFM with built in disc drive (512K ram) £363 (E360) £400. Atari 520STFM+ (1000K ram) £452 (E445) £485. Atari 520STFM with b/w monitor £458 (E470) £560. Atari 520STM £263 (E265) £304. Atari 520STM+ (1000K ram) £352 (E348) £397. Cumana 1000K disc drives for the 520STM:—single £147 (E147) £163, dual £242 (E236) £280. Atari 520K ST disc drives £119 (E129) £135. Atari 1000K ST disc drives £183 (E182) £198. Atari ST monochrome monitor £137 (E147) £195. Atari 12" medium resolution ST colour monitor £368 (E362) £413. 20 Megabyte ST hard disc (Now available from stock) £636 (E613) £673. Centronics printer cable for the ST range £16 (E16) £20. We offer good discounts on most ST software for example:—Hisoft DEVPAK £42 (E42) £46. Metacombo Lattice C £81 (E81) £85. Computer Concepts Fast Basic £79 (E76) £80. LDW Basic ST, new basic compiler £99 (E88) £92. VIP Professional, Lotus 1-2-3 Clone for ST £159 (E139) £143. Pro Fortran 77 £121 (E108) £112. Pro Pascal £121 (E108) £112. Atari 130 XE computer + game £95 (E99) £120. Atari 130XE + disc drive + 1029 printer + software £313 (E315) £373. Atari cassette recorder £34 (E38) £48. Atari 1020 4 colour printer £93 (E94) £114. Atari 1029 dot matrix printer £118 (E124) £151. Atari 1050 disk drive with DOS 3 £118 (E124) £151.

SINCLAIR PRODUCTS AND CAMBRIDGE COMPUTERS

Spectrum 128K Plus Two computer:—without joystick and software pack £148 (E150) £180, with joystick and software pack £158 (E162) £194. Blank microdrive cartridges for the QL and the Spectrum £2.50 (E3) £4. QL floppy disc interface (See Cumana disc section for suitable drives) £86 (E84) £94. Spectrum floppy disc interface (See Cumana section for suitable disc drives) £76 (E76) £86. Spectrum centronics printer interface and cable £46 (E42) £47. Cambridge computers Z88 £297 (E271) £299. Mains adaptor £15 (E17) £22. 128K ram cartridge £65 (E57) £62.

COMMODORE COMPUTERS

Commodore Amiga A500 Computer £533 (E524) £574. Modular £25 (E35) £25. Amiga A500 with 1080 colour monitor £848 (E839) £846. Commodore 128 computer + software + joystick £223 (E223) £265. Commodore 128D £518 (E499) £539. 1571 Disc drive £278 (E269) £285. Commodore 64C computer £185 (E185) £210. Commodore 64C computer with mouse, cassette recorder and software £239 (E242) £272. Converter to allow the use of most ordinary mono cassette recorders with the Commodore 128 and Commodore 64 £9.78 (E9) £11. Commodore MPS1000 printer £269 (E262) £296. 1541C disk drive £194 (E192) £208.

AMSTRAD PRODUCTS

We can supply a wide range of software for the 1512, the PCW8256 and the PCW8512—write for a quote. New Amstrad 1512 IBM Personal Computer Clones:—1512 computer with single disk drive and b/w monitor £499 (E499) £606, dual disk b/w £619 (E614) £621, single colour £669 (E655) £762, dual colour £771 (E745) £852. 10MB hard disc b/w £863 (E830) £970. 20MB HD b/w £951 (E907) £1047. 10MB HD colour £1014 (E961) £1101. 20MB HD colour £1102 (E1038) £1178. DMP3000 printer £190 (E193) £226. FD3 £166 (E173) £204. HD10 £467 (E430) £490. HD20 £575 (E540) £600. Amstrad CPC464 computers:—colour £291 (E320) £404, green £197 (E235) £316. Amstrad 6128 colour £391 (E420) £500. Amstrad PCW8256 £440 (E464) £571. Amstrad PCW8512 £554 (E577) £684. Amstrad DMP2000 printer £166 (E171) £204. Extra disc drive for Amstrad 6128 £99 (E105) £136. Amstrad DD1 Disc Drive £155 (E156) £186. Amstrad joystick £11 (E12) £16.

CUMANA 3.5" AND 5.25" CASSED DISC DRIVES WITH CABLE AND POWER SUPPLY

40-80 track switchable double sided, to suit floppy disc interfaces of the Sinclair QL, Sinclair Spectrum and BBC B. 3.5" drives:—single £134 (E134) £156, dual £224 (E219) £251. 5.25" drives:—single £172 (E169) £199, dual £310 (E306) £347.

PRINTERS

Epson LX86:—without tractor £276 (E275) £309, with tractor £300 (E298) £342. Star NL10 £235 (E234) £270. Interfaces for NL10 £37 (E35) £37. Brother M1109 £220 (E224) £285. Shimwa CTI CPA80+ £208 (E210) £247. Cannon PW1080A £303 (E298) £338. Microperipherals MP165 £219 (E223) £265.

SWANLEY ELECTRONICS

The Computer Export Specialists
Dept. YC, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England
Tel: SWANLEY (0322) 64851

Official orders welcome. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured airmail postage. The third price is for export customers outside Europe (including Australia etc) and includes insured airmail postage.

Experience on Your Computer shows that in some cases word-processing software can make it too easy to make changes. The temptation is always to make just one more slight revision, often at the expense of much-needed time. Do you find it harder to reach the stage where you can regard your work as finished?

"Immensely. A very interesting thing occurred in the last stages of *Dirk Gently*. I was doing the typesetting on the Mac, largely to buy myself extra time past the deadline, and I suddenly realised that for some reason I'm allergic to hyphenation. I caught myself rewriting a line in order to make it look better on the page, which is mildly ridiculous.

"Incidentally, since I did that exercise I've found it almost impossible to read a book for pleasure. The sense of it hasn't been going in because I've been concentrating on its appearance."

Is *Dirk Gently* the first project that you have word-processed from start to finish?

"I think I first used a word processor in late 1982. I spent several months in Los Angeles – which I hated – and while I was there I acquired a DEC Rainbow. I didn't really know anything about it at the time, but the great thing about it was supposed to be that you could run eight-bit CP/M and sixteen-bit MS-DOS software. Unfortunately hardly anyone wrote anything for it, which made the whole exercise rather pointless. Anyway, I cut my teeth on that machine, with various versions of Wordstar. But the only really good programs I could find for the Rainbow were the Infocom games. Whenever a new machine comes out they're among the first with the software. I hadn't the faintest interest in games at that stage – I thought they were all about shooting little aliens and chasing them round mazes. The first Infocom adventure I played was *Suspended*, and it was a revelation. I was startled by it – here was something that was witty, intelligent and literate. I enjoyed it very much. A mutual friend put me in touch with the people at Infocom and I spent a day with them; we got on extremely well and I ended up doing the *Hitch-Hiker* game for them.

"I replaced the Rainbow with an Apricot XI. I still wasn't really happy with that. I knew I was getting hooked on computers but I still hadn't got the right machine. Then one day when I was at Infocom they showed me a funny-looking machine which turned out to be the Macintosh. In the first few seconds I fell in love with it. I started playing with *Macpaint* and I felt instantly at home with it. I bought one as soon as I could: in fact, I think mine was the first ever Macintosh in this country. Thinking back now about how feeble the original 128K machine

"I HADN'T THE FAINTEST INTEREST IN GAMES – I THOUGHT THEY WERE ALL ABOUT SHOOTING LITTLE ALIENS"



was, it all seems rather naive, but I fell in love with the potential of the Macintosh concept as much as with its actual capability at that time."

What software do you write with?

"*MacAuthor*. It's a British program, very powerful. One of the many nice things about it is the attitude of the authors, Icon Technology. They are incredibly responsive to user feedback. They update versions fairly regularly and they constantly add features which people have asked for. Mike Glover, who runs the company, came over to help me with the typesetting, to see how the program actually worked for professional writers, and to see if I had any complaints. They are about to do a major revision; in fact they're starting from scratch with completely new code.

"Of all the word processors available for the Mac it's the only one with which you can write and typeset a novel, including the new Microsoft *Word 3*. *Word 3* is a very powerful and infinitely configurable, and so is *MacAuthor*, but the difference is just three lines of code which give you something called smart quotes. The kind of output you get on a typewriter and most computers up to now isn't typeset quality because computers use generic quotation marks – the same vertical mark at either end of the quotation. Entering proper opening and closing quotation marks is extremely difficult and error-prone on the Mac, even if you can remember to do it. But with smart quotes, *MacAuthor* automatically determines whether you want an opening or a closing mark and acts accordingly."

Computers are certainly prominent in *Dirk Gently* but they are not crucial to the plot. Given your interest have you ever been tempted to make them a central theme?

"I wouldn't want to make something primarily about computers, because the technology changes so fast that whatever you write will be very rapidly out of date. I'm more interested in the things you can do with computers than

with computers themselves. In fact I'm just about to start work on a new book, which I've got to get done by the end of this year, and it's come out of a rather neat little idea I've had about the way you use word processing programs. I think the reason the Mac has started to feature in the book is that I spend eight to ten hours a day sitting in front of it."

But there is a lot of computer-related material in *Dirk Gently*...

"I tried to put in something which not everyone would understand, but keep it to a minimum. Anyone who does understand it is going to be pleased, but on the other hand anyone to whom it isn't immediately familiar will be able to understand it from context. They won't be turned off by the idea that something is being directed past them. It's detail which you may as well get right. It's like horse-racing and Dick Francis – I love Dick Francis but I've never been near a horse in my life. I always find that I've learned something about horses by the end of one of his books, and I am sure that is a key reason for his success."

There are one or two places in *Dirk Gently* where you sound rather cynical about the way computers are used by the military.

"The whole thing about military high technology and Star Wars is that anyone at all involved in computers knows that it can't be relied upon to work. Software always needs nursing along and tweaking up, and the idea of a sudden emergency coming about and all this untested software coming into operation is ridiculous."

You seem to have a talent for spotting the absurdity of many mundane things...

"The contrast between the ordinary and the extraordinary fascinates me. I particularly enjoyed writing *Dirk Gently*, but it is no secret that I was unhappy about the last of the Hitch-Hiker books, *So long and thanks for all the fish*. I'd run out of steam on Hitch-Hiker because I tend to work best where the mundane and the bizarre meet and towards the end

of Hitch-Hiker there was nothing ordinary left. I was aware of this and trying to bring it all back to Earth, but Arthur Dent, whose original role was to be the ordinary guy, was now the stranger, and he was no longer our representative. The whole thing got cock-eyed."

Tell us something about your latest Infocom adventure, *Bureaucracy*.

"It involves you in increasingly horrendous adventures, great disasters, catastrophes, and you end up lost in the jungle being pursued by natives. Your basic objective is to get your bank to acknowledge a change-of-address card, and everything flows from that.

"When I started work on the game with Infocom it became a much more collaborative thing than Hitch-Hiker, because everybody had bits they wanted to put in. Generally the response I've had is 'Yes, this has happened to me!' The sensation of having someone recreate these horrors for you makes people share them — a kind of catharsis in a computer game.

"At Infocom they have long wanted me to do a second Hitch-Hiker game but I think I'd much rather base my next adventure game on my experiences of trying to get a movie made of Hitch-Hiker in Hollywood. That was a bizarre experience. The role you would play would be Shakespeare transplanted to Hollywood and trying to get *Hamlet* made as a film."

What are the differences between writing an adventure and writing a novel?

"It's a totally different way of thinking. When I was first told about adventure games I didn't really like the idea. The writer seemed to be abdicating responsibility for the plot; if the player was making it up as he went along, the player might as well sit down and write it himself. But in all kinds of ways you the writer have an extra level of control. If you write a book you assume that after a while the reader is on your wavelength, and has picked up what you want him to pick up so you can spring the surprises you want to spring. With a game you know exactly what the player will be thinking or expecting; they can't have got there accidentally. So you can play cat and mouse with the player a great deal more than you can with a reader.

"It's rather like being a practised stand-up comic; you go out in front of an audience and you know the things they're going to try to throw back at you. You always have your response ready and it can sound completely spontaneous even though it isn't.

"When you begin to know how an audience will respond you can begin to tempt them in certain directions, because you're ready for their reaction. It looks as if the performer isn't in control

but in fact he is because he is leading the audience to do certain things. You're doing the same thing in writing a computer game."

There's a science-fiction novel, *Dream Park*, in which people go on holiday in theme parks run by the people who now write adventure programs. The players take part in superbly realistic games, complete with simulated animals, nasty weather, black magic and other traditional adventure themes. If the technology becomes available do you think that would be the logical progression?

"It's a good idea. If people could go on simulated holidays it would avoid a lot of environmental damage. A lot of holiday resorts have had to be altered to expectations of the people who go there. It would be much better if the people who wanted that kind of holiday had their holidays simulated for them and the places could be left as they were. If people are going to have a holiday in a synthetic resort it may as well be simulated without damaging the original."

About the Hitch-Hiker game...

"I had to do it myself because if I hadn't been involved it wouldn't really have been a Hitch-Hiker game. A lot of people want me to do a comic book but again I'm not interested and if anyone else did it it wouldn't be the real thing. It was only after seeing the Infocom games that I thought that this was something that would be quite fun to do. Coincidentally the Infocom people has been talking about finding some-one to work with who was from a writing background rather than a computing background, and they'd held back because they weren't sure about finding a writer who'd understand the logical structures involved. They hadn't thought of anyone in particular but I was on their list. We spent a day chatting about it and we just got on like a house on fire."

Did you find your lack of computer knowledge a drawback?

"So much nonsense has been talked about the need to be computer-literate. It's the computers that need to be people-literate. There's a great friend of mine who works in Los Angeles, and as I got to know about computers I discovered that this friend was rather more involved than I'd thought. His name is Alan Kay — he invented the whole WIMP idea at Xerox PARC."

Was he one of the people who came up with the idea of the Dynabook?

"The Dynabook was his concept, yes. When I became involved with the Mac I suddenly realised how significant he was, which sent quite a shiver up my spine. He has a very nice analogy for how computers will eventually integrate into

everyday life so that they become practically unnoticeable.

"He says he saw a picture many decades ago of when the electric motor was the big new thing which was going to revolutionise our lives. People were rushing around like headless chickens saying that you would be doomed, unemployable, a social outcast unless you were electric-motor-literate. He saw a picture of the home of the future of that time. The artist had drawn it with just one enormous electric motor in the attic. It was running everything in the house off belt drives, the way the Victorian engineers powered their factories with a single stream engine. That, he says, is our current understanding of computers. Eventually computers will disappear into the things we use."

Does this mean that computer magazines will become redundant?

"I doubt it. The activity of computing is always going to be a great deal more interesting than the computers themselves. Right now, though, computers are very interesting. The great thing about the Mac is that conceptually it's the least out-of-date computer on the market. While we need more power and flexibility on computers to get them to where they ought to be, it is interesting simply to look at them to see what's wrong with them. You can see what you ought to be able to do with one of these wonderful machines, but you can't quite get there. When each new model comes out everyone wonders if this is finally the machine that will let them do everything they want, so that they can stop worrying about computers and just get on with life.

"Right now, watching the computer industry is like watching the fridge industry in the thirties. People would rush around at parties talking about the fridge they had just bought. There were fridge magazines too, the equivalent of *Your Computer* now, but soon there came a point where the hardware reached a satisfactory state of development so people instantly lost interest. Everyone has a fridge now, and they have revolutionised the way we cook and eat, but you don't feel any urge to talk about the new models.

"That's what I mean when I say computers will eventually disappear. They will still be there, of course, but when they are good enough they will be taken for granted and no-one will pay them any attention.

"An interesting application of the disappearing computer is the colour television. They're so easy to use and so rarely go wrong that you forget that fifteen years ago that it was a pretty laborious task to get a decent picture. Now you just push a button and it works first time. It isn't black magic — it's because of the computer in there."

MACHINE LEARNING

CREATING THE
THINKING
MACHINE
IS THE AIM OF
PROGRAMMERS
WORKING IN
ARTIFICIAL
INTELLIGENCE.
MARCUS JEFFREY
EXPLAINS

Artificial Intelligence is a rather widespread subject with boundaries which tend to be difficult to define. Despite this, there are a few areas which are undoubtedly still within the realms of the thinking machine. One such is that of Machine Learning, which we are going to take a brief look at in this article.

If you were to ask people to define the term Artificial Intelligence, you would almost certainly get a different answer from each person you spoke to. Originally, Artificial Intelligence was defined as any machine action which, if performed by a human, would be said to require intelligence. Unfortunately, this definition was never particularly satisfactory. For example, at the turn of the century, simple mathematics would have been said to require intelligence, however, computers and even hand-held calculators can easily perform these operations, and they certainly do not fall into the categories of artificial intelligence as it is known today.

I could go on, citing examples of spreadsheets, accounts packages, simulators, chess, computer vision, and so on. Only the last few of these would be considered to

fall into the field of artificial intelligence, and even these may have a limited life. For instance, if a new technique were developed which allowed the computer to play a perfect game of chess based on a few simple algorithms, then suddenly the game would lose its status and would no longer be considered as an artificial intelligence problem.

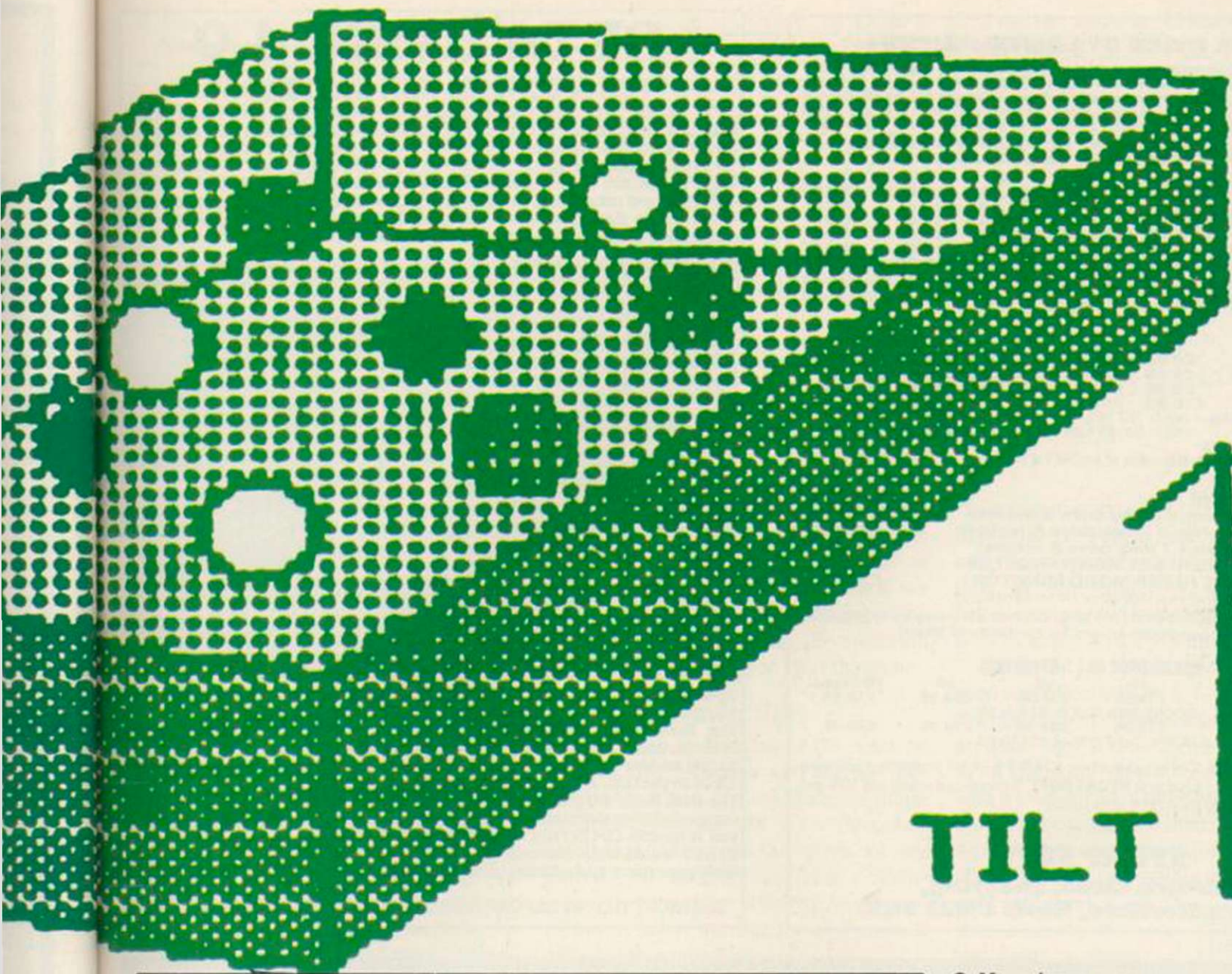
One of the areas which few people would deny lies solely within the bounds of artificial intelligence is that of machine learning. Humans develop and learn from experience, and teaching a computer to use this process must surely embody the concept of the 'thinking' machine. This is, to some extent, emulating the laboratory rat experiments, where tests of intelligence and behaviour were performed by sending mice through mazes. Would they learn from their earlier mistakes, to find the correct way through the maze? Or is it

true, as *The Hitch Hiker's Guide to the Galaxy* surmised, that the mice are actually studying us?!

There are a number of approaches to machine learning. One of the easiest to understand is that of trial and error. Imagine yourself in a completely alien society. You walk up to a man in the street and say "Hello", only to find yourself flat on your back, having been punched in the face! Not a very pleasant fellow, was he? Unfortunately, exactly the same procedure is repeated with two other men, who you approach in the same manner. By now, you are probably very sore, have a couple of black eyes, and will be very reluctant to repeat the procedure. You have just gone through a process of learning by trial and error.

Continuing the learning process, you might try approaching women rather than men, or you may try something other than the word "Hello", which may be taboo in such a strange society. Thus, the learning process would continue. If for instance, after your first three abortive attempts at communication, you continued to repeat the process, and the next eight men you spoke to were very amenable, then you may change your original hypothesis, cal-





TILT

MIDDLE **SIDE** **CORNER**

● There are only three possible opening moves in the game of noughts and crosses.

● Menacing moves teach a computer to play.

are plenty of programs around which can play this game perfectly, but the point of this exercise was to let the machine start by playing random moves and learn from experience how to play the game better. The model was constructed by assigning a different matchbox to every board position. These matchboxes had variously coloured beads in them and a V-shaped slot cut in the front, such that when the matchbox was tilted forward, one of the beads was selected by chance, by being the first to roll through the slot. This arrangement is shown in Figure One.

When it was time for Menace to make a move, the matchbox corresponding to the present position would be shaken then tilted to select a coloured bead at random. There were nine colours, one for each square, and boxes only contained beads corresponding to legal moves. In addition, symmetry was used to reduce the number of beads. For instance, the box for the first move (Menace always moved first) contained only three beads, corresponding to the centre, side and corner (Figure Two). As the game progressed, Menace would make random moves, based upon whichever bead happened to roll through the slot. At the end of the game, stimulus is

ling the first three attempts unfortunate coincidences.

This learning process can be conceptualised in the form of a stimulus model. Starting with a list of all possible actions (in this case opening lines), each would have assigned to it a probability of success. When you are first in the alien environment, these probabilities may all be the same, or they might be modified if you decide to try to apply what you know of your own environment. On first meeting somebody, you would try one of the opening lines, either randomly or the one with the highest probability. You would then increase or decrease the probability associated with the action based upon

their response. If they punch you, the probability of a favourable response would decrease. Alternatively, if they turned around, smiled, gave you a meal and a house, and generally heaped riches upon you, then you would almost certainly increase the probability of success for the action which led to this favourable result.

Matchbox

Machine learning of this sort is not entirely restricted to computers. In fact one of the earliest experiments was in the form of a matchbox model, called *Menace* (Matchbox Educable Noughts And Crosses Engine), which was designed to play the game of noughts-and-crosses. Now, there

to the
actu-
es to
est to
error.
alien
street
lat on
n the
is he?
edure
o you
v, you
ple of
ant to
gone
al and
s, you
r than
r than
oo in
arning
ance.
pts at
repeat
n you
n you
s, cal-

BLANK DISCS AT LOWER PRICES

All discs made by a top manufacturer to highest standards, all certified 100% error free. 2 for 1 REPLACEMENT on any faulty disc other than by mis-use. 5 1/4" have reinforced or FUJI style super hub rings. Trackers can be supplied B side notched. Mimics are manufactured for double sided use on single sided drives. All come with write protects, labels, and sleeves.

SPECIAL OFFER - FREE DISC NOTCHER WORTH £4.75 WITH EVERY 100 5 1/4" DISCS ORDERED

UNBRANDED	10	25	50	100	10 Cased
SS 48tpi	£6.75	£12.95	£24.95	£44.95	£7.75
DS 48tpi	£7.25	£13.95	£26.45	£47.45	£8.25
SS 96tpi	£7.25	£13.95	£26.45	£47.45	£8.25
DS 96tpi	£7.55	£14.95	£27.95	£49.95	£8.55
TRACKER DS 96tpi	£7.95	£17.95	£33.95	£59.95	£8.95
MIMIC F DS 96tpi	£9.45	£22.95	£43.00	£78.00	£10.95

COLOURED DISCS supplied in splits of 5 per colour (10s can be supplied 2 of each) i.e. 25 can be 5 green, 5 red and 15 beige. Other colours are blue and grey.

UNBRANDED COLOURED	10	25	50	100	10 Cased
SS 48tpi	£8.95	£19.95	£37.95	£71.95	£9.95
DS 48tpi	£9.95	£21.95	£40.95	£75.95	£10.95
SS 96tpi	£9.95	£21.95	£40.95	£75.95	£10.95
DS 96tpi	£10.95	£23.95	£43.95	£81.95	£11.95

LOCKING DISC BOXES - HOLD 50 £9.45 - WITH 25 TRACKERS £24.95
HOLD 100 £11.95 - WITH 50 TRACKERS £43.95

DISC NOTCHER - £4.75
VERBATIM VEREX 8" SS/SD - Box of 10 ONLY £14.95

ATARI HARDWARE

520 STM (1/2 meg ram)	£249.95*
520 STFM (1/2 meg ram + 1/2 meg drive & mouse)	£379.95*
520 STFM+ (1 meg ram + 1/2 meg drive & mouse)	£479.95*
1040 STF (1 meg ram + 1 meg drive & mouse)	£559.95*
520 STFM & SM 125 HI RES MONO MONITOR	£479.95*
1040 STF & SM 125 HI RES MONO MONITOR	£659.95*

(One year warranty on all hardware)

* Only we give you a 5 disc pack of Public Domain software including CPM emulator, 5 blank discs and dust covers for hardware all free!!!

BLANK 3 1/2" DISCS

	10	25	50	10 Cased
135tpi SS/DD	£14.95	£34.95	£64.95	£15.95
LOCKING DISK BOX of 90	£19.95			
DS/DD	£17.95	£38.95	£74.95	£18.95
LOCKING DISK BOX of 40	£10.95			

No extras, all our prices are fully inclusive. Many ATARI 8 & 16 BIT programs - just write for more info. Cheques etc. payable to **STORT SOFT**. (International orders add 10% and remit in Pounds Sterling by Bank Draft or Int. Giro.)

Send to:

STORT SOFT

18 Crown Close, Sheering,
Bishop's Stortford, Herts CM22 7NX (171)

BETA BASIC 4.0

FOR SPECTRUMS WITH 128K MEMORY

BETA BASIC 3.0 gave you a structured BASIC with procedures, great graphics commands, better editing, lightning-fast data handling and a full range of toolkit features. SINCLAIR USER said: 'FANTASTIC'. CRASH: 'elegant...comprehensive'. MICRONET: 'Get it now!'. EVERYDAY ELECTRONICS: 'Powerful...thoroughly recommended'. Now BETA BASIC 4.0 adds new commands to unleash the power of the 128K Spectrum! Beta Basic 4.0 is Spectrum Basic compatible, but adds more than 100 new commands and functions to transform your machine!

MASSIVE ARRAYS UP TO 64K!

e.g. DIM !names\$(600,100). End your memory problems! This array could be searched in 0.2 seconds with the INARRAY function, or sorted alphabetically in 5 seconds using the SORT command.

LIST ! and INPUT !

let you move files directly between RAM disc and Microdrive, disc or screen without using the normal memory.

INTERRUPT-DRIVEN SOUND

allows generation of complex tunes and sound effects on 3 channels while your program keeps on going.

FAST PATTERN FILL

can fill any area with any user-defined 16*16 pixel pattern. The whole screen can be filled in less than a second!

FASTER CIRCLE (12 times) and DRAW (2.5 times)

You can select either RS232 output or 48K-type printer output.

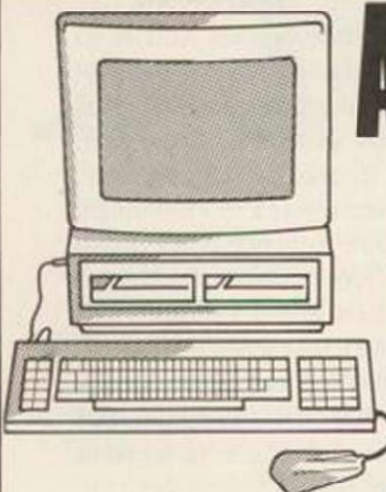
SAVE! allows saving any part of a program to RAM disc.

Special upgrade package for Beta Basic 3.0 owners! State date of purchase if bought direct, OR return your original tape. Upgrade price: £8.95
The Beta Basic NEWSLETTER is packed with ideas, advice, readers' contributions, etc. You can buy 6 back-issues immediately (a total of 90 pages) and/or subscribe for the next 6 bi-monthly issues. Price for 6 issues: £5.00 in the U.K., £5.50 in Europe, £6.00 elsewhere.

The Beta Basic 4.0 package includes Beta Basic 4.0 AND Beta Basic 3.0 and comprehensive manuals - so buy it even if you don't have a 128K Spectrum yet! A special OPUS DISCOVERY version is available (normal price). Price: £15.95 world-wide. Eurocheques, ACCESS (MasterCard) welcome. Please write your name and address clearly. Make cheques payable to BETASOFT.

BETASOFT (YC), 92 OXFORD ROAD, MOSELEY, BIRMINGHAM B13 9SQ

SUPERTEC COMPUTER OFFERS



AMSTRAD

PC 1512 SM	£516.35
PCW 8526	£458.85
PC 1512 DM	£642.85
PCW 8512	£573.85
PC 1512 SC	£711.85
PC 1512 DC	£838.35

PC 1512 SOFTWARE

Wordstar 1512	£69.95	Sidekick	£29.95
Supercalc 3	£69.95	Various Games (Eg. Pitstop II)	£19.95

PRINTERS . . . PRINTERS . . . PRINTERS

Including: EPSON • BROTHER • MANNESMANN TALLY

STOP PRESS!

Call for details of NEW Mannesmann MT910

LASER PRINTER

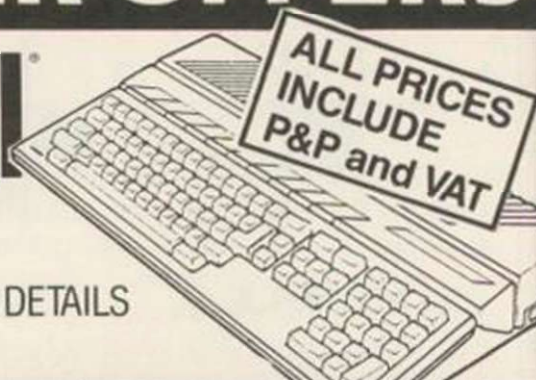
PERSONAL SHOPPERS WELCOME
MON - FRI
9 a.m. - 5 p.m.



BULLETIN BOARD
0268 293639 (24 HOURS)
300 BAUD

ATARI

MANY ST SYSTEMS
AVAILABLE FROM
STOCK - CALL FOR DETAILS



ST GAMES

E.G. STAR GLIDER
DEEP SPACE - ARENA
SUNDOG - THE PAWN
HACKER - SILENT SERVICE
FLIGHT SIMULATOR II
PLUS MANY MORE

ST SOFTWARE

Including:
KUMA - HABA - ATARI - PHILON
CASHLINK - SOFTWARE PUNCH
CHIPSOFT (ST ACCOUNTS)
BATTERIES INCLUDED
Call for details and prices

CUMANA D/D DRIVES FOR ST

CSA 354 (Single) £159.00 CSA 358 (Twin) £269.00

DISKS

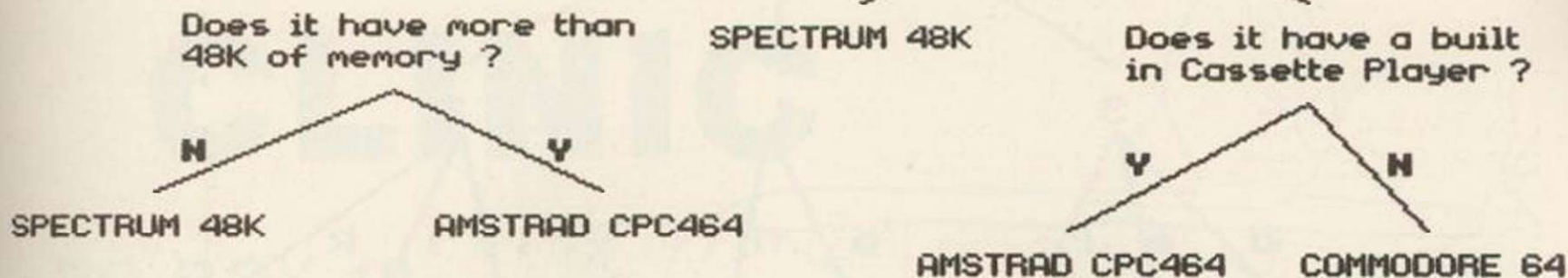
5 1/4" SS/DD (Pack of 10)	£7.50
3 1/2" DS/DD	£2.50 ea.
3 1/2" SD/DD	£1.95 ea.

MODEMS by Miracle Technology

WS2000	£125.00
WS4000	
Auto-dial/Auto-answer	£195.00

SUPERTEC LTD. CORNWALLIS HOUSE, HOWARDS CHASE, BASILDON, ESSEX SS14 3BB Tel (0268) 282308

● Tree diagrams are important in artificial intelligence.



● By asking these questions a computer can learn to identify objects.

◀ applied. If Menace lost, then a bead of the appropriate colour is removed from each of the used boxes, making it less likely that Menace will play the same move in a future game. Similarly, if Menace won (or drew, if playing an expert), then a bead of the appropriate colour is added to each of the used boxes, encouraging Menace to play a similar move in the future.

This approach, which essentially has the computer mimicking human behaviour, is not necessarily the best. Though the human brain is well beyond the best computer in terms of memory organisation and processing, we do still have a number of drawbacks. One of these is our tendency to forget things. We seem to store information in a variety of unusual ways, and the "trigger" to, say, recall a name cannot always be found just when we need it. I am sure you have come across the situation where you recognise a face, but cannot remember the name. Barring a complete failure of main and backup storage, computers never forget anything unless they are told to. Consequently, much more efficient knowledge building techniques can be used.

Questions

A very simple game, which most of us have played at one time or another is Twenty Questions. One person thinks of an object, and a second tries to guess the object by asking no more than twenty simple questions. This game is often started with the question "Is it animal, vegetable, or mineral?", though officially all the questions should be of a form such that they require a yes or no answer. If you were to listen to people playing the game, you would no doubt find many different methods used. For example, some people have a collection of "useful" questions which will quickly narrow down the search. However, the majority of people lack the ability for totally logical thought, and many of the questions they ask will be of little or no help. A computer can be taught differently.

For the purposes of demonstrating how the computer can work, we will limit our-

selves to just a subset of items to choose from; that of computers. The computer is starting with absolutely no knowledge of the subject area. To give it a chance, we will give it the name of one computer which we might think of, such as the Spectrum 48K. Now we are ready to start the game.

Knowledge

Let's begin by thinking of the Amstrad CPC464. The computer will use the only knowledge it has, and ask if we are thinking of the Spectrum 48K. We tell the computer that this is not the micro we are thinking of. Lacking any further knowledge, the computer is forced to give up. However, before starting the next game, it asks us three questions:

Q: What micro were you thinking about?

A: Amstrad CPC464

Q: What would be a good question which would distinguish between the Spectrum 48K and the Amstrad CPC464?

A: Does it have more than 48K of memory?

Q: In the case of the Amstrad CPC464, the answer would be?

A: Yes

Having entered this question and answer session into memory, the computer can now ask a further question in its search for the correct micro. The computer has effectively built the tree shown in Figure 3.

Memory

We can now think of another computer, say the Commodore 64. The computer will first of all ask whether the micro we are thinking of has more than 48K of memory, to which we answer 'Yes'. It therefore asks if we are thinking of the Amstrad CPC464, to which we must answer 'No'. Having reached the bottom of the tree, the computer is forced to give up, but it again asks the two questions. This time our answers might be:

Commodore 64

Does it have a built-in cassette player?
No

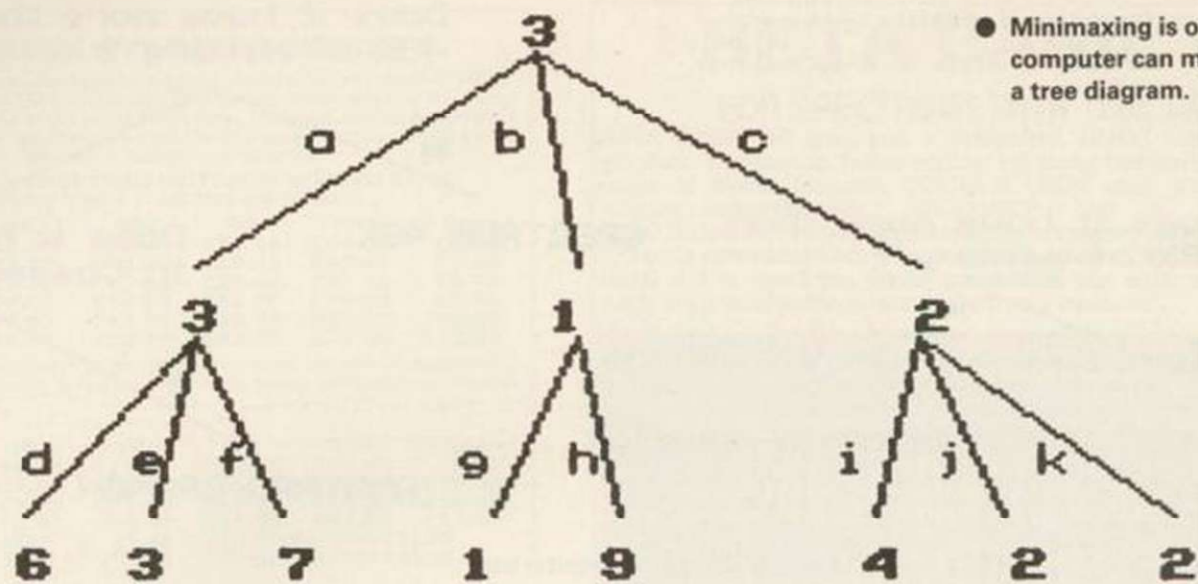
The computer adds this to its tree, which now looks like Figure Four, and continues with the next micro. It is fairly obvious that, as this continues, the computer builds up more and more information. This is an example of rote learning.

A different method of rote learning was used very effectively by A. L. Samuel in his draughts (checkers) playing program. This program used a look-ahead tree followed by an evaluation function. So, for instance, with a look-ahead of only two-ply (it would normally be more than this), the computer would test all of its own moves, followed by all the opponent's possible replies.

At this level, it would then evaluate the position using a number of factors, such as the number of pieces, their positions and so on. It would store these evaluations, and assign the numbers to the bottom level nodes of the tree. The computer is trying to maximise these evaluations, and the opponent is trying to minimise them. Therefore, at the second level, the lowest score from the subtrees at the bottom level is taken. Finally, again trying to maximise these scores, the computer looks for the highest score at the second level and makes this move.

If this process seems a bit complex, look at the diagram in Figure 5. The numbers at the bottom are the evaluations of the position at a depth of two-ply, where the computer is trying to attain the highest possible score. Ideally, this would be the node labelled '9'. However, since the opponent would be trying to minimise the computer's score, he would not play a move to the node labelled '9', but would instead choose the one labelled '1'. This lowest figure is placed at the node on the second level, and the other second level nodes are treated similarly. Now, the computer has a choice between three nodes where, after the opponent's move (assuming the opponent plays as expected), the value of the position will be '3', '1' or '2' respectively. Obviously, in this case, the computer would play move 'a' leading to the node

ML³



● Minimizing is one way the computer can move through a tree diagram.

◀ with the highest value. This operation is known as 'Minimaxing' and is frequently used in trees of this sort.

The problem with this tree-building method is the time it takes to search the tree. If we assume an average of ten moves from any position, then a search of just two-ply will require evaluating $10 \times 10 \times 10$, or 100, positions. Searching to a depth of six-ply would require searching a million positions (ie. 1000000). Samuel's program improved upon this by storing its evaluations. So, for the position in Figure Five, it would store the board for the top node, and assign it the value '3'. Now, when searching to a depth of two-ply, rather than

immediately evaluating the position, it would search through its list of stored positions. If it found a match, then it would use the evaluation

already stored. Thus, it has effectively searched to a depth of four-ply. Now, by storing the position yet again, if during another game it matches it to a two-ply search, it will have an evaluation to a depth of six-ply, and so on. The only draw-back with this method is the intensive use of memory to store all the positions. Therefore, only the most frequently used positions were stored, and housekeeping routines were written to keep the number of stored positions reasonably low.

Evaluation

In addition to this method of learning, Samuel's program also learnt from its own play. The evaluation function was based on a number of distinct features such as the number of pieces, centre control, threat of fork, and so on. Each of these had a weight assigned to it, such that the more important features had higher weights. The eventual evaluation was of the form:

$$S = w1*s1 + w2*s2 + \dots + wn*sn$$

Now, if we could search the entire game tree to the end of the game, we could assign scores of '1' for a win '0' for a draw and '-1' for a loss. Unfortunately, this isn't the case, and the evaluation function is designed to give an indication of what we

would find if we could search further. The problem which now arises is how to choose these weights. The answer is to let the program amend them through experience. This is similar to the Menace match-box model, but far more sophisticated.

The program increases or decreases its weights for various features based on the difference between the minimaxed score ('3' in the above example) for the current position, and the evaluation score for the current position, which will have been worked out at a previous level. If the evaluation function were perfect, then these two numbers would be the same throughout the game. Working in this way, the program can be set to play itself. Not only will it increase its stored library knowledge, but it will also tune its own evaluations, based on experience.

Expert systems

Eventually, Samuel's Checkers program had "remembered" all the worthwhile board positions, and had tuned its 40-odd factor evaluation function to play at close to championship level.

Up to this point, we have been studying game-orientated topics, and you may be wondering whether all this research is ever going to achieve anything. Game-playing is a very important aspect of artificial intelligence, provided an enclosed environment in which to test the programs. However, machine learning is now being used for practical applications at the forefront of technology.

You have probably heard the jargon phrase 'Expert Systems' mentioned during recent years. An expert system is essentially an intelligent database. It has lots of data and a set of rules which operate on the data. In its simplest form, the expert system can be viewed as a series of IF... THEN statements. For instance, if you had an expert system to diagnose faults with your computer (not very useful if the expert system is based on the computer!) it might ask the following questions:

"Is the Power light on (Y/N)?"

"Is the computer plugged in (Y/N)?"

"Is the power switch on (Y/N)?"

"Is the computer connected to the TV (Y/N)?"

Based on the answers to these, it would try to diagnose what is wrong with the computer, and if it was unable to find the fault, would suggest that you return the computer to the dealer.

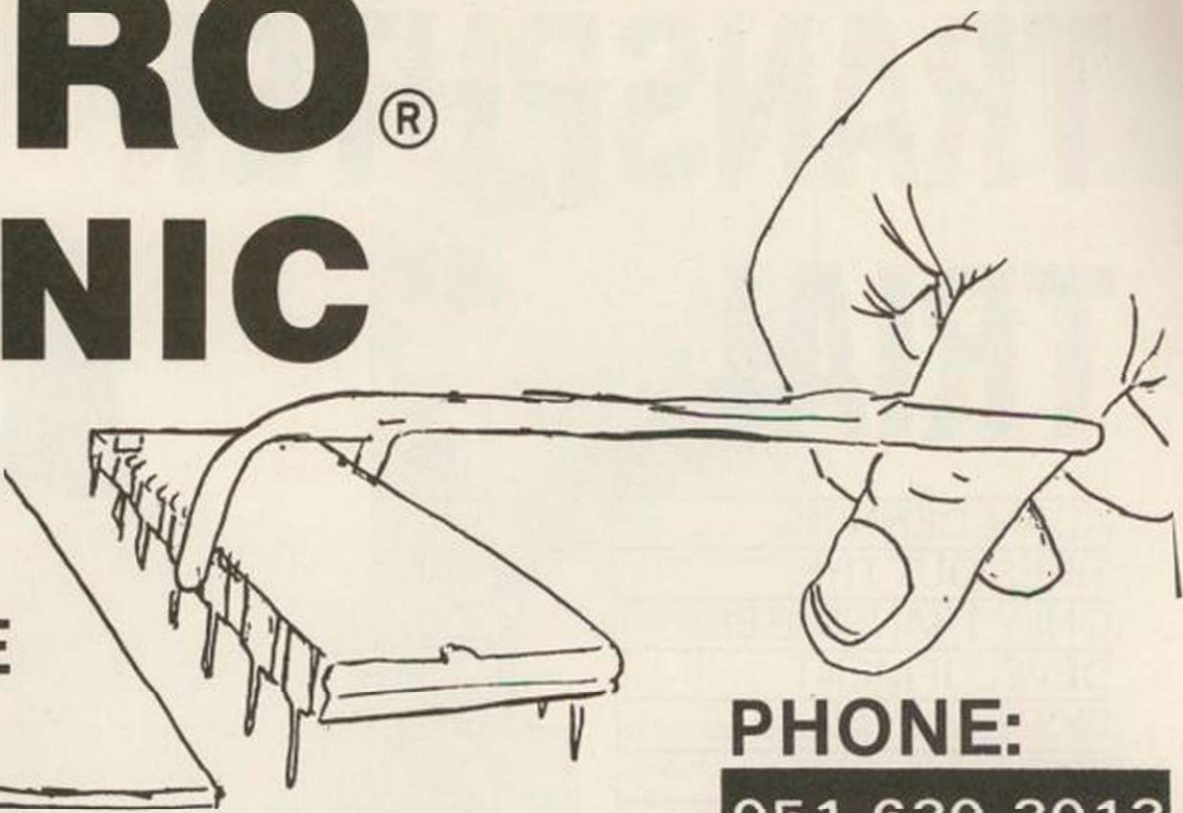
Rule induction

The problem with expert systems is the knowledge acquisition stage. In other words, the difficulties involved in entering information into an expert system database in a logical form. For instance, let us assume that we are trying to develop an expert system which will help you to choose the best game programs available for your computer. Now, this is quite a subjective decision. Do you like games to be fast, do you want graphics, adventures, shoot 'em ups or intellectual challenges? Trying to present all this knowledge to a computer could be quite a headache. Instead, a number of currently available expert systems learn from experience. Given basic knowledge on a subject, they form their own set of production rules to handle the database. They then test themselves by trying to pick out games which you would like. If they make a mistake, and choose a program which you did not like, then it will require a modification of the system. The computer will explain its reasons for choosing the game, and you will tell it why it was wrong. Based upon this updated information, the computer will modify its rules, and consequently improve its experience in the field of choosing games.

These rule-induction based expert systems are becoming increasingly popular. This is not only because they do not require explicit knowledge to be programmed, but also because they often tend to organise knowledge in a far more efficient, and often revolutionary way. They are beginning to reach the stage where they can do things better than the human expert.

MICRO[®] CLINIC

PO BOX 19
WALLASEY
MERSEYSIDE
L45 4FB



PHONE:

051-630 3013

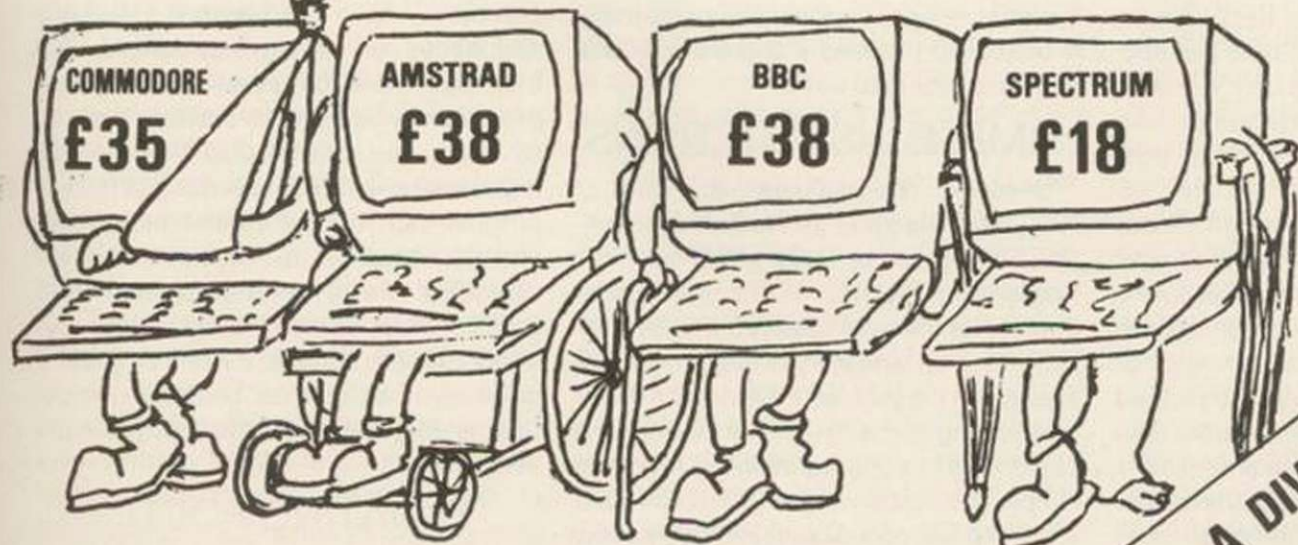
WHY ARE WE DIFFERENT TO MOST OF OUR COMPETITORS?

- i) The whole computer guaranteed for 4 months!
- ii) Every computer fully soak tested before return!
- iii) All leading makes of computer repaired!
- iv) We don't say 24-hour service and then take 3-4 weeks!
- v) Providing parts available we guarantee 7-day turn-round!

- i) JUST PACK YOUR COMPUTER CAREFULLY, IF IN DOUBT INCLUDE POWER SUPPLY.
- ii) INCLUDE CHEQUE/POSTAL ORDER TO MAXIMUM AMOUNT PAYABLE TO MICROSNIPS LTD.
- iii) OR PAY BY ACCESS/VISA/SPECTRUM CHARGE CARD OR LOMBARD TRICITY CARD GIVING CARD NO. EXPIRY DATE.



ALL
PRICES
INCLUDE
RETURN
POSTAGE
(FOR GROUP 4
COURIER -
ADD
£8)



PRICES SHOWN ABOVE ARE GUARANTEED MAXIMUMS -
SUBJECT TO NO TAMPERING!



A DIVISION OF
MICROSNIPSLTD

TRANSPUTER TRIAL

ADAM DENNING
TRIES OUT THE
ONLY TRANSPUTER
DEVELOPMENT
SYSTEM AVAILABLE
FOR ANY HOME
COMPUTER

The Kuma K-Max is a transputer development system for the Atari ST. The hardware is supplied in a small box with a short ribbon cable which plugs into the side of the ST, and the software is supplied on a normal ST-format 3.5" disk. The transputer box can house either one or two transputers, depending upon the configuration you desire. The box we examined contained one transputer — obviously the cheaper option, but the upgrade path is followed by sending the unit back to Kuma.

The transputer and the ST communicate via a fast serial link chip, specially-designed by the transputer designers Inmos, which is capable of data transfer at rates up to 20Mb (20M bits) per second. This is extremely fast for a micro-computer serial port. The transputer units used are Inmos T414s, which is best described as the standard transputer.

A transputer is a microprocessor whose mode of operation is somewhat different from normal microprocessors — Inmos is bound to say fundamentally different, but others see it as a matter of degree. Firstly, the transputer is designed for *parallel processing*; running more than one computation at the same time. This is done by having more than one transputer in your transputer system, although most of the software written for transputers is effectively ignorant of the number of transputers available and will in fact run happily in a pseudo-parallel fashion on one-transputer systems such as the one we examined. The only obvious differ-

ence is that attempts at parallel processing on one transputer are rather slower than when executed on multi-transputer systems, as genuine parallel processing is unable to proceed if there's only one chip to do the hard work.

SIMPLE INSTRUCTIONS

Secondly, the transputer is a form of RISC chip, standing for Reduced Instruction Set Computer. RISC is the currently fashionable method of microprocessor design. Its followers believe that by concentrating on simplicity of design, greater speed can be achieved. Obviously this is true so long as the majority of instructions performed in a computation are relatively simple instructions. A RISC chip has a small instruction set containing only a few instructions, while chips not following the RISC school of thought contain a wide variety of built-in instructions to perform even the most obscure functions. Here is not the place to say whether one method actually is better than the other, but the

RISC concept is certainly catching on.

By providing the right set of instructions, a RISC chip may carry out any computation by combining suitable sequences of simple instructions. For example, an 8086 assembly language programmer is likely to perform division by using one of that chip's two divide instructions; a 6502 assembly language programmer, on the other hand, would write (or steal from a book!) a division algorithm using shifts, rotates and mathematical operations. This does not imply that the 6502 is a RISC chip but it does demonstrate that complex computations may be performed with simple instructions.

FLOATING POINT

As a parallel-processing RISC chip, the transputer's main boast obviously is its speed. It is said that the latest transputer, one which incorporates a floating-point arithmetic unit on the chip (not the unit supplied in the K-Max), is as fast as a DEC





Vax 8650 supermini.

The transputer clearly is a scientific curiosity, one which most programmers, engineers and dabblers would like to get their hands on. Kuma's little plastic box provides a relatively cheap way, as long as you already own an Atari ST. There are some drawbacks, though.

The first problem can be overcome simply by spending more money: a transputer development system really needs more than one transputer unit to be useful. The second problem is a little more serious, though. To take advantage of parallel processing such that the applications being processed are unaware of how many transputers are present, Inmos recommends programming in their own specially-designed high-level language, Occam. They enforce this point strongly, saying that the assembly language used by the chip is liable to change without notice and that the Occam compiler produces code as good as hand-compiled code. All the transputer applica-

tions and programs printed anywhere are going to be in Occam or in some other high-level language such as C for which Inmos has written a compiler. The C compiler produces Occam, too. The message from Inmos, in large flashing lights, is that if you intend to develop applications for the transputer, stay away from assembly language programming. Any large user of the chip is going to follow this rule so learning the assembly language of the chip may provide intellectual stimulation, but it does not provide the information one really requires for development.

As yet an Occam compiler is not available, although Kuma plans to release a number of high-level language products including Occam and C in the near future. When these appear the programmer will be able to use the K-Max with much greater confidence.

ASSEMBLY LANGUAGE

This is not to say that the K-Max is useless, as there is something to be gained from learning about the chip's memory map and its basic workings. The overriding factor though is that data on the assembly language accepted by the transputer is very hard to come by. There is a little information provided in the K-Max manual but programmers interested in this system are sure to want more.

The software supplied with the system consists of an assembler, debugger and editor combined in the usual Kuma manner. Since this is the only transputer assembler we have ever seen it is impossible to make meaningful comparisons with rivals. Certainly it does its job of assembling source code into object code with commendable speed. The editor is a combination line-editor and screen editor, one keypress taking you between the two. The screen editor limits you to movements through the text, deletions and insertions. All the more advanced editor features, such as search and replace, are performed only from the line editor. The package would certainly be

enhanced by a more friendly and more powerful (Gem-based, perhaps?) editor but programmers seem able to cope with most text-entry methods.

The debugger is a useful tool. It allows you to examine and alter transputer memory, disassemble transputer assembly language, run programs and fill memory with given bytes. It does not allow single-stepping, though.

Some example source files are provided on the distribution disk, including the inevitable Sieve of Erasthones prime number program. The sieve is written using a 'virtual' algorithm, allowing it to calculate prime numbers far greater than the normal sieve program using real memory. Certainly this program runs fast, but the examples aren't exactly exciting. A graphics demonstration would be nice, for example. The problem is of course that the transputer in the K-Max is not implemented as a co-processor for the Atari's own 68000 processor, so it is unable to provide what we all want - a faster, more powerful ST. This may well prove to limit its appeal in commercial terms.

The documentation supplied with the unit is rather cheaply produced, complete with irritating lapses in spelling and grammar. It covers the basics of transputer operation, fast serial link operation and general transputer assembly-language programming, and it also describes the use of the editors, assembler and debugger. It seems to repeat itself often and undoubtedly could hold more information.

In summary, the K-Max is potentially very educational although many users may find it rather daunting. With a better manual it could be useful to some determined hackers, but inevitably the lack of Occam hinders its usefulness, especially as it cannot be used to enhance the Atari ST's own operation. Buy it if you fancy yourself in the role of white-coated mad scientist, otherwise you might be better advised to save up for an 80386 machine.



When the Amstrad was launched over two years ago it had a number of advantages over its rivals, one of which was the ability to create stereo sound. This is achieved by the use of the programmable sound generator chip from General Instruments designated AY-3-8912. This chip has 15 regis-

MUSIC MAESTRO



GETTING STEREO SOUND FROM THE CPC HAS BEEN DIFFICULT. WE TESTED A UNIT WHICH MADE IT EASY



● Above: All kinds of music and sound effects will sound better with the Maestro.

ters compared with the eight found on the CPU so, as you can imagine, it is a fairly complex piece of equipment.

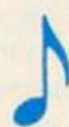
The Amstrad has only one speaker driven by an internal amplifier, which is not much use for stereo sound, but on the back it has a stereo output jack socket...

lead from the amp into the computer, plug the stereo output lead into the jack socket and finally connect the speaker leads to the amp and away you go.

The leads are just long enough for you to position the amp away from the computer, but the speaker leads are long

they are much improved by a system such as the Maestro.

For the more seriously minded, there are a number of utility programs on the market which allow you to create tunes, sound effects and so on. For these users, something as good as the Maestro is



great. I wonder how many people plugged their stereo headphones or speakers into this socket expecting to hear their favourite beeps, bops and bangs in super stereo and heard absolutely nothing? The internal amp drives only the internal speaker, so you need to buy a separate amplifier and a pair of speakers or headphones, or attempt to utilise a Hi-Fi unit.

Amstrad sells an amplifier/speech synthesiser to complement the computer, but there are other systems on the market notably the Maestro from Vanguard Leisure. The Maestro unit arrived in a large polystyrene box, together with a pair of high quality 30w double cone air suspension speakers, a pair of miniature headphones and a demo tape. Setting up the equipment is easy and straightforward. You just plug the power lead from the monitor into the amp, link the power

enough for you to set them up where you want. The amplifier is well made, both inside and out, and contains both left and right volume controls, a headphone jack socket and a switch to change from speakers to headphones. The speakers themselves are typical of the good quality car stereo type and can be mounted at any attitude with the brackets supplied. As they are of the dual cone type, they give you an excellent response over the full frequency range.

The sound quality from the Maestro is first class, though it is dependent upon the sound being generated by the computer - the demo tape gives you quite a few examples of what you can expect. The difference good sound can make to a game is amazing. Take, for instance, *Sorcery* from Virgin or *Defend or Die* from Alligata. These games may be old, but

probably a must.

At £39.95 the Maestro is not cheap, but given the quality of the speakers, the addition of headphones and the overall finish and presentation, it has to be good value for money.

It is worth noting that Vanguard Leisure is marketing a number of tapes/disks of dedicated music called Easy Listening. At present there are four tapes and two disks available containing such diverse offerings as Bach's Toccata and Fugue in Dm to Another one Bifes the Dust from Queen. The scores are well written and pleasing to listen to, while the screen display incidental graphics. The tapes cost £6.50 and the disks £14.50.

Vanguard Leisure Ltd, Church Row Chambers, Franklands, Longton, Preston PR4 5PD.

WIZARD OF THE NORTH

...through the purple mists of time, out of the ancient land called Amouderness... come the WIZARD bringing gifts and spells and magic lights to delight your eyes.

MERCURIAL (SPEEDY) SUPPLY OF SOFTWARE & ACCESSORIES: ORDER IT NOW!

QL SPECTRUM VIC20 ELECTRONIC AMSTRAD APPLE2 IBM ATARI COMMODORE JOY STICKS BUSINESS SOFTWARE GAMES EDUCATIONAL SOFTWARE

25% OFF ALL PROGS AT £5.95 & ABOVE!

TO ORDER: DEDUCT 25% FROM R.R.P. OF PROG(S) REQUIRED & SEND CHEQUE/P.O. TO: WIZARD OF THE NORTH, THIMBLE HALL SCORTON, NR PRESTON, LANCS. PR3 1AY.


OR SEND S.A.E. FOR CATALOGUE AND DETAILS OF FREE PROGRAMS

PLEASE TELL THE WIZARD YOUR NAME, FULL ADDRESS & COMPUTER MAKE & MODEL ALSO STATE WHETHER YOU NEED TAPE, ROM OR DISK (IF DISK, GIVE SIZE ETC)

PRICES INCLUSIVE FOR UK ORDERS. ADD £1 FOR EUROPE AND £1.50 ELSEWHERE

OR PHONE (0524) 791266 FOR PRICES NOW

CAPITOL

HOTLINE 0705 210012 

SPECIAL OFFER

KUSTOM COVERS

CASH TRADER	£79	PC1512-2 part set	£11:95
SHOE BOX	£99	PCW 8256-3 part set	£9:95
TIME KEEPER	£49	Amstrad 6128-2 part set	£7:50
MAIL FLOW III	£39	Amstrad 464-2 part set	£7:50
DBASE II	£85	DMP 2/3000	£4:95

Free Lockable storage box with:
50x5 1/4 DS/DD Disks £34:95
100x5 1/4 DS/DD disks £64:95

Dbase II £85

HARDWARE

1512 SD Mono	£499	Juki 6100	£399
1512 DD Mono	£625	Juki 6200	£489
1512 DD Colour	£830	Cannon PW1080A	£349
1512 HD20 Mono	£1025	MP201	£399
1512 HD20 Colour	£1220	MP165	£239
PCW 8256	£430	Star NL10	£349
PCW 8512	£550		
Opus PCII SD Mono	£565		
Opus PCII DD Mono	£800		
Opus PCII 20 Meg HD	£1125		

PRINTERS

FOR FURNITURE & PRINTER RIBBONS, RING FOR CATALOGUE.


PCW8256 SOFTWARE

SANDPIPER		HISOFT	
Sandpiper Accounts	£140	Dev Pack 80	£34:95
Payroll	£75	Pascal	£34:95
File Manager	£95	'C'	£34:95
Accounts + Payroll	£195	Knife	£11:00
Intergrated Accounts	£195	Torch	£11:00
		Art in Pascal	£11:00
MICRO-PRO		LINC	
Wordstar	£40:00	Teach Yourself Locoscript	£12.95
Wordstar Deluxe	£60:00		
CAXTON		CAMSOFT	
Cardbox	£42	Integrated Accounts	£149:95
Condor One	£82	Pay Roll	£49:95
Scratch Pad +	£45	Cambase	£49:95
Touch N'Go	£15	COMPACT	
Smart Key	£39	Integrated Accounts	£185
Brain Storm	£39	Order Processing	£75
		Nominal Ledger	£75
M.A.P.		Daybook	£75
Integrated Accounts	£145	Nucleus	£75
Payroll	£45	Sales Ledger	£75
Purchase Ledger	£45	Sales Invoicing	£75
Sales + Invoicing	£45	Purchase Ledger	£75
DATARUN		ANAGRAM	
Datafile 1	£26	Sales Ledger	£86:25
ARNOR		Purchase Ledger	£86:25
Prospell	£26	Stock Control	£86:25
Protect	£79	ACCESSORIES	
DISKS		8256 Wiz Card	£17:00
KAO Branded 5 1/4 DS/DD	£8:95	8256 Joystick Interface	£13:00
Unbranded 5 1/4 DS/DD	£7:95	Mouse Mat	£3:95
Maxel CF2 3" Disk	£24:95	Parallel Printer Splitter	£42:50
DISK STORAGE BOXES		JOYSTICKS	
Hold 50x5 1/4 Disks	£9:95	Cheetah 125 +	£7:95
Hold 100 x5 1/4 Disks	£14:95	Mach One +	£12:95
		Professional	£17:95

Please make cheques payable to:
CAPITOL, F3, Railway Triangle, Farlington, Portsmouth, Hampshire, PO6 1TG.
PLEASE SUPPLY

NAME _____
ADDRESS _____
POSTCODE _____
DAY TEL. NO. _____
SIGNED _____

Please Debit My ACCESS/VISA The value of £ _____
All prices include VAT and postage in the UK. Overseas please add £1.50.



VDU OPERATORS DO IT WITH A

THINGI

computer copy holder

Patent Pending

OUTRIGHT WINNERS
WIRRAL BUSINESS IDEA of the YEAR AWARD

PROMOTE YOUR BUSINESS HERE
Keep your name in front!

Makes an Ideal Gift - Everybody needs a Thingi!
 Unique Velcro™ Fastening

The Thingi creates working space out of "thin air".
 Left hand or right hand versions.
 The compatible low cost solution to the problem that plagues all computer users!
Don't struggle any longer - **GRAB YOUR THINGI NOW!!!**

Your nearest Stockist is **OVERBASE LTD.**
1st Floor Trace Building,
176 Conway Street,
Birkenhead,
Wirral L41 3JB England
Tel: (051) 647 8981 (8 lines)
Telex: 859671 MONREF G Ref 72: Mag 20290

R.R.P. **£6.99**
exc. VAT and P & P

Another Great British Product Exported Worldwide • Dealer Enquiries Welcome

DATA SOLVED

WITH THE AID OF
INGENIOUS ADD-ONS
THE DISABLED CAN
COMMUNICATE
THROUGH COMPUTERS.
CAROL ATTACK
INVESTIGATES

Computers can bring a host of benefits to our lives. They ease communications and help us to deal with information quickly and efficiently but their usefulness to able-bodied people is slight compared to the advantages a computer can give to people with certain disabilities.

To highlight those possibilities, Datasolve, a Thorn-EMI company based at Sunbury-on-Thames, has launched the Datasolve Award for Technological Innovation to Aid Cerebral Palsy Children. Cerebral palsy is a disability caused by damage to the brain at birth. Sufferers are unable to control muscle movements and have great and frustrating difficulties in communication.

AWARENESS

Margaret Fawcett, Datasolve group marketing manager, explained how the company became involved with raising awareness of the problems of cerebral palsy children.

"Datasolve inaugurated a charity ball for the computer industry last year and it was decided to nominate a different charity to benefit each year. Last year we raised more than £40,000 for the Association for Spina Bifida and Hydrocephalus children, through the ball and other fundraising events. This year the charity we chose was the Spastics Society, which works for people with cerebral palsy. We had decided to look for a charity appropriate to our industry, so that we could do more than raise money.

"The Spastics Society seemed best as there are strong links between the Society and the computer industry already. People with cerebral palsy usually have full control of one muscle group and through that they can control a keyboard. The Spastics Society already has a microcomputer officer who co-ordinates work in this area.

"Many people who are related to or know someone with cerebral palsy have used their computing knowledge to facilitate that person's use of a keyboard; as the disability is specific to the individual, each case tends to require an individual solution so that they can sit at a computer and



● A pupil from Thomas Dealrue School, Kent, learning to paint with the Photonic Wand.

work, though some inventions have helped many people."

The award scheme was begun by a group of Datasolve employees who saw that there was an opportunity to provide a great deal of help and raise awareness of the usefulness of computers to people with cerebral palsy.

"We began the award scheme to encourage a range of people, particularly hobbyists who may not have thought of these problems previously, to think of what can be done to help the handicapped. We wanted them to develop gadgets which would be of use to a child. We want to increase awareness."

After a launch of the award scheme, there were a great many enquiries from home enthusiasts and small-scale manufacturers. Twenty-five entries were received, varying in the amounts of technology involved in their operation. Some were simple ideas, for example a device to help wheelchair users to position

themselves in front of computer. Another entry was a double-sized keyboard to fit over the existing one which would enable a child with reasonable control of the hands to get to grips with the increased hit area and be much less frustrating than a standard-sized keyboard.

Two of the entries are already in production and proving their usefulness to children in schools and at home. The 4-Way Games Joystick was invented by Tony Cartwright of Interface Designs at Guildford. It is a simple idea to help children with cerebral palsy play computer games which require a joystick with their able-bodied contemporaries. It drives all standard games software on the BBC series machines, except for the few which demand a true analogue joystick.

The 4-Way Games Joystick differs from standard models in its rugged and stable construction. A large stick movement helps those with limited control over limb movement to move in the proper direc-

● A pupil from Charlton Park School, London, preparing to use the 4-way Games Joystick.



approximately £100 and details can be obtained from the Photonic Wand Co on 0244 300002.

These commercially-exploitable inventions are examples of what Datasolve has been seeking in competition entries. They negate the effects of a severe handicap and help the user to work or play with a computer in the same way as anyone else. Should any entries be suitable for development and production, Datasolve will help entrants find a suitable manufacturer and provide marketing advice, and do everything possible to get the product on the market. Fawcett says:

"There are obvious benefits to the company in sponsoring this type of competition, as Datasolve is involved in the education sector of the computer market and it ties with that. We should try to promote a social conscience. There is a great deal of expertise among the public relating to computers and we are trying to tap that. We must harness the enthusiasm of hobbyists and the ideas on which they are working should be taken up by industry. We hope this initiative will have a lasting effect."

Another important point is the relationship between the computer industry and people with cerebral palsy. Using a computer is a good way for a disabled person to gain employment on equal terms to able-bodied people. In the past there have been few real jobs for the severely disabled and technology should open the opportunities which previously have been denied them.

With wider interest and more input from the computer industry and experts at home, more disabled people can be helped to work and enjoy a hobby which does not discriminate against them because of their communication difficulties.

The entries are being judged by a panel of experts, including representatives from the Spastics Society. They will all be on display to the industry at its charity ball at the Hilton Hotel, London on June 11. The Duchess of Kent, the patron of the Spastics Society, will attend.

The winner will be presented with a Thorn-EMI Liberator, a laptop model which Datasolve believes would be useful to anyone with an interest in computing. Although this competition is a one-off, next year's charity should receive similar innovative support.

lightpen, and permits a child to use a computer by head movement alone. The wand, which plugs into the analogue socket of a computer, is attached to a plastic helmet or to spectacles and acts like a pointer moving the cursor round the screen as the child's head is moved.

The wand can help children with severe involuntary head movements, as the closer they sit to the screen the greater the movement necessary to move the cursor. Users with very limited movement can adjust the system so that it responds to very small head movements.

The wand will work up to a distance of two metres from the screen and although it can detect light from the screen at that distance it is unaffected by daylight or lighting.

The flexibility of the wand allows it to be used by many people and it can be used with a variety of programs depending on the needs of the user. Young children can use it to select single letters or whole words, play computer music or paint a coloured picture.

Older and more proficient users can, with the addition of keyboard emulation software, run commercial programs without modification, including word processing programs. That is done through the use of special alphabetic displays on the screen which enable the user to select commands or letters. The wand is sold for

tions. A single fire button is built into the top of the stick but those who cannot manipulate it are helped by an automatic fire facility brought into action by a switch at the base of the joystick. A specially-designed gate gives the joystick a fast but positive movement.

INDEPENDENCE

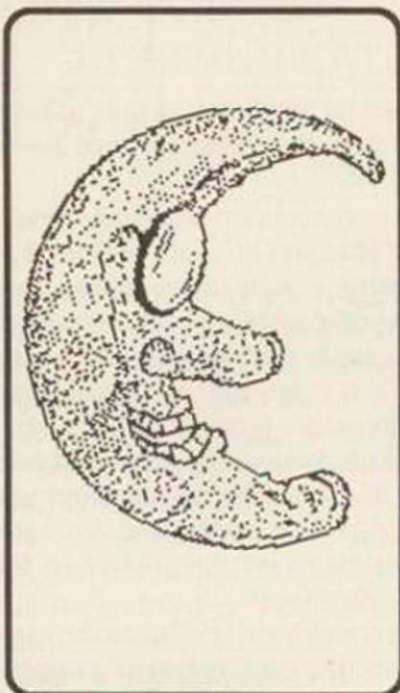
Cartwright believes that technology has a great deal to offer cerebral palsy children and would like to see more work being done to help them lead independent lives. "It is vital to understand the psychological importance to a disabled child of being able to play exactly the same games as a brother or sister and not being excluded on the basis of handicap," he says.

The joystick is already available from Interface Designs at a cost of £60.40. The company can be contacted on 0483 32909.

The second of the designs already in production is the Photonic Wand. It is an optical sensor, a long-distance version of a

Wizard-ware!

Computer wizards only!



As the year wears on, you find your money seems to shrink in purchasing power. This is one of the hitherto unexplained Laws of Nature...

In an effort to reverse these laws, Interface Publications has decided to do a warehouse clear-out, and give you the chance to build up an incredible library of computer books - for just one pound per book. Send us cold hard cash (we'll also grudgingly accept cheques, book vouchers or money orders, if you insist) and we'll get your books to you, el pronto!

Books which give you the power...
without the price!



BBC/ELECTRON

- Let your BBC Micro Teach You to Program
- Exploring Artificial Intelligence on your BBC Micro - Hartnell
- Putting your BBC Micro to Work
- Advanced Programming Guide to BBC - Jeremy Ruston
- Using the BBC Micro in Education - Clive Gifford
- 36 Challenging Games for the BBC Micro
- Creating Adventures on the BBC Micro
- 40 Best Machine Routines for BBC Micro - Ian Hutt
- Dynamic Games for the Electron - Neal Cavalier-Smith

ATARI

- Mastering the Atari 400/600/800
- Making the Most of 400/600/800

COMMODORE 64/128

- Exploring Artificial Intelligence on your Commodore
- Mastering the Commodore 64 - Mark Greenshields
- Challenging Games for the Commodore
- Putting your C64 to Work
- How to Program the C64
- Creating Arcade Games on your Commodore 64
- Creating Adventures on your Commodore 64
- MEGABASIC for the C64

APPLE IIc/IIc+/II+

- The 3-D Animated Apple
- How to Program the Apple II
- Outstanding Programs for Apple
- Challenging Programs for Apple

TEXAS TI 99/4A

- Dynamic Games TI 99/4A
- Making the Most of TI 99/4A

SINCLAIR QL

- Exploring the QL
- QL Games Companion
- The QL Handbook
- Exploring Artificial Intelligence on your QL

EDUCATION

- Using Computers in Education
- Art of Structured Programming
- Exploring Expert Systems
- Replicating Reality: Exploring Computer Simulations
- Easy Way to Program your New Computer

SPECIAL TITLES

- Dynamic Games for the Oric
- Creating Political & Military Simulation Games
- Beginner's Guide to FORTH
- Practical uses for the Micro in Home
- Capital Radio's Book of Simple Computer Programming

Interface Publications Ltd.,
9 - 11 Kensington High Street,
London W8 5NP

Please send me the indicated books.

Value of order (@ £1 a book) £ _____
PLUS 35p per book postage £ _____
Total for this order £ _____

*I enclose cheque/money order/
cold hard cash*

Name _____

Address _____

YC/87

Atari naturally enough chose the Atari Show, held in London from April 24-26, to launch their numerous new models in the UK market. Delivery and prices for the two versions of the PC, the Atari SLM laser printer and the Mega ST were announced by the National Sales manager.

The entry level Atari PC will be available in June. The 512K computer will support EGA and CGA graphics modes without the need for add-on cards and will cost £399.95 without a monitor or £499.95 with. The system features an 8088 microprocessor with a switchable clock speed of 4.77Mhz or 8Mhz. It is expandable to 640K plus 640K screen RAM. Sockets are provided for an 8087 maths co-processor, and there is a parallel printer interface and an RS232C port for modems and other serial devices.

AVAILABILITY

A single floppy disk drive is standard, though there is the option of fitting a second one, and a mouse is also provided.

The expandable system will be ready in July. With a twin floppy drive it will cost £599.95 and with a 20Mbyte hard disk drive the price goes up to £999.95. In addition to the features it shares with the entry level model five expansion slots to house industry standard expansion cards are included.

Jack Tramiel, Atari's Chairman explained the decision to move into this part of the market; "We aim to cover the total spectrum of business and we are now fully equipped to do this. People want an IBM clone because it's what they have in their office. If they want to buy them we are going to make

SHOWING OUT

them. It's not something I'm very proud of."

Perhaps the most exciting of the new products was the laser printer for the Mega ST. It will be available from June as will details of its price which, it seems, is yet to be decided. However when the printer does arrive it will print eight A4 pages a minute at a resolution of 300 dots per inch. This means that a 1mm square contains 140 points. The printer uses the DMA interface on the ST.

The Mega ST itself is to be sold in two versions. The 2MB version will cost £999.95 and the 4MB version £1299.95. Open architecture design will make expansion easy, and it will be compatible with existing ST software. Ports for modems, printers and MIDI are standard and the music features are quite impressive.

The Mega ST and SLM laser printer together form a desk

THE 1987 ATARI SHOW MERITED A VISIT FROM JACK TRAMIEL. OUR REPORTERS WERE ALSO THERE



● Above: the entry level Atari PC is compact, offers built-in graphic modes and is available very soon.

top publishing unit though assessment of the system must await the announcement of the printer's price. Atari are also keen to promote the music capabilities of the various versions of the ST.

Apart from the product launches (which included a games machine, the £89.95 XE) the show includes an array of software which is quite astonishing. Both business and entertainment uses are being vigorously pushed. Activision, US Gold and Rainbird were among the companies showing games and Rainbird's *Guild of Thieves* adventure was one of the more interesting and colourful.

The business and non-games packages shown were all touted as making good use of the ST's graphics capabilities and it can no longer be said that the only good software for the machine is games based. *1st Word Plus* would be enough in itself to refute this, with numerous small improvements.

However the variety and quality of programs currently being developed or adapted for the ST will provide plenty of choice for the business or serious home user. One example of the products on offer is Precision Software's *Superbase*, an easily manipulated relational database system with a useful picture/text library.

The hardware launches and software displays at the Atari Show were one thing but the Atari executives themselves were most keen to show the regeneration of their company. Jack Tramiel, who had flown over for the occasion, glowingly praised UK Head Bob Gleadow for his work and a justifiable air of self congratulation could be detected. The company's turnaround is at least impressive with an 81.8 per cent increase in sales from 1985 to 1986, and although they refused to disclose precise figures relating to their performance in the UK market the long-term outlook is very positive.



● Above: the price of this printer remains a mystery.

ADVENTURE BUILDING

**This month Pete
Gerrard explains
the art of text
compression in
adventure
writing**

We finished last month's look at parsers with some homework. It entailed trying to find some way in which we could introduce a spelling checker into the main body of the parser listing and thus correct any errors the adventure player might make when typing-in instructions. It is hoped that you tried to produce such a routine and if you did you probably reached the same conclusion I did – that it is absolutely impossible.

Well, perhaps not – just very difficult, that is all. A simple check in last month's listing could look for the presence of the word 'hte' and re-translate that as 'the', since there is no such word in the English language as 'hte' and one must assume that the player really meant to type-in the word 'the'. That occupied part of line 4018 and all of line 4700.

Similar amendments to the listing could be made and would allow us to check for other possible typing errors on the part of the player but, as well as being time-consuming, it would also use a good deal of memory, a precious commodity to the adventure game writer. Apart from that, the only sensible way would be to look at that part of the program which checks to see whether a non-recognised noun, for instance, is a recognised verb, in which case the program would inform the player that it had recognised the word but not in the context the player wanted to use it.

We could have a cross-referenced list of words stored in a two-dimensional array, WORDS say, so that if a non-recognised word – 'OPNE' for example – was found as part of WORDS(21,1), then WORDS(21,2) could contain the word 'OPEN' and insert that in the place of the spelling mistake. That would involve going through the whole parser again to try to analyse the sentence with its spelling mistake corrected and so, on the whole, it is probably

not worth the effort involved. We will have to assume that adventure game players can spell.

Since we are producing a text-only game we want to be able to store as much text as possible in memory, to give the player the impression that he is using a large, well-thought-out program. That is not particularly easy to do on most home computers. Some have large amounts of memory and will not need to compress text, although any adventure game gains by having more for the player to read while he is playing the game.

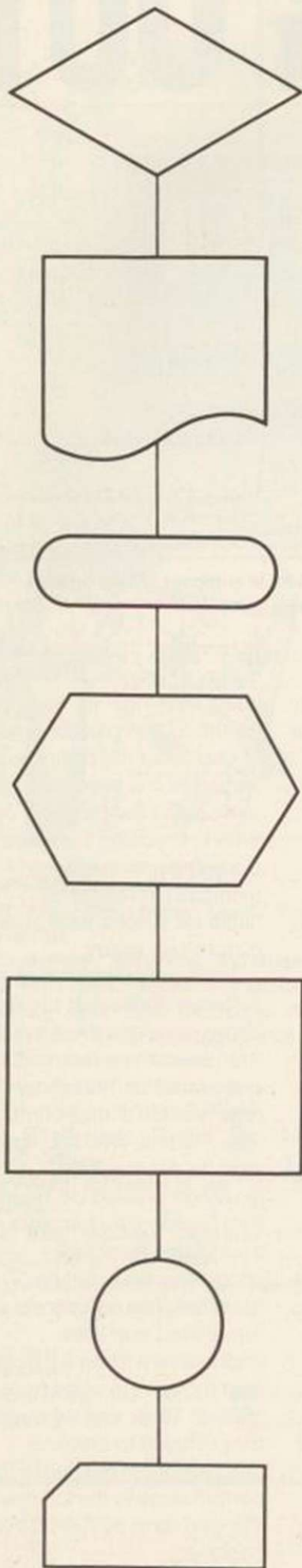
Other home computers have large amounts of memory tucked away somewhere which can be accessed and used to store some room descriptions without eating into our Basic memory. Others have not.

One could store all the text on disk and produce a game, Infocom-style, which reads all its room descriptions and messages from a series of disk files, freeing the main RAM of the computer to cope with the game and not worry about using vast portions of memory to print-out a message which may be seen only once by the player.

Our brief is to produce a stand-alone game, so disk drives are ruled out. We cannot be machine-specific, so there should be no PEEKing behind the ROMs to store data that way. We cannot assume that the computer has a massive amount of RAM to play with in the first place, so that leaves us with the problem of having literally to compress text.

When you see the word simple, ears prick up – it will all be easy this month. Wrong. Simple methods might be simple but they are not very good and tend to be very adventure-specific. What we are trying to do is to produce a generalised text compressor which will work on any adventure you might write and will be relatively easy to transport from one computer to another – as in BBC to Commodore 64, rather than just from one Amstrad PC to another Amstrad PC.

Let us look at something straightforward. Most location descriptions in adventure games tend to start with the words 'You are in a', or 'You have entered' or 'You have arrived at', or something reasonably similar. How about having a set of phrases stored away as a separate array which can be called up every time a certain symbol is met? Like, for example, this:



● Figure 1

```

10 A$(1)="You have arrived at a":A$(2)="You are standing in a"
20 REM get on with game for a bit.
1210 REM room description one comes here.
1211 Z$="1 wooden door, which is an integral part of a wooden
house.":GOSUB 1900:RETURN
1220 REM room description two comes here.
1221 Z$="2 large hole in the ground, with your feet immersed in
something stickily horrible.":GOSUB 1900:RETURN
1230 REM get on with game for a bit.
1900 FOR I=1 TO LEN(Z$)
1902 A$=MID$(Z$,I,1):IFA$="1" THEN PRINT A$(1):GOTO 1906
1903 IFA$="2" THEN PRINT A$(2):GOTO 1906
1904 REM a few more A$=
1905 PRINT A$
1906 NEXT I:RETURN

```

Not only does this take up a large amount of memory – if used judiciously it can save you a reasonable amount as well – it has the effect of making the resultant printout look very jerky, to say the least. Most computers have a number of characters stored in memory which are not accessed easily from the keyboard and anyway adventure location descriptions usually need only the letters of the alphabet, a few punctuation statements, and possibly – but not very often – numbers as well.

Consequently it is usually easy enough to find a collection of 64 or so characters, not part of the previously-mentioned lot, whose ASCII values are consecutive. Say, for example, characters 160 to 223 – fairly common, those. So if instead of line 1902 checking for AS it could check for the ASCII value of AS, and if it fell between 160 and 223 define a variable A to equal ASCII VALUE-160 and print AS(A), having predetermined what the 64 strings in AS() will be.

That can save memory but requires plenty of care to get the printout speed looking correct and also requires time and patience to get the descriptions to be spaced properly on the screen. Unless you want to write an interrupt-driven word-wrap routine you will be better doing this kind of thing by trial and error – printing the description on the screen and adding or deleting characters until it all fits into place.

The problem, however, is something rather more than being a little awkward to use. It is very adventure-specific; few adventures set in the Wild West will have anything in common with adventures set in Sherlock Holmes territory, to pick two differing types of adventure at random. Moreover, if you decide to dive into the murky waters of machine code and do all of the foregoing in 6502 code or whatever, you will have a good deal of work to do every time you want to set up a new collection of phrases for a new adventure.

How much better it would be if we could devise a routine which will work for any adventure and which will consistently save more space than that rather long-winded procedure. The answer will be revealed soon. It will give us a typical memory saving of about 35-40 per cent, which is one way of saying that room descriptions

which once occupied 18K is now reduced to something a little over 11K – an extra 7K for code, which is not to be sneezed at. Twice the memory Vic-20 had when it was introduced, merely by running the Gerrard text compressor. That is progress.

There are, however, a number of problems attached. Chief among them is that we cannot use numeric or graphic characters and instead are restricted to letters of the alphabet – upper- and lower-case, of course – spaces, commas, full stops, quotation marks and apostrophes. That should, of course, be sufficient to cater for all possible needs and if you want to use anything else in your descriptions you have to change the routine yourself. The great advantage of using it, however, apart from the memory saving, is that one line is used to print-out all room descriptions, wherever the player happens to be – or messages for that matter. Say the variable CP contains the current location. To print the location description which corresponds to location CP we:

POKE 51967,CP:SYS51968

At least, that POKE and SYS work on the version as implemented on the Commodore 64. Other machines will be covered later, when we get down to specifics.

First, how does it work? Most of the computers in the realms of the *Your Computer* readership are what is known as 8-bit computers. Larger business machines fall into the 16-bit group, while some can be described only as 2-bit. We devote ourselves to 8-bit computers now. Being an 8-bit machine, that means that in any one byte a computer is capable of addressing any one of 256 numbers.

One byte in an 8-bit computer consists of eight bits, and that, amazingly enough, is why they are called 8-bit computers. One byte is also the amount of memory occupied by any one character, like the letter 'A', the number '7', the symbol '*' and so on. We can split our one byte into its component eight bits like this:

● Figure 2

Bit number	7	6	5	4	3	2	1	0
Value	128	064	032	016	008	004	002	001

Each bit can be either on or off; there are only two ways about it. An electric cir-

cuit is either on or off and so is a bit. If bit zero of byte 1024, say, is on and all the

others are off, byte 1024 would contain the value 1. If bit one was on and all the rest were off, the same byte would contain the value 2. If bit three were on and the rest were off, the value 8 would be stored there. If bits four and five were on and the rest were off, the value of 48 (16+32) would be stored there. By adding all the numbers you reach the value of 255, which means that when all eight bits are turned on the value of 255 is stored in byte 1024. Thus 256 values can be stored in any one byte, since 255 numbers allows us to store 255 values plus one for when every bit is turned off and the byte contains the value of zero.

So we can store any one of 256 numbers in any one byte. How many characters is the average home computer capable of displaying on the screen, regardless of different colours and user-defined characters? By an amazing coincidence, 256. With how many bits can a high-resolution Spectrum screen cope horizontally? Again, 256. So when you store your location description somewhere in memory, so far as the computer is concerned you could be storing any one of 256 characters in every location of memory, and so one byte is used to store each character.

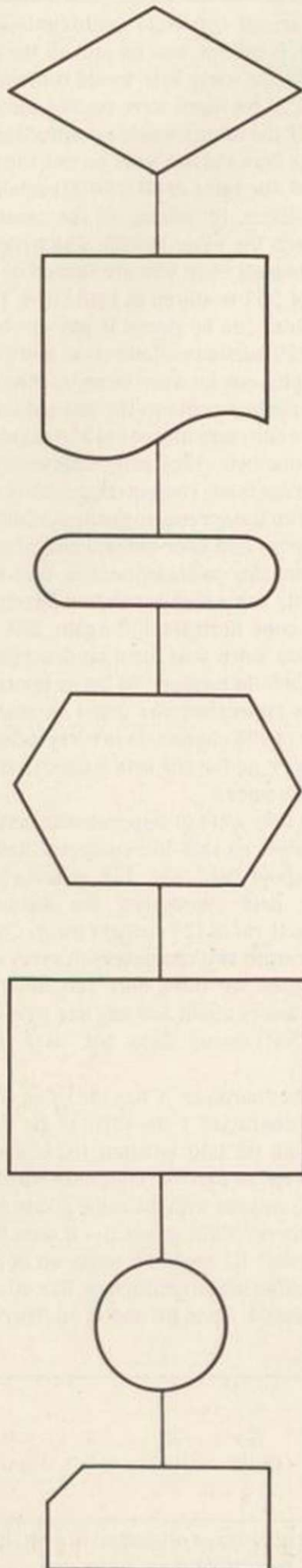
What if we were to dispense with certain characters, so that the computer had to worry about only, say, 128 of them? No reverse field characters, for instance, which gets rid of 128 straight away. Could we now store two characters in every one byte, since we have only 128 different ones to worry about and any one byte can store 256 values? Sadly not, as I shall explain.

Say the character 'A' has the value of 65 and the character 't' the value of 20. If we POKEd an 85 into location 1024, would that not tell us that one character with the value 65 and one with the value 20 are now stored there? Think about it – it does not. The number 85 could be made up of any combination of two characters, like 40 and 45, 21 and 64, 4 and 81, and so on. There is

only two ways about it. An electric circuit is either on or off and so is a bit. If bit zero of byte 1024, say, is on and all the

ADVENTURE BUILDING

Cont.



● Figure 3

```

10 REM YOUR COMPUTER PG 13/4/87
20 X$=CHR$(34):R1$=CHR$(18):R2$=CHR$(146):FORI=
1TO14:CD$=CD$+CHR$(17):NEXT
30 POKE55,0:POKE56,96:A=1024:B=55296
40 CD$=CHR$(144):CR$=CHR$(29)+CHR$(29)
50 POKE 53281,7:POKE53280,9:PRINTCHR$(147)CHR$(
144)CHR$(14):
60 FORI=0TO39:POKEA+I,28:POKEB+I,0:NEXT:FORI=1T
O23:POKEA+I*40,28:POKEB+I*40,0
70 POKEA+39+I*40,28:POKEB+39+I*40,0:NEXT:FORI=0
TO39:POKEA+960+I,28
80 POKEB+960+I,0:NEXT
90 PRINTTAB(31)R1$"Your Computer"R2$
100 PRINT:PRINT:PRINTCR$"Enter room description.
..R1$(1)"
110 PRINTCR$"Revise room description..R1$(2)"
120 PRINTCR$"Quit.....R1$(3)"
130 POKE198,0
140 GETA$:IFA$=""THEN140
150 IFA$="3"THEN420
160 IFA$="1"THEN270
170 IFA$<"2"THEN140
180 PRINT:PRINT:PRINTCR$"Enter room number ";
190 POKE198,0:R$=""
200 GETA$:IFA$=""THEN200
210 A=ASC(A$):IF(A<48ORA>57)ANDA<>20ANDA<>13THEN
200
220 R=LEN(R$):IFA=13ANDRTHENPRINTR2$:GOTO360
230 IFA=20ANDRTHENR$=LEFT$(R$,LEN(R$)-1):PRINTA$
:POKE1662,32:POKE1663,28:GOTO200
240 IFA=20THEN200
250 IFLEN(R$)=2THEN200
260 R$=R$+A$:PRINTR1$A$:GOTO200
270 PRINT:PRINT:PRINTCR$"Enter room number ";
280 POKE198,0:R$=""
290 GETA$:IFA$=""THEN290
300 A=ASC(A$):IF(A<48ORA>57)ANDA<>20ANDA<>13THEN
290
310 R=LEN(R$):IFA=13ANDRTHENPRINTR2$:GOTO390
320 IFA=20ANDRTHENR$=LEFT$(R$,LEN(R$)-1):PRINTA$
:POKE1662,32:POKE1663,28:GOTO290
330 IFA=20THEN290
340 IFLEN(R$)=2THEN290
350 R$=R$+A$:PRINTR1$A$:GOTO290
360 R=VAL(R$)
370 IFR>64ORR=0THEN30
380 R=R-1:POKE51976,R:R=R+1:SYS51968:GOSUB660:GO
TO490
390 R=VAL(R$)
400 IFR>64ORR=0THEN30
410 R=R-1:POKE51967,R:R=R+1:SYS51968:GOTO470
420PRINT:PRINTCR$"Are you sure (Y or N)?"
430 GETA$:IFA$="Y"THEN460
440 IFA$="N"THEN30
450 GOTO430
460 PRINTCHR$(147):END
470 PRINTCHR$(147):
480 PRINTCHR$(14):
490 PRINT:PRINTCHR$(19)LEFT$(CD$,10)R1$:FORH=1T
O40:PRINT" ";:NEXTH:PRINTCHR$(19):
500 PRINTCHR$(19)LEFT$(CD$,12)"Room number "R1$:
R:CHR$(157)"-CHR$(19):
510 PRINTCHR$(19)LEFT$(CD$,14)R2$"To compress:"R
1$"]R2$:CHR$(19):
520 GETA$:IFA$=""THEN520
530 IFA$="]"THEN610
540 IFA$=","ORAS$="."ORAS$=""ORAS$=" "ORAS$=CHR$(34
)THEN600
550 A=ASC(A$):IF(A>64ANDA<91)OR(A>192ANDA<218)TH
EN600
560 IFA$=CHR$(20)THENPRINTA$:GOTO520
570 IFA$=CHR$(13)THENPRINTA$:GOTO520
580 IFA$=CHR$(17)ORAS$=CHR$(145)ORAS$=CHR$(29)ORAS
=CHR$(157)ORAS$=CHR$(19)THEN600
590 GOTO520
600 PRINTA$:GOTO520
610 SYS51776
620 GOSUB660:PRINTCHR$(19)LEFT$(CD$,14)R1$"SPACE
"R2$"to return to menu."CHR$(19):
630 POKE198,0
640 GETA$:IFA$<" "THEN640
650 GOTO30
660 PRINTCHR$(147):
670 SYS51455
680 PRINT:PRINTCHR$(19)LEFT$(CD$,10)R1$:FORH=1T
O40:PRINT" ";:NEXTH
690 PRINTCHR$(19)LEFT$(CD$,12)"Room number "R1$:

```

no way of knowing which two numbers originally went into making up that number of 85.

If you study the diagram of how a byte is made up, you will see why. Look at the bits which have to be turned on to make the number 85. Unfortunately, it is not possible to store two separate numbers with values of anything up to 128 and then later distinguish those two numbers from any other two numbers.

If we used only numbers 0-16 we could do it. Sixteen times 16 equals 256, which is what we can store in one byte, remember? So if we multiply our first number by 16 it is stored in the left-most four bits of the byte. Add our second number, which is stored in the right-most four bits of the byte and you see how two separate numbers with values

in the range 0-16 can be stored in one byte.

There is only one problem. There are 26 letters in the alphabet and by using the range 0-16 we have confined ourselves to having room descriptions which use only characters in the range A-Q. That, as you might imagine, is a little annoying. Replacing anything later with a 'Q' with an 'a' is not very productive.

Twenty-six letters of the alphabet, plus a space, four punctuation marks and another character to indicate whether the letter concerned is an upper-case or a lower-case one, gives us 32 symbols to play with. The numbers 0-32 cannot be stored in one byte and still enable us to distinguish combinations of numbers but if we spread our information over a number of bytes we can then selectively take five

```

R1 CHR$(157) ". "; R2 CHR$(19);
700 RETURN
710 A$=STR$(I):A$=MID$(A$,2):IFLEN(A$)=1 THEN A$=""
O"+A$
720 RETURN
730 PRINT:PRINT"Press "R1$SPACE"R2$" to continue
R."
740 POKE198,0
750 GETA$:IFA$("<") THEN 750
760 PRINTCHR$(147);:RETURN

```

● Figure 4

Character	Meaning
CHR\$(34)	Quotation marks
CHR\$(18)	Reverse field on
CHR\$(146)	Reverse field off
CHR\$(17)	Move cursor down one line
CHR\$(144)	Turn print colour to black
CHR\$(29)	Move cursor right one character
CHR\$(14)	Switch to upper/lower case mode
A=1024	Start of screen memory
B=55296	Start of screen colour memory
POKE198,0	Empty keyboard buffer
48-57	ASCII values of numerals
20	ASCII value of delete one character
13	ASCII value of RETURN or ENTER
32	ASCII value of space
CHR\$(147)	Clear the screen display
CHR\$(19)	Move cursor to top left of screen
65-90	ASCII values of lower case letters
193-218	ASCII values of upper case letters
CHR\$(145)	Move cursor up one line
CHR\$(157)	Move cursor left one character

● Figure 5

```

LOADER PROGRAM
XLIST
5 DIMS(2),E(2),B(2),D(8)
10 READS(1),E(1),B(2),E(2),B(1),B(2):FOR I=1 TO 8:
READD(I):NEXT
20 R$=""
25 B=0
30 FOR J=8(1) TO E(1)
35 READA:B=B+A:POKEJ,A
40 NEXT
45 IF B<>S(1) THEN PRINT"Lines 200-370 incorrect."
:END
46 PRINT"Lines 200-370 correct."
50 B=0:D=0:P=0
55 FOR J=8(2) TO E(2)
60 D=D+1:IF D/100=INT(D/100) THEN GOSUB 90
65 READA:B=B+A:POKEJ,A:Z=Z+A
70 NEXT
75 IF Z<>S(2) THEN PRINT"Data error-stop." :END
80 PRINT"Data entered correctly." :END
90 IF Z<>D(P+1) THEN PRINT"Lines "P$100+400-"P$100
+490" incorrect." :END
91 PRINT"Lines "P$100+400-"P$100+490" correct."
92 P=P+1:Z=0:RETURN
100 DATA 1918, 52095, 50944, 51826, 25663, 129611
110 DATA 11546, 13782, 14736, 13518, 23256, 12886, 1236
4, 18066
200 DATA 7, 248, 215, 248, 87, 248, 87, 248, 87, 255
210 DATA 7, 248, 87, 248, 87, 248, 87, 184, 215, 248
220 DATA 7, 248, 87, 248, 87, 248, 87, 120, 87, 248
230 DATA 7, 248, 87, 248, 87, 248, 87, 248, 87, 248
240 DATA 7, 250, 87, 248, 87, 248, 87, 248, 0, 3
250 DATA 174, 250, 202, 189, 64, 203, 141, 45, 199, 141
260 DATA 7, 199, 141, 113, 199, 141, 157, 199, 141, 181
270 DATA 199, 141, 3, 201, 141, 19, 201, 141, 30, 201
280 DATA 141, 51, 201, 141, 64, 201, 141, 77, 201, 141
290 DATA 96, 201, 141, 106, 201, 141, 128, 201, 141, 142
300 DATA 201, 141, 154, 201, 141, 174, 201, 96, 255, 0
310 DATA 255, 0, 255, 8, 96, 97, 98, 99, 100, 101
320 DATA 102, 103, 104, 105, 106, 107, 108, 109, 110, 111
330 DATA 112, 113, 114, 115, 116, 117, 118, 119, 120, 121

```

```

340 DATA 122, 123, 124, 125, 126, 127, 128, 129, 130, 131
350 DATA 132, 133, 134, 135, 136, 137, 138, 139, 140, 141
360 DATA 142, 143, 144, 145, 146, 147, 148, 149, 150, 151
370 DATA 152, 153, 154, 155, 156, 157, 158, 159
400 DATA 162, 0, 189, 128, 5, 32, 0, 200, 233, 1
410 DATA 153, 0, 195, 200, 232, 192, 9, 48, 239, 32
420 DATA 80, 200, 234, 189, 0, 195, 10, 10, 10, 141
430 DATA 233, 198, 232, 189, 0, 195, 41, 28, 74, 74
440 DATA 109, 233, 198, 153, 235, 99, 200, 189, 0, 195
450 DATA 41, 3, 10, 10, 10, 10, 10, 10, 141, 253
460 DATA 198, 232, 189, 0, 195, 10, 109, 233, 198, 141
470 DATA 233, 198, 232, 189, 0, 195, 41, 16, 74, 74
480 DATA 74, 74, 109, 233, 198, 153, 235, 99, 200, 189
490 DATA 0, 195, 41, 15, 10, 10, 10, 10, 141, 253
500 DATA 198, 232, 189, 0, 195, 41, 30, 74, 109, 233
510 DATA 198, 153, 235, 99, 200, 234, 189, 0, 195, 41
520 DATA 10, 10, 10, 10, 10, 10, 10, 141, 253
530 DATA 198, 232, 189, 0, 195, 10, 10, 109, 233, 198
540 DATA 141, 233, 198, 232, 189, 0, 195, 41, 24, 74
550 DATA 74, 74, 109, 233, 198, 153, 235, 99, 200, 189
560 DATA 0, 195, 41, 7, 60, 10, 10, 10, 141, 253
570 DATA 233, 198, 232, 189, 0, 195, 109, 233, 198, 153
580 DATA 235, 99, 200, 234, 234, 234, 234, 140, 84, 200
590 DATA 172, 255, 199, 200, 200, 200, 200, 200, 140, 255
600 DATA 199, 192, 240, 240, 15, 140, 44, 199, 140, 84
610 DATA 199, 140, 112, 199, 140, 156, 199, 140, 180, 199
620 DATA 140, 0, 140, 84, 200, 32, 96, 200, 173, 255
630 DATA 199, 201, 240, 240, 5, 76, 0, 199, 234, 234
640 DATA 96, 234, 234, 234, 234, 234, 234, 234, 234, 234
650 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
660 DATA 201, 44, 240, 27, 201, 48, 240, 26, 201, 39
670 DATA 240, 25, 201, 34, 240, 24, 201, 27, 48, 24
680 DATA 201, 64, 16, 23, 169, 30, 96, 234, 169, 27
690 DATA 96, 169, 28, 96, 169, 29, 96, 169, 31, 96
700 DATA 169, 30, 96, 234, 105, 1, 96, 169, 31, 153
710 DATA 0, 195, 189, 128, 5, 233, 64, 200, 153, 0
720 DATA 198, 96, 120, 120, 120, 120, 120, 234, 234, 234
730 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 160
740 DATA 0, 142, 1, 199, 162, 0, 96, 120, 120, 120
750 DATA 120, 120, 173, 254, 200, 109, 1, 199, 141, 254
760 DATA 200, 162, 0, 142, 1, 199, 176, 16, 170, 142
770 DATA 3, 199, 142, 57, 200, 162, 5, 142, 4, 199
780 DATA 142, 58, 200, 96, 162, 5, 142, 120, 200, 170
790 DATA 76, 113, 200, 26, 214, 180, 215, 70, 103, 90
800 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
810 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
820 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
830 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
840 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
850 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
860 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
870 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
880 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
890 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
900 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
910 DATA 128, 162, 0, 189, 0, 99, 41, 248, 74, 74
920 DATA 74, 234, 168, 185, 32, 202, 32, 240, 201, 189
930 DATA 0, 99, 41, 7, 10, 10, 141, 253, 201, 232
940 DATA 189, 0, 99, 41, 192, 74, 74, 74, 74, 74
950 DATA 74, 109, 235, 201, 168, 185, 32, 202, 32, 240
960 DATA 201, 189, 0, 99, 41, 62, 74, 168, 185, 32
970 DATA 202, 32, 240, 201, 189, 0, 99, 41, 1, 10
980 DATA 10, 10, 10, 141, 253, 201, 232, 189, 0, 99
990 DATA 41, 240, 74, 74, 74, 74, 109, 235, 201, 168
1000 DATA 185, 32, 202, 32, 240, 201, 189, 0, 99, 41
1010 DATA 15, 10, 141, 258, 201, 232, 189, 0, 99, 41
1020 DATA 128, 74, 74, 74, 74, 74, 74, 74, 109, 255
1030 DATA 201, 168, 185, 32, 202, 32, 240, 201, 189, 0
1040 DATA 99, 41, 124, 74, 74, 168, 185, 32, 202, 32
1050 DATA 240, 201, 189, 0, 99, 41, 3, 10, 10, 10
1060 DATA 141, 255, 201, 232, 189, 0, 99, 41, 224, 74
1070 DATA 74, 74, 74, 109, 255, 201, 168, 185, 32
1080 DATA 202, 32, 240, 201, 189, 0, 99, 41, 31, 168
1090 DATA 185, 32, 202, 32, 240, 201, 234, 239, 240, 4
1100 DATA 232, 76, 1, 201, 96, 234, 234, 234, 234, 234
1110 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
1120 DATA 172, 254, 201, 192, 1, 240, 4, 32, 210, 255
1130 DATA 96, 160, 0, 140, 254, 201, 105, 127, 76, 215
1140 DATA 201, 234, 234, 234, 234, 234, 234, 234, 234, 234
1150 DATA 234, 234, 76, 00, 202, 234, 234, 234, 234, 234
1160 DATA 234, 234, 234, 234, 234, 64, 0, 24, 185, 32
1170 DATA 202, 201, 64, 240, 4, 76, 208, 201, 96, 141
1180 DATA 253, 201, 160, 1, 140, 254, 201, 96, 234, 234
1190 DATA 234, 234, 234, 234, 234, 234, 234, 234, 234, 234
1200 DATA 65, 66, 67, 68, 69, 70, 71, 72, 73, 74
1210 DATA 75, 76, 77, 78, 79, 80, 81, 82, 83, 84
1220 DATA 85, 86, 87, 88, 89, 90, 91, 92, 93, 94
1230 DATA 95, 96, 162, 0, 160, 4, 142, 44, 199, 142
1240 DATA 86, 199, 142, 112, 199, 142, 156, 199, 142, 180
1250 DATA 199, 142, 84, 200, 142, 3, 199, 142, 57, 200
1260 DATA 140, 4, 199, 140, 58, 200, 142, 1, 199, 142
1270 DATA 254, 200, 140, 120, 200, 142, 255, 199, 160, 0
1280 DATA 74, 0, 199

```

consecutive bits from each byte and use them in turn, since five bits are the number required to give us a value in the range 0 to 31, or 32 different numbers.

Now all we have to do is write a machine code routine which translates what is found on the screen and decodes it so that eight bytes – or characters on the screen – are now translated into five bytes' worth of information; and reads five bytes of information from memory and re-converts it into eight characters again.

If you have just been dazed and confused, do not worry. To put it basically, we will read in our location descriptions, typed-in normally on the screen, in groups of eight bytes or characters. A machine code routine will take care of everything and store the data in memory. When we

want to recall it, another machine code routine will re-convert everything to normal and display our location description as it was first typed-in, but now occupying somewhat less than two-thirds of its original amount of memory.

This sadly machine-specific Basic routine allows you to enter your descriptions and then stores them in memory for later recall. You will need to save them to disk or tape using an assembler, monitor, or whatever. To go mad, you will need to save memory from \$6000 to \$9FFF if you use the maximum allowed 64 room descriptions, each of which, when condensed, occupies a maximum of 256 bytes in memory – around 380-390 characters of uncondensed location description. Those figures apply only to a Commodore 64, of

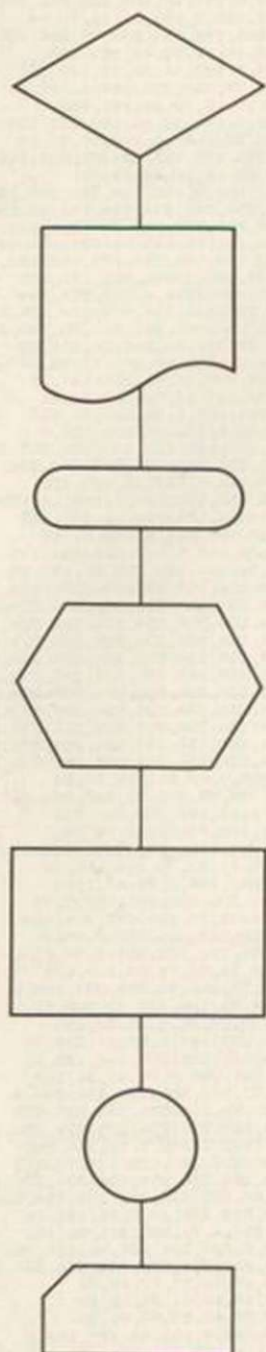
course; others to follow.

Given the following table, you should be able to convert it to run on any home computer.

So much for American Standard Code for Information Interchange. It is like trying to fit a spare Ford Escort engine into something which Nigel Mansell might use to do better than he did in the Brazilian Grand Prix. Line 30, by the way, lowers the top of Basic memory on the 64 to allow us to use 16K up at the top without interfering with anything else. Use HIMEM, or whatever commands your computer might have, instead.

If you look at lines 380, 610 and 670, you will see three SYS calls to machine code routines. These machine code routines are listed – Commodore 64 only:

Cont.



● Figure 6

```

BASIC COMPRESSION
XLIST
 5 PRINTCHR$(147);:REM CLEAR THE SCREEN
 6 PRINTCHR$(14);:REM SET UPPER/LOWER CASE
10 PRINT"You are walking along a dusty, dirty"
12 PRINT"trail towards the centre of town. To"
13 PRINT"the south, behind you, there is nothin
g"
14 PRINT"but rocks and wilderness, land not fit
"
15 PRINT"for man nor beast, even you. To the"
16 PRINT"north, however, is the town, home of"
17 PRINT"saloons and good time gals, liquor and
,"
18 PRINT"if you ever make it that far, a bank a
s"
19 PRINT"well. This is your source of money.
Gofor it."
20 I=I+X;X=0:IFI>367THEN100
21 Q=0:FORJ=QTOQ+7
22 B=0
25 A=PEEK(1024+I+J)
26 IF(A>0AND<27)THEN40:REM LOWER CASE LETTER
28 IFA=32THENA=27:GOTO40:REM SPACE
30 IFA=44THENA=28:GOTO40:REM COMMA
32 IFA=46THENA=29:GOTO40:REM FULL STOP
33 IFA=34THENA=30:GOTO40:REM QUOTES
34 IFA=39THENA=31:GOTO40:REM APOSTROPHE
35 IF(A>64AND<91)THENA=A-64;B=1:GOTO40:REM UPP
ER CASE LETTER
36 PRINT:PRINT"Character not valid. Re-enter t
ext.":END
40 IFB=1ANDQ=7THENB=0
41 A=A-1:A(Q)=A:IFB=1THENA(Q)=31:A(Q+1)=A:Q=Q+1
42 X=X+1:Q=Q+1:IFQ=8THEN46
43 NEXTJ
46 A=(A(0)8B:B=(A(1)AND28)/4:A=A+B:POKE49664+P,A
47 A=(A(1)AND3)864:B=A(2)82
48 C=(A(3)AND16)/16:A=A+B+C:POKE49665+P,A
49 A=(A(3)AND16)/16:B=(A(4)AND30)/2:A=A+B:POKE4
9666+P,A
50 A=(A(4)AND1)8128:B=A(5)84:C=(A(6)AND24)/8
51 A=A+B+C:POKE49667+P,A
52 A=(A(6)AND7)832:B=A(7):A=A+B:POKE49668+P,A
53 P=P+5
54 GOTO20
100 PRINTCHR$(147);:REM CLEAR SCREEN
102 Z$="ABCDEFGHIJKLMNOPQRSTUVWXYZ ,.-"+CHR$(34)+
""$
104 Z=0:P=235
106 FORI=0TO4:A(I)=PEEK(49668+Z-I):NEXT
108 A=(A(4)AND248)/8:GOSUB120
109 A=(A(3)AND192)/64:B=(A(4)AND7)84:A=A+B:GOSUB
120
110 A=(A(3)AND62)/2:GOSUB120
111 A=(A(2)AND240)/16:B=(A(3)AND1)816:A=A+B:GOSUB
120
112 A=(A(1)AND128)/128:B=(A(2)AND15)82:A=A+B:GOSUB
120
113 A=(A(1)AND124)/4:GOSUB120
114 A=(A(0)AND224)/32:B=(A(1)AND3)88:A=A+B:GOSUB
120
115 A=A(0)AND31:GOSUB120
116 Z=Z+5:IFZ<PTHEN106
118 END
120 A=A+1
121 IFA=32THENX=1:GOTO125
122 IFX=1THENV=ASC(MID$(Z$,A,1)):V=V+128:PRINTCH
R$(V):X=0:GOTO125
123 PRINTMID$(Z$,A,1);
125 RETURN
  
```

It works and if you have an assembler or disassembler you will be able to take it to pieces and see precisely how it fits together. If you have not or do not have a Commodore 64 but still want to use the routine, here is the same thing in Basic, which will do the same thing but, of course, at a much slower rate:

This is much easier to adapt for other machines and if you do not understand about truth tables, ANDs and ORs, I fear that is a little beyond the scope of this article. There are plenty of books on the subject, so unfortunately you will have to be content with the fact that it works.

Anyway, back to conversion. All you need to know are the position of the top left-hand corner of the screen in memory – location 1024 on the Commodore 64, as used in line – the ASCII values of characters as spelt out in lines 26-35, and to find somewhere safe in memory to store your information after altering the top of Basic memory, using HIMEM or whatever. This refers to the POKE 499xxs everywhere.

Compared to the Commodore 64 machine code version this runs like a disease-riddled snail but at least it works. It is also much easier to convert for other computers. The printout on the screen is pleasant, as it is done at a fast enough speed to keep the interest of the player without being so fast as to be illegible – as if written by an invisible hand, as someone once described it.

Both this Basic and the earlier machine code program work in the same way. Take a string of characters – ZS in the Basic program, just a collection of 32 consecutive bytes in the machine code one – find the values of the eight/five-byte decoding and recoding, and print the appropriate character.

Use the program headed Demonstration Model to enter your location descriptions, up to a maximum of 64 as noted. On the bottom line of the text area when entering your description, do not use more than about the first 15 characters, because if you do the rest will be ignored. That still

gives you 64 descriptions, each of a maximum of about 380 characters which, when compressed, will occupy some 250 characters each – reasonable saving.

There is plenty of theory but not much work this month, so your homework must be to understand the theory behind the text compression technique. When you do, Commodore 64 owners can relax secure in the knowledge that all they have to do by the time next month's *Your Computer* appears is to enter the 64 room location descriptions. The remainder can either live with the slowness of the compression technique – which, after all, only you will see: the person playing the game will see the resultant printout, or try dabbling in machine code.

Having squeezed our quart of text into a pint of memory, next month we will start building the vocabulary of the game and seeing how the two parts discussed so far – parser and text compressor – are used to generate the beginnings of the adventure game.

LONDON'S LARGEST DISPLAY OF PRINTERS MONITORS
COMPUTERS AND PERIPHERALS

HI VOLTAGE

The London AMIGA Centre

NEW AMIGA A500 IN STOCK NOW!

'The Ultimate Home Computer' 512K machine with built-in 3 1/2" 880K double sided drive. Runs original Amiga software

PRICES FROM **£499** + VAT
INCLUDING FREE SOFTWARE



AMIGA A1000 IN STOCK NOW!

Based around the Motorola 68000 CPU, with multi-tasking as standard along with a palette of 4096 colours.

PRICES FROM **£599** + VAT
INCLUDING FREE SOFTWARE
+ ON SITE MAINTENANCE

ALEGRA 1/2 MEG
A1000 RAM PACK CAN
BE UPGRADED TO 2 MEGS
NOW ONLY **£299** + VAT



NEW AMIGA A2000 IN STOCK NOW!

'The Only Desktop Computer You Will Ever Need' capable of running 2 x 3 1/2" disc drives, 1 x 5 1/4" drive and a hardcard with IBM Emulation simultaneously.

PRICES FROM **£1095** + VAT
INCLUDING FREE SOFTWARE + ON SITE MAINTENANCE



AMIGA SOFTWARE - LOWEST PRICES

Aegis Animator	£99.95	Digiview	£189.95
Aegis Draw	£124.95	Logistix	£139.95
Aegis Drawplus	£219.95	Modula2	£79.95
Aegis Images	£49.95	Pagesetter	£119.95
Aegis Impact	£119.95	Sonix (musicraft)	£69.95
CLI-mate	£29.95	Superbase Personal	£124.95
Deluxe Music Const. V.2	£79.95	Truebasic	£129.95
Deluxe Paint V.2	£119.95	Flight Simulator II	£44.95
Digi Paint	£59.95	FS2 Scenery Disc No. 7	£24.95

All prices include VAT and UK P&P

PHONE FOR NEW CATALOGUE
On Amiga Hardware and Software

PUBLISHER "Move over Mac"

Desk top publishing for the Amiga integrates with deluxe paint, scribble wordprocessor etc. Can produce copy in both colour and black and white

IN STOCK NOW **£149.95** inc VAT
Desktop Publishing Software inc. FREE Postscript Driver

Mail Order + Export Hot Line Phone 01-686 6362

Delivery by Securicor (4 day) please add £5.75 per item.
Delivery by Securicor 24 hour please add £9.95 per item.

Send off or order by 'phone quoting your Access, Visa No.
'Phone 01-686 6362. Immediate despatch on receipt of order or cheque clearance. Or Telex your order on: 946240 Attn 19001335.

EXPORT

Contact our specialist export department on 01-686 6362

EXPORT CUSTOMERS SUPPLIED TAX FREE.

OPEN MONDAY-SATURDAY 9 AM-6 PM

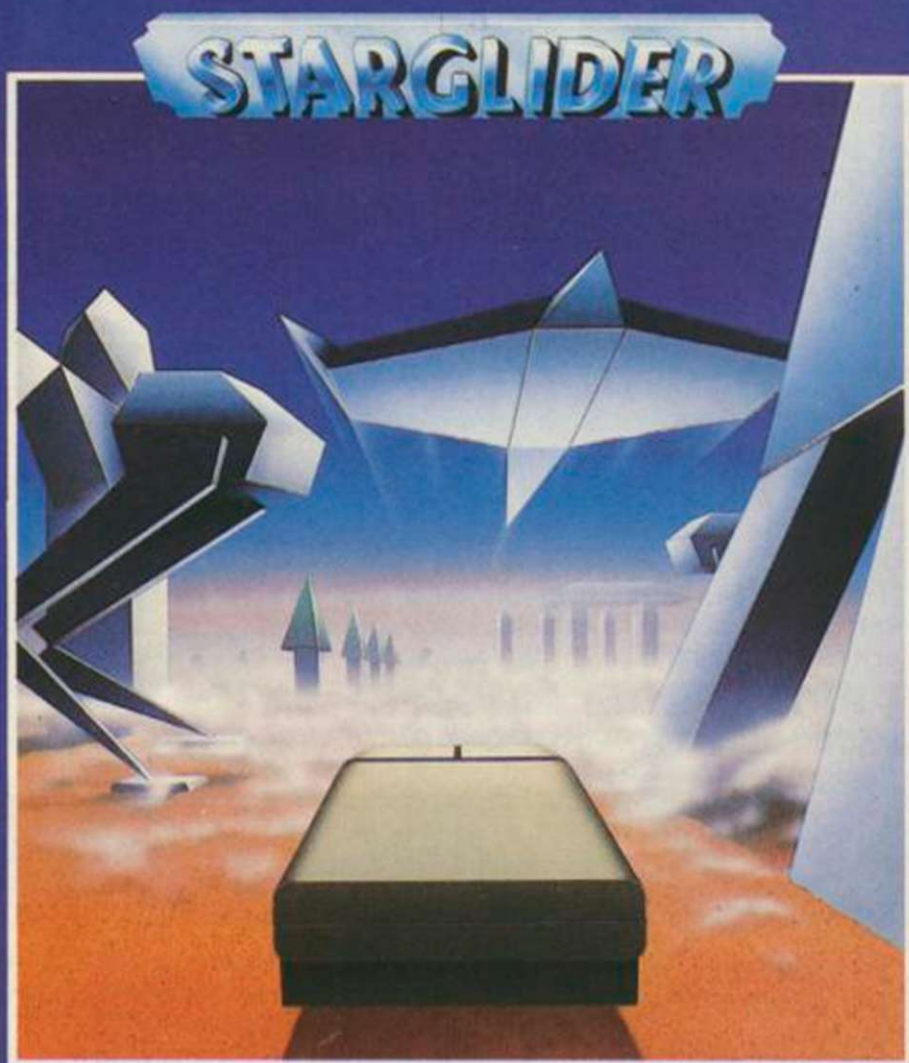
OPEN MONDAY-SATURDAY 9 AM-6 PM

ALSO A VAST RANGE OF DISK DRIVES, JOYSTICKS, DISK BOXES, INTERFACES, SHEETFEEDERS, ETC.

HI VOLTAGE 53-59 High Street, Croydon, Surrey CR0 1QD. Tel: 01-681 3022

Prices correct at copy date. Subject to change without notice due to currency fluctuations etc. E. & O.E.

COMPLETION



NOVELLA

By James Follett

This month we are offering five copies of each of two of the most exciting games to be released in the last few months, Rainbird's *Starglider* and *The Pawn*.

Starglider is the game entirely to blame for the low productivity of certain *Your Computer* staff, which may or may not convince you that it is worth having. Once you've begun blasting away at the disturbing variety of enemies trying to block your intergalactic progress we can guarantee that you too will be spending a lot of time out there.

The Pawn is an illustrated adventure of rare quality and imagination. Set in the fairy land of Kerovnia (from which you are trying to escape) *The Pawn* is enriched by many interesting characters and situations with which to interact, all illuminated by the stunning graphics. Addictive stuff.

Both games are packaged to the usual high Rainbird standards and include a lengthy novella each, as well as hints and instructions.

To enter simply send your answers to these five questions along with your name, address and preferred format to *Your Computer*, Greencoat House, Francis Street, London SW1

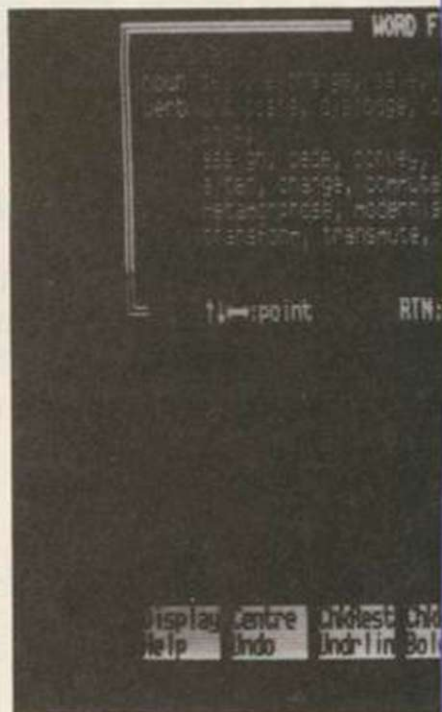
TAR 4

This is particularly time-consuming when a document is being written to a specific word or line count, as the new word-counting program can be invoked only from the opening menu. Previous versions of WordStar leave the layout settings as the user left them unless he exits WordStar altogether and returns to the operating system.

Thesaurus

WordStar Professional packages have always included spelling and mail merge software, and this new version is no exception. This version goes one step further by including a new facility, an on-line thesaurus called Word Finder. Like CorrectStar, the spelling checker, Word Finder only becomes useful when installed on a hard disk. The dictionary and thesaurus files are extremely large and only the capacity and speed of a hard disk can do justice to the elegant design of the software.

Word Finder is a TSR program, like Sidekick, and must be loaded from the DOS as part of a start-up batch file. It is remarkably



● Above and below: the wonders of...
 ily add their jargon to a supplementa...
 tionary so that it will not be queried...
 Alas, CorrectStar, like all spelling...
 kers, is unable to spot errors whe...
 wrong word has been used. If yo...
 "core" instead of "care" it will pass...
 marked.
 Other features never bef...

1DG, to arrive by Monday 6 July 1987.

Competition Rules

The winners of the competition will be the persons who send the first all-correct entries drawn from all those received before the closing date of the competition.

The names of the winners will be announced in the August issue of *Your Computer*.

All entries must arrive at the *Your Computer* offices by Monday 6 July 1987.

Each person must enter the competition only once.

Entries to the competition cannot be acknowledged.

No employees of Focus Investments nor their agents or close relatives may enter the competition.

The decision of the Editor in all respects of the competition will be final.

No correspondence with regard to any aspect of the competition will be entered into.

Focus Investments assumes no responsibility or liability for any complaints arising from this competition.

Starglider	
<input type="checkbox"/>	Atari ST
<input type="checkbox"/>	Amiga
<input type="checkbox"/>	Apple II
<input type="checkbox"/>	Commodore 64/128 (disk & cassette)
<input type="checkbox"/>	Amstrad PCW 8256
<input type="checkbox"/>	Amstrad 6128
<input type="checkbox"/>	IBM
<input type="checkbox"/>	Spectrum 48/128 (cas)

Pawn	
<input type="checkbox"/>	Atari ST
<input type="checkbox"/>	Amiga
<input type="checkbox"/>	Macintosh
<input type="checkbox"/>	Commodore 64/128 (disk)
<input type="checkbox"/>	Amstrad PCW 8256
<input type="checkbox"/>	Atari 800 (disk)
<input type="checkbox"/>	Amstrad 6128
<input type="checkbox"/>	Spectrum 128 (cassette)
<input type="checkbox"/>	Apple II

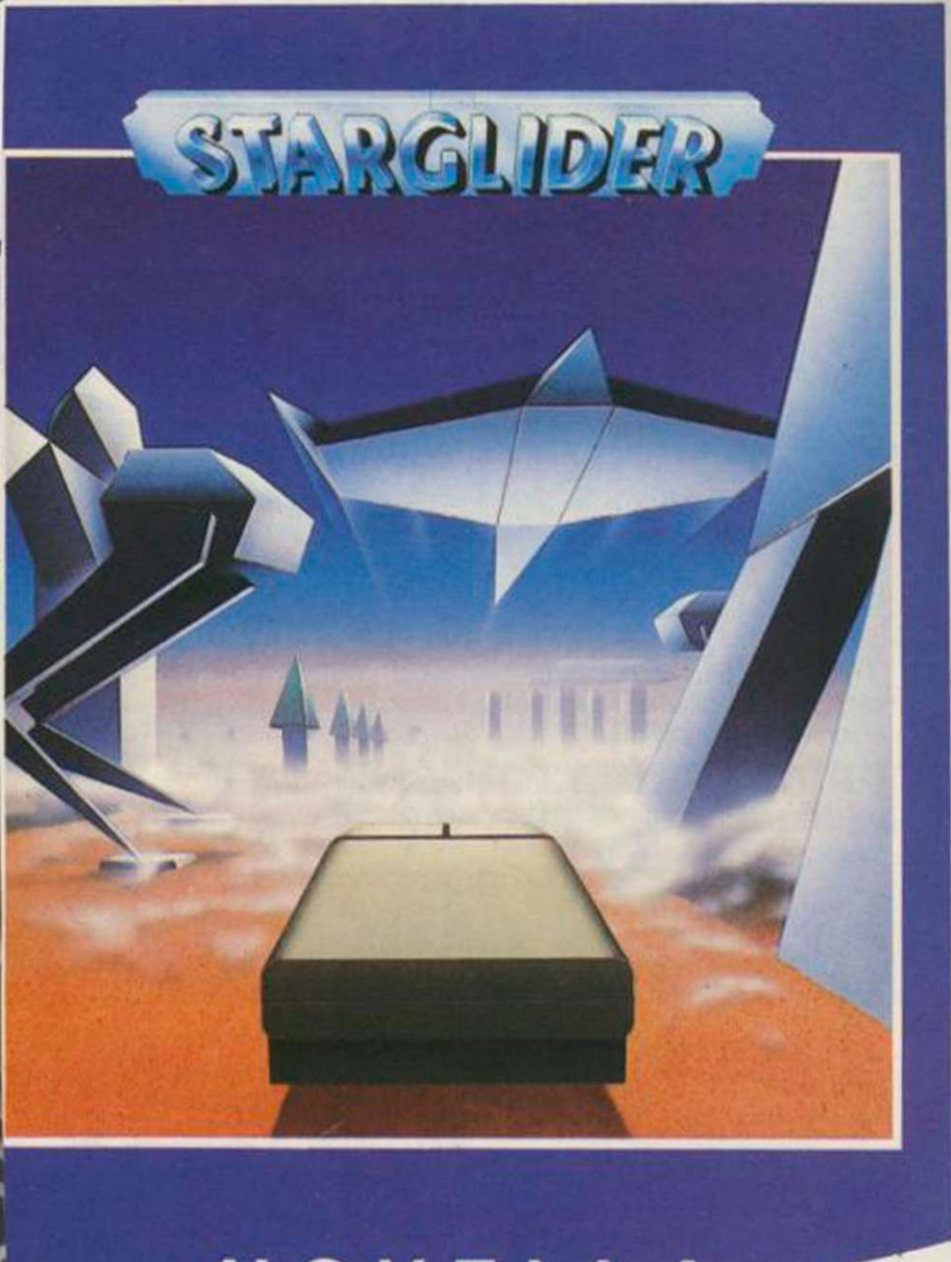
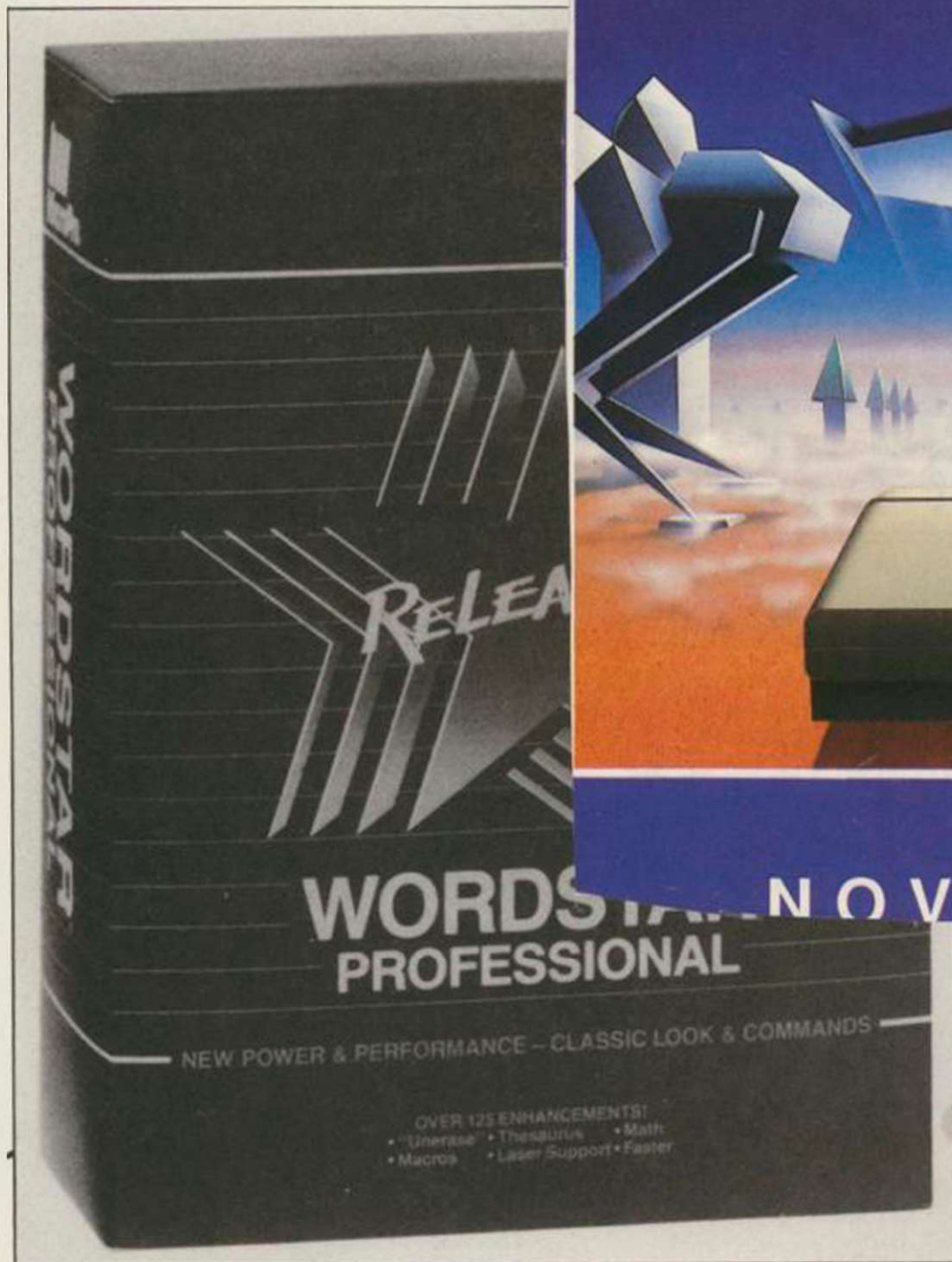
QUESTIONS

1. What was the first machine for which *Starglider* was released?
2. Who is the author of *Starglider*?
3. Which software company wrote *The Pawn* for Rainbird?
4. Which famous programming partnership is generally credited with writing the first mainframe computer adventure game? Is it:
 A) Kernighan & Ritchie?
 B) Crowther & Woods?
 C) Crowther & Dalglish?
5. Which company owns Rainbird Software?

Name

Address

W



WORDSTAR PROFESSIONAL NOVELLA

Variations

Creating or editing a document with the new WordStar a few variations from the traditional control-key sequences appear. Changing the line spacing now requires an extra carriage return, though the range of available settings is now much wider. Changing the level of help menu assistance uses a revised sequence of keystrokes which will irritate the seasoned WordStar user at first.

Where a particular sequence of editing commands needs to be repeated a number of times the appropriate keystrokes can be entered into a keyboard macro in the fashion made popular by Lotus 1-2-3. In the past, many WordStar users have adopted similar tactics by using third-party macro generators.

One change which some users will consider retrograde concerns the loss of margin settings and line spacing when a document is closed and the user returns to the opening menu. When the document is reopened the settings revert to the defaults. The text which has already been entered retains the layout it was given at the time of writing, but if any alterations or additions are to be made, the layout settings must be returned to the old values.

WordStar Professional Release 4.0 is a classic defeat of revolution by evolution. Its publisher Micropro had a smash hit with the WordStar line in the heyday of CP/M, but then concentrated on new products which bore little resemblance to the classic WordStar other than the name in some cases.

The procession of WordStar 2000, Easy and WordStar 1512 left many old-time WordStar users disgruntled that their favourite word-processor was not being upgraded to take advantage of the latest WP features. Some even defected to a look-a-like program called *NewWord*, which looked and felt like WordStar but had the audacity to include many long-awaited features not yet available from the Micropro camp, and at a lower price.

With considerable style, Micropro killed

two birds with one stone. Buying the upstart *NewWord* developments effectively eliminated the irritation of another company eating into Micropro's market. Meanwhile, the brains behind *NewWord* went into a huddle with the Micropro team to come up with a completely renovated WordStar which combined up-to-date functionality with the traditional WordStar look and feel.

Influence

WordStar 4.0 clearly shows the *NewWord* influence. The program files are now mostly .EXE rather than .COM files, and the overall size of comparably set-up systems has grown considerably. WordStar 4 can be run on floppy disk system, but the meagre 360K of storage on a PC-compati-

TAR 4.0

This is particularly time-consuming when a document is being written to a specific word or line count, as the new word-counting program can be invoked only from the opening menu. Previous versions of WordStar leave the layout settings as the user left them unless he exits WordStar altogether and returns to the operating system.

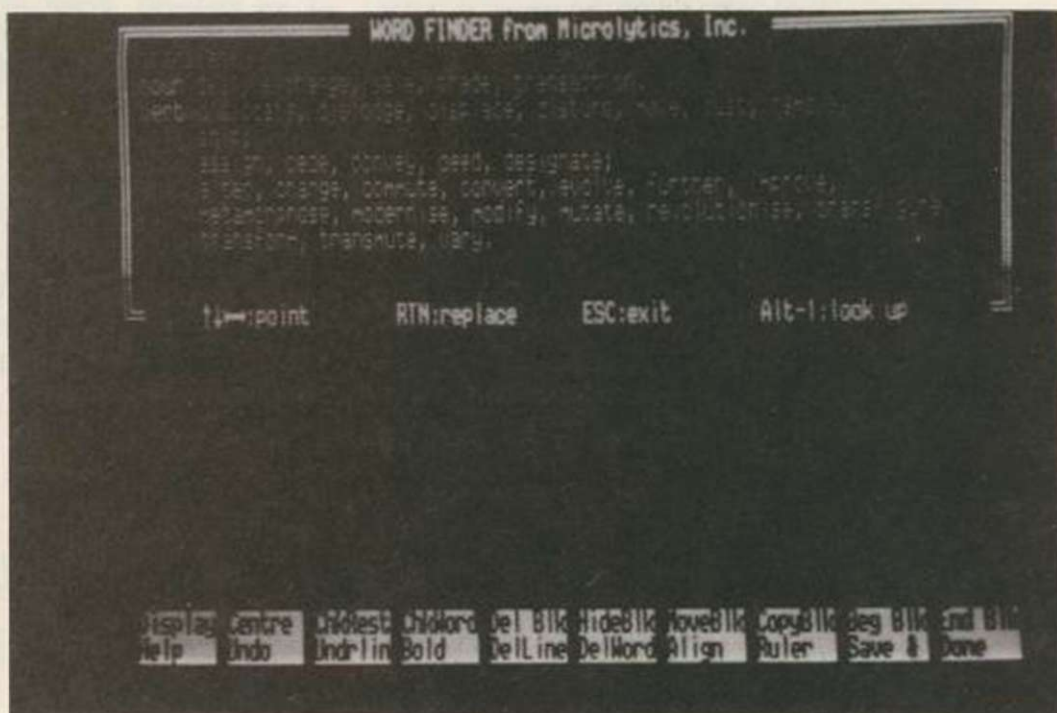
Thesaurus

WordStar Professional packages have always included spelling and mail merge software, and this new version is no exception. This version goes one step further by including a new facility, an on-line thesaurus called Word Finder. Like CorrectStar, the spelling checker, Word Finder only becomes useful when installed on a hard disk. The dictionary and thesaurus files are extremely large and only the capacity and speed of a hard disk can do justice to the elegant design of the software.

Word Finder is a TSR program, like Sidekick, and must be loaded from the DOS prompt or as part of a start-up batch file before WordStar itself. It is remarkably straightforward to use — just position the cursor on a word you wish to look up and press ALT-1. A window opens at the top of the screen and within a second the synonyms for the selected word appear. If none of these appears suitable, more alternatives can usually be raised by looking up one of the words within the window. Another keystroke substitutes the new word for the one in the original text.

Primitive

For some years the Micropro spelling checker was a rather primitive piece of software known as SpellStar. One of the major innovations of the otherwise unremarkable WordStar 2000 was a completely new spelling checker known as CorrectStar. This has now been implemented as part of the WordStar professional package, where it offers a fast and convenient way of looking up a single word or checking through a complete document. As CorrectStar searches through the text, unrecognised words are automatically queried. Often CorrectStar is able to suggest the correct spelling of a mistyped word, and making the substitution is a single-keystroke operation. Writers with specialised vocabularies can eas-



● Above and below: the wonders of WordStar 4.0.

ily add their jargon to a supplementary dictionary so that it will not be queried.

Alas, CorrectStar, like all spelling checkers, is unable to spot errors where the wrong word has been used. If you type "core" instead of "care" it will pass unremarked.

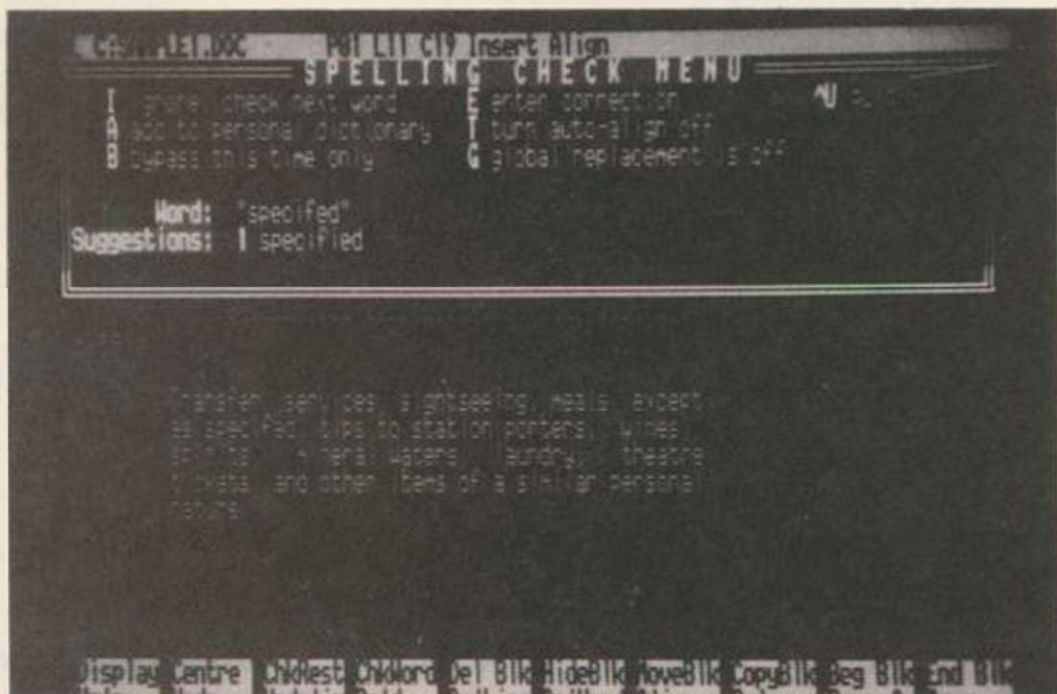
Other features never before seen in WordStar Professional include built-in arithmetic functions and rudimentary box-drawing. The latter would come into its own particularly when used in conjunction with a laser printer driver. Sadly, though, no Postscript driver is available, so laser printer support is limited to those units which can emulate less sophisticated impact printers.

The arithmetic functions are extremely

useful. An on-screen calculator is provided for quick calculations, but most PC owners already use something like Sidekick for such purposes. More valuable is a block mathematics function, allowing you to perform some of the functions of a spreadsheet program within a word-processing document.

WordStar Professional 4.0 is a great step forward from the earlier versions, yet it retains the fundamental way of working which long-term WordStar users know so well. It should ensure the continued success of the WordStar dynasty for years to come.

WordStar Professional 4.0
£399.00 plus VAT
Micropro UK 01-879 1122



Subscribe to **YOUR COMPUTER**

A new look for an established magazine

Your Computer is now taking a new approach to satisfying its readership. More in-depth reviews, more features, more style, and more to satisfy computer owners who want to do more than just play games. We are sure that existing subscribers will immediately find the magazine changes for the good, but if you have yet to subscribe, now's the time!

Special offer

10% OFF

Anyone subscribing to *Your Computer* this issue will save 10%* on the new subscription price of £18 per annum. This means that for twelve months, you will receive the best computer magazine available, earlier than your friends, and cheaper too!

A subscription to *Your Computer* makes an ideal present for a friend with an interest in computers. Just complete the appropriate section below, make your cheque payable to Focus Magazines Ltd and send to Quadrant Subscription Services, Oakfield House, Perrymount Road, Haywards Heath, RH16 3DH.

I would like to take advantage of the Your Computer special offer. Please begin my subscription with the next issue of the magazine. I enclose a cheque/postal order for £16.20.

Name _____

Address _____

Postcode _____

Please send the subscription to the person named below starting with the next issue.

Name _____

Address _____

Postcode _____

June 1987 *Your Computer* *UK Residents Only Offer closes October 1987

GHOST WRITER

It is terrible to be saddled with something you did nearly 10 years ago. There can hardly be a single sentient being in the whole of the known universe who does not know that Douglas Adams wrote *The Hitch-hiker's Guide to the Galaxy*. Large sections of the show are now recited wholesale by children too young to have known the Parrot Sketch.

The immense popularity of HHGTTG means that, whatever Adams does, there will be a large number of readers who will keep expecting Zaphod Beeblebrox to pop up at the most improbable moments.

What Adams needed to do was write a completely new, non-Guide novel. Which is strange, because that is precisely what he has done. In *Dirk Gently's Holistic Detective Agency* he avoids the pitfalls of doing another HHGTTG sequel in all but name, yet provides sufficient techno-humour material to keep most Guide-freaks happy.

Giving a precis of the plot would ruin the book for you. Like all good detective novels, Dirk features some extremely acute plot twists. The likes of Agatha Christie rely heavily on characters who are not what they seem. Adams does this, too, along with liberal helpings of time and space travel, robots and ghosts.

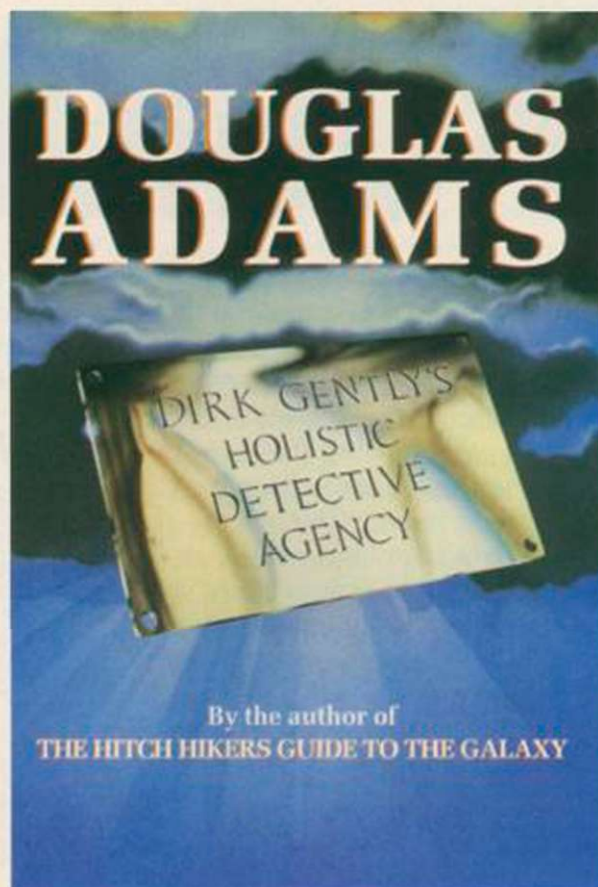
The whole thing takes some time to get rolling – Dirk does not really appear until about halfway through. That gives Adams time to build the main characters – a luxury he did not have with the almost slapstick speed of the Guide books.

Adams is a well-know Apple Macintosh fanatic. The main character in the book has six of the machines and I expected Adams to have the same number. In fact he has only five but he is working on the next one. Computer-based music is also a strong element in the book – another of Adams' preoccupations.

Throughout, the writing is peppered with computing phrases and, not to put too fine a point on it, jargon. For example, a robot monk is subject to an error checking protocol which stops it leaping from a tree in the belief it can fly.

Adams believes that computer nuts will smile knowingly at the bits of jargon, while the uninitiated will skip the more obscure words. That could be true but in a way it is a pity more was not made of the computers. They fulfil a largely decorative role. Computing is now part of the social structure

Dirk Gently's Holistic Detective Agency
Author: Douglas Adams
£9.95 hardback
Publisher: Macmillan



and is almost common language. It is about time computers had their own literature, like horse racing in the work of Dick Francis. This book goes halfway.

The copy I saw was an early proof which Adams had set by printing directly from the Mac. By getting involved in the page layout, Adams found himself re-writing lines to avoid hyphenated word-breaks or ugly paragraphs. The fiddling with the fine detail could be part of the reason the book as a whole feels undisciplined. The pace varies unevenly, from plodding at the start to chaotic at the end.

When he gets into his stride, Adams writes well. It is entertaining stuff, even when some of the jokes use rather well-worn formulae.

The biggest problem is at the end – it all seems rather rushed. You can sense that Adams was up against a deadline and I did not find the ending all that satisfying. In particular, the extremely interesting ghost created early in the story is largely forgotten and then used in a fairly meaningless way at the end.

Dirk Gently has fewer jokes than the Guide – radio series or books. The style of writing is far more mainstream, even

though the ideas are, in places, even stranger. This is a more imaginative work. It is simply that the book lacks the tightness of the earlier stuff. It is still funny and entertaining and newcomers to Adams will probably wonder why I feel a little disappointed. Of course, it is almost a guaranteed success. Computer buffs will love it.

Steve Mansfield.



POP-UP PROGRAMS

Anyone owning a PC is almost certain to have a copy of some pop-up program – SideKick, WordFinder, THE Index or whatever. These programs run invisibly in the background, until a special key or key combination is pressed. Then they spring into life, popping-up on the screen over whatever program is currently running.

When we want to return to whatever we were doing before we activated the pop-up program we need only press a key or two and the previous program is

TSR PROGRAMS CAN BE VERY USEFUL, BUT HOW DO YOU WRITE THEM? ADAM DENNING EXPLAINS ALL

restored as if nothing had happened. Pop-up programs are so useful and convenient that everyone is producing them these days. But, how do you go about writing such programs?

This two-part article – the final instalment will appear next month – will explain all about pop-up programs and how to write them. As a practical example, this month we are going to write a digital clock program which appears to run concurrently with whatever other program is being used.

Due to the nature of pop-up programs, most are written in 8086 assembly language. This one is no exception, so a certain amount of familiarity with Intel 8086 assembly language is assumed.

In addition, you will need an assembler and a linker to assemble the programs. We recommend Microsoft MASM, which includes the Microsoft linker. Other packages can be used, so long as they accept the same assembler source as MASM. You will also need the DOS utility EXE2BIN, which you should find on one of your system disks.

For those without assemblers, the hex code can be entered directly into memory using the DOS DEBUG utility, and then saved away as a file. The hexadecimal bytes are shown alongside the instructions in the listing.

Before we start examining how pop-up programs work, we must clarify our terminology. Pop-up programs use a

technique known as terminating but staying resident, to stay in memory while allowing other programs to run, so they are referred to as TSRs.

How TSRs Work

When a program is executed, DOS allocates a certain amount of memory in which it can run. In the case of programs with the COM extension, this is all available memory, but the more versatile EXE format allows programs to specify their minimum and maximum memory requirements.

When a program ends, it returns to DOS, which releases all the memory it originally gave to the program, as well as any extra memory which that program may have obtained through DOS memory allocation functions. This seems to mean that if a program wants to stay in memory while telling DOS that it has in fact finished running, it needs to play dirty tricks and fool the operating system.

Luckily, the authors of DOS catered for this requirement and provided an alternative exit method, using the KEEP DOS function. This function call tells DOS that a program has finished running, but that a given amount of the memory allocated to the program at execution start should remain allocated. This means that the next program to be run will have less memory available to it, as DOS ensures that the memory kept for a TSR is not used by other programs.

The amount of memory still allocated when a program exits in this way is entirely up to the programmer. So, a large TSR with a lot of initialisation code – which is needed only once – can release the space occupied by this code when it exits, leaving just the amount of memory required.

Once a program has exited in this way, DOS is back in control and the program is never called again. So, what use is it? The only way such a program can regain control is by having previously altered an interrupt vector.

An interrupt vector is an address stored in memory which is used by the microprocessor to tell it what routine to execute when an external interrupt occurs or when an INT instruction is executed. There are a large number of interrupts on

the 8086 processor and some of them are used for special purposes.

On the IBM PC and compatibles, further interrupts are used by the hardware and software to perform certain actions. Whenever you press a key, for example, an interrupt is generated and the code jumped to is that pointed to by interrupt vector number 9. Once an interrupt routine has finished processing, it executes a special instruction which returns to the program which was running when the interrupt occurred. Thus, interrupt routines must not alter any registers and must be as short as possible so that the interrupted program is not delayed noticeably.

Altering an interrupt vector seems to be a question of finding the vector concerned and replacing the the address stored there with the address of the routine to be called whenever that interrupt occurs. But, there is a possibility that the interrupt whose vector is being altered may be called while its vector is being altered. One way of avoiding this is to disable interrupts while the vector is being altered. Another alternative is to use the DOS services for getting and setting interrupt vectors.

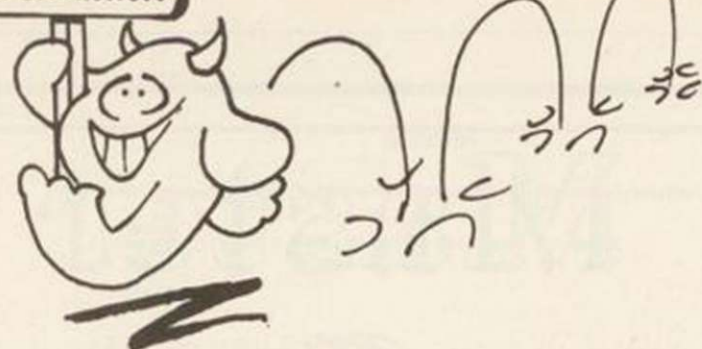
INTERRUPT

The latter method is preferred because, although the interrupt vectors on 8088, 8086 and 80286 in real mode are defined by Intel in a specific location, this is not guaranteed to be the case on new and future Intel microprocessors. The DOS services will safely alter or read the correct vector in all circumstances.

An altered interrupt vector thus causes the TSR to be called whenever that interrupt occurs. Once we have control we can do basically what we like, except that various parts of the operating system are not re-entrant – this means that an area of code may not be executed by two processes at the same time – so must generally be avoided.

When the TSR has finished its tasks, it should not generally execute an IRET – return from interrupt – instruction but must *chain* to the routine which was pointed to by the interrupt vector before it was changed by the TSR. This ensures that every TSR running on a given interrupt is given a crack at the whip. It also means that TSRs which share the same interrupt may interact in ways not intended by the author.





Digital Clock TSR

The digital clock is an extremely straightforward program which is able to display the current time in the top right hand corner of the screen. It does this by setting up the Timer Tick interrupt vector so that each time a tick interrupt occurs, the routine labelled MYINT is called. IBM PCs and compatibles are set up to generate a timer tick interrupt at such a frequency that 18.2 occur per second.

Each time such an interrupt occurs, the clock program calculates the current time and compares the seconds value with the seconds value stored last time the code was called. If the values differ, the seconds, minutes and hours values are stored and displayed on the screen. If the values are the same, no further action is taken. In either case, the routine ends by restoring any corrupted registers and jumping to the previous contents of the interrupt vector, thereby maintaining any chain of TSRs in operation.

INITIALISATION

Looking at the code in more detail, the first thing the program does when executed is to jump to BEGIN. The code from BEGIN to end of the program is the initialisation code; once it has been executed it is required no longer as it does not form part of the interrupt routine. Its first action is to display the program name on the screen. It then uses DOS to obtain the current contents of the timer tick interrupt vector.

This value is returned in registers ES and BX and stored by the program so that the interrupt routine can chain to this address when it has finished. DOS is used to set up the time tick interrupt to point at MYINT, the routine which starts at the very top of the listing, after the jump to BEGIN. Note that the segment address of the routine is passed to DOS in ES and the offset of the routine within this segment in DX.

Once the vector is set up, the program can return to DOS, so it calculates how much memory it needs to keep by working out the highest address used. The code from BEGIN onwards is not needed, so it becomes the highest address. This is converted to paragraphs, because DOS

wants it that way, and used as a parameter to the DOS KEEP function. This causes all the memory from the base of the program up to BEGIN to be saved, but all other memory owned by the program is released.

This means that the clock occupies only 512 bytes of your memory – 512 because it is always rounded up to a 16-byte boundary. The first 256 bytes of this is the Program Segment Prefix which every program needs. The first few bytes of this – up to offset 005CH – must not be altered, but the rest is free for our use.

Now that the program has returned to DOS with the interrupt routine installed, the code starting at MYINT will be called 18.2 times a second. The first thing it does is switch to a local stack, as we have no guarantee that the stack used by the interrupted program will be large enough for our needs.

It is always a good idea to have a local stack in an interrupt routine. We need to save the old stack before we do this, so SS and SP are stored in local variables. AX is saved also in a variable as this is used before the new stack is included.

Having provided a new stack, DS is set up to hold the same value as CS, so that our data can be accessed easily, and then all the registers are saved on the stack.

RETURN

Interrupt 1AH, the time-of-day interrupt, is called to determine the current time. The next part of the code, shown in upper case in the listing, converts the number returned by this interrupt into the current time in hours, minutes, seconds and hundredths of seconds. It is fairly complicated but works on all machines regardless of their processor speed.

The seconds are compared with the stored seconds value to see if they are the same. As the routine is called over 18 times a second, this saves time by ensuring that the displayed time is updated only when it actually changes rather than each time it is called. Assuming the seconds values are different, the new seconds value is stored, as so is the current hour and minute.

The ROM-BIOS video interrupt is used to determine the screen mode and number of columns on screen. The number of columns is used to calculate the starting position of the clock. This column value is calculated each time the dis-

play is updated to ensure that the clock display works even if we change screen mode.

If we are in screen mode 7, a mono display adaptor is being used, so that screen segment begins at B000H. Any other mode indicates a colour/graphics adaptor, where the screen starts at segment B800H. Please note that the clock display works only in text modes.

Colour adaptors have a number of video pages, so the screen start segment value is adjusted to incorporate the current video page number before the value is stored in ES. Text screens have two bytes per character, the high byte holding the attribute and the low byte the character itself. So, by getting the column position, multiplying by two and using it as an offset into the segment pointed at by ES, we can write directly to screen memory and cause the time to appear. We could use the ROM-BIOS to avoid any possible snow effects, but this method is faster and shorter. Also, very few IBM compatibles actually produce snow.

ROUTINE

The routine DECOUT converts the number in AL to two decimal digits by dividing AX by 10. This leaves the quotient in AL and the remainder in AH. By adding ASCII 0 to both of these, the numeric values become ASCII digits.

The routine OUTCHAR displays each character. It puts the required attribute in AH and uses the STOSW instruction to store AH and AL in screen memory at ES:DI. STOSW increments DI automatically to point at the next screen location. The attribute, 70H, is black text on a white background. If you want to have a different colour scheme you need only change this byte.

Once all the digits are displayed, the registers are restored, the old stack is swapped in and then the program jumps to the old interrupt routine.

To generate this program, type in the text using an editor and assemble it as follows, assuming you have called it DCLOCK.ASM: *masm dclock/ml*; Then link it by typing: *link dclock*; Now use the DOS EXE2BIN utility to convert it to a COM file:

```
exe2bin dclock
ren dclock.bin dclock.com
del dclock.obj
del dclock.exe
```

The program may then be run by typing its name at the DOS prompt in the usual way. If you do not have an assembler and linker, run the DOS DEBUG utility and either type in the hex or type in each instruction. When everything has been entered, save the file out to DCLOCK.COM.

As a simple example of a typical TSR application, the digital clock is ideal. It is short, yet performs a useful function.

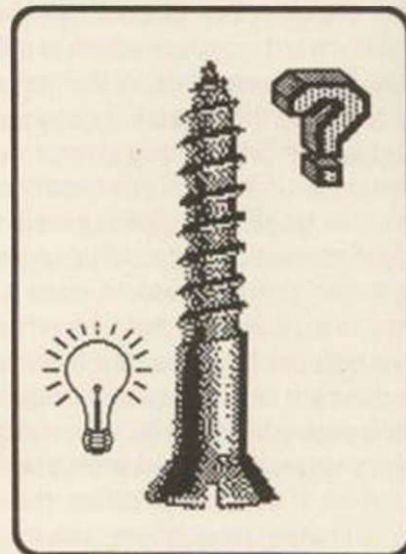
Now! Master Machine Code!

Here's your chance to master machine code on your:

- Spectrum!
- Commodore 64!
- Amstrad!

And, for the real expert, we have the ultimate trip -
ADVANCED Z80 PROGRAMMING!

**At very special prices for Your Computer readers!*



SPECTRUM/SPECTRUM+

Mastering Machine Code on Your Spectrum - Toni Baker

This acclaimed book is designed to teach the essential elements of programming in machine code on the Spectrum and Spectrum+. It assumes absolutely no knowledge of the subject whatsoever, and yet still promises to take you to a level of proficiency beyond your wildest dreams. Starting with simple addition and subtraction, you are slowly guided through printing and inputting in machine code. You are shown how to use the screen to its utmost. The book explores and utilises the incredible speed of machine code, giving you real time graphics games like BREAKOUT. Special offer price to readers of *Your Computer* - £5.00, plus 55p postage.

Spectrum Machine Code Made Easy

Volume One - For Beginners
Volume Two - Advanced
Originally published at £5.95 per book, both books are now available as a set, for just £5.00, plus 70p postage.

AMSTRAD!

Now you can get to grips quickly with machine code on your Amstrad! As well as a complete, easy-to-follow course to take you through all the elements of programming in machine code on your Amstrad, this exciting book contains a generous collection of ready-to-run machine code routines (including pixel by pixel scrolling in four directions). You can incorporate these into your BASIC programs, even if you don't have a clue how they work! These 'pre-packaged' machine code routines are designed to make created arcade and animated games as simple as possible. A complete arcade game is also included in the book to show the routines in action.

Chapter headings include

- Your first machine code program
- Passing parameters
- Simple Arithmetic
- Stacking and Jumping
- Logical Operators
- Screen and ROM Routines
- The Games Writing Package

Originally published at £8.95, **MASTERING MACHINE CODE ON YOUR AMSTRAD 464/664/6128** is available as a special offer to readers of *Your Computer* for just £5.00, plus 55p postage!

Mastering Machine Code on the Commodore 64. Now you can master machine code on your C64. Say goodbye to jerky, slow-moving graphics in BASIC, and learn the secrets of professional, incredibly swift graphic production in machine code!

Mastering the Commodore 64

Both these were originally published at £7.95 each. As a special offer to readers of *Your Computer*, they are now being offered as a set, for just £5.00 in all, plus 70p postage!

ADVANCED Z80 MACHINE CODE PROGRAMMING Originally published at £12.95, this 342-page book is now available for £5.95, plus £1.00 postage!

Interface Publications Ltd.,
9 - 11 Kensington High Street,
London W8 5NP

Please send me the following:

- Mastering Machine Code Spectrum - £5.00, plus 55p postage
- Spectrum Machine Code Made Easy - Volumes 1 and 2 - £5.00, plus 70p postage
- Mastering MC Amstrad - £5 plus 55p
- Mastering MC Commodore 64/Mastering the C64 - £5.00 plus 70p postage
- Advanced Z80 MC Programming - £5.95 plus £1.00 postage

I enclose cheque/money order/cold hard cash for £ _____

Name _____

Address _____

```

PAGE      ,132
;.....
;#
;#                      BCLKLOCK.ASH
;#
;.....

; A program to display a digital clock at the top of the screen

; By Adam Denning

; Actually made to work 25-10-86

= 000A      LF          equ    0ah
= 000B      CR          equ    0dh

= 0010      VIDEO_INT   equ    10h
= 0014      KEYBOARD_INT equ    16h
= 001A      TIME_OF_DAY_INT equ    1ah
= 001C      TIMER_TICK_INT equ    1ch
= 0021      DOS_INT     equ    21h

= 0002      CONOUT      equ    02h
= 0009      PRINT_STRING equ    09h
= 0008      READ_LINE   equ    0ah
= 0019      CURRENT_DISK equ    19h
= 0025      SET_INT_VECTOR equ    25h
= 002C      GET_TIME    equ    2ch
= 0031      KEEP_PROCESS equ    31h
= 0034      GET_DOS_CRIT_F equ    34h
= 0035      GET_INT_VECTOR equ    35h
= 003C      CREATE      equ    3ch
= 003B      OPEN        equ    3dh
= 003E      CLOSE       equ    3eh
= 003F      READ        equ    3fh
= 0040      WRITE       equ    40h
= 0047      GETCMD      equ    47h
= 0048      MALLOC      equ    48h
= 0049      FREE        equ    49h
= 004A      REALLOC     equ    4ah
= 004B      EXEC        equ    4bh
= 004C      EXIT        equ    4ch

= 0002      SET_CURSOR   equ    02h
= 0003      READ_CURSOR  equ    03h
= 000E      WRITE_CHAR   equ    0eh
= 000F      GET_VIDEO    equ    0fh

= E90B      TICCNT      equ    59459      ; Magic number for TDB interrupt

= B000      MONO_SCREEN  equ    0b000h    ; segment address of mono screen
= B800      COLOUR_SCREEN equ    0b800h    ; segment address of colour screen

% 1000      PAGE_LENGTH equ    1000h     ; length of video page

0000      code segment byte public 'CODE'
          assume cs:code

          DOS macro func
            mov ah,func
            int  DOS_INT
          endm

002C      org 2ch

= 002C      ENVIRONMENT_SEG equ this word
003C      org 3ch
= 005C      I_PTR          equ    this word      ; chain to 0x0000
005C 7777  I_OFF          db    ?
005E 7777  I_SEG          db    ?

0060  ??    seconds       db    ?              ; second count

= 0061      mins_hours    equ    this word
0061  ??    minutes       db    ?
0062  ??    hours         db    ?

= 0063      start_colum   equ    this word
0063  ??    clock_colum   db    ?
0064  ??    clear_this    db    ?

0065 7777  oldss          db    ?              ; saved stack segment
0067 7777  oldsp          db    ?              ; saved stack pointer

0069 7777  old_ax         db    ?              ; saved AX

0100      org 100h
0100 E9 01FB R      start: jmp begin

0103 2E: 0C 16 0045 R  eyint: mov cs:oldss,ss      ; save SS, SP and AI
0108 2E: 09 26 0047 R      mov cs:oldsp,sp

```

terminate

POP-UP PROGRAMMING

but stay

```

0100 2E: A3 0049 R      mov     cs:old_ax,ax
0111 FA                cli                          ; Disable interrupts and...
0112 9C CB             mov     ax,cx                ; ... set up new stack
0114 BE D0             mov     ss,ax
0116 9C 0100 R        mov     sp,offset start     ; use 0000 - 00FF as stack!
0119 FB                sti
011A 1E                push   ds
011B 06                push   es
011C BE D8             mov     ds,ax                ; base DS = CS

                                assume cs:code,ds:code,ss:code

011E 55                push   bp                    ; Preserve all registers
011F 56                push   si
0120 57                push   di
0121 52                push   dx
0122 51                push   cx
0123 53                push   bx                    ; DS, ES, BP, SI, DI, DX, CX, BX

                                ; *****

0124 2A E4             sub     ah,ah
0126 8B 26 0044 R      mov     clear_this,ah      ; clear this byte!

012A C8 1A             INT     TIME_OF_DAY_INT
012C 91                ICNG   AX,CX                ; Get high part of tick in DX
012D 92                ICNG   AX,BX                ; and low in AX
012E 89 0005           MOV     CX,5                ; Multiply times 5
0131 8B 0A             MOV     BX,BX                ; Save high 16 bits
0133 F7 E1             MUL     CX                    ; Multiply low 16 bits
0135 52                PUSH   BX                    ; Save high part of result
0136 93                ICNG   AX,BX                ; Save low part of result and
                                ; get high multiplicand
0137 F7 E1             MUL     CX                    ; Multiply high 16 bits
0139 8B CA             MOV     CX,BX                ; Save high part of result
013B 8B D8             MOV     DI,AX                ; Move middle part of result to
                                ; correct reg.
013D 58                POP     AX                    ; Get carry out of low multiply
013E 83 D0             ADD     BX,AX                ; correct middle part of result
0140 83 B1 00           ADC     CX,0                  ; Correct high part if necessary
0143 8B C3             MOV     AX,BX                ; restore low part of result

0145 89 E900            MOV     CX,TICKCNT          ; Divide BX:AX by TICKCNT
0148 F7 F1             DIV     CX
014A 8B D8             MOV     BX,AX
014C 2B C8             SUB     AX,AX
014E F7 F1             DIV     CX
0150 8B B3             MOV     BX,BX                ; BX:AX = Time in hundredths
                                ; of seconds

0152 89 00C8            MOV     CX,200              ; Divide by 200 so result fits
                                ; in 16 bits

0155 F7 F1             DIV     CX
0157 92                ICNG   AX,BX
0158 B1 64             MOV     CL,100              ; Find hundredths of seconds
015A F6 F1             DIV     CL
015C 8B B8             MOV     BX,AX                ; BX = hundredths, BL = part
                                ; of seconds

015E 8B C2             MOV     AX,BX
0160 2B B2             SUB     BX,BX
0162 89 001E            MOV     CX,30                ; Find the rest of seconds
0165 F7 F1             DIV     CX
0167 B0 E2             SHL     BL,1
0169 82 B8             ADD     BL,BL                ; BL = seconds

016B B0 E1             SHL     CL,1                 ; 60 min/hr
016D F6 F1             DIV     CL
016F 8B C8             MOV     CX,AX                ; put hrs. and mins. in the
                                ; right registers

0171 84 C8             ICNG   CL,CH
0173 8B B3             MOV     BX,BX                ; Put secs. and secs/100 in
                                ; right registers

0175 84 D6             ICNG   DL,BH

0177 36 36 0040 R      cmp     dh,seconds          ; a new second started?
0179 74 40             js     notime                ; leave if not
017B 8B 36 0040 R      mov     seconds,dh          ; also store new second
0181 89 0E 0041 R      mov     nine_hours,cx      ; and minute and hour
0185 84 0F             mov     ah,GET_VIDED       ; get current video code and
                                ; page

0187 CD 10             int     VIDED_INT           ; 8 chars for 00:00:00
0189 80 EC 08           sub     ah,8                 ; store clock start column
018C 8B 26 0043 R      mov     clock_coluan,ah    ; in screen ROWHD?
0190 3C 07             cmp     al,7
0192 75 05             jnz     colour              ; branch if not
0194 8B D000            mov     ax,ROWHD_SCREEN    ; also AX = screen segment
0197 EB 0C             jmp     short none

0199 2A B8             colour: sub    bl,bl          ; get video page number in BX
019B 86 BF             xchg   bl,bb
019D 8B 0100            mov     ax,PAGE_LENGTH SHL 4 ; length of video page in
                                ; paragraphs

```

```

01A0 F7 E3          mul    bx          ; get current page segment
01A2 05 B800       add    ax,COLOUR_SCREEN
01A5 BE C0         mov     es,ax      ; get screen segment to ES
01A7 8B 3E 0063 R  mov     di,si
01A9 03 FF         add    di,di
01AD FC           cld
01AE A0 0062 R    mov     al,hours   ; output hours
01B1 EB 01E7 R    call   decout
01B4 90 3A         mov     al,':'      ; followed by a colon
01B6 EB 01F7 R    call   outchar
01B9 A0 0061 R    mov     al,minutes ; then the minutes
01BC EB 01E7 R    call   decout
01BF 90 3A         mov     al,':'      ; another colon
01C1 EB 01F7 R    call   outchar
01C4 A0 0060 R    mov     al,seconds ; and the seconds
01C7 EB 01E7 R    call   decout

01CA 5B           notimes pop    bx          ; restore registers
01CB 59           pop     cx
01CC 5A           pop     dx
01CD 5F           pop     di
01CE 5E           pop     si
01CF 5B           pop     bp
01D0 07           pop     es
01D1 1F           pop     ds
01D2 2E: A1 0049 R  mov     ax,cs:old_ax
01D6 FB           sti
01D7 2E: BE 16 0045 R  mov     ss,cs:oldss ; restore old stack
01DC 2E: BB 26 0067 R  mov     sp,cs:oldsp
01E1 FA           cli
01E2 2E: FF 2E 005C R  jmp     cs:I_PTR      ; chain to previous owner

; DECOUT displays AL as a 2-digit decimal number at ES:DI

01E7             decout proc  near

01E7 2A E4         sub    ah,ah        ; divide by 10
01E9 B1 06         mov    cl,10
01EB F6 F1         div   cl
01ED 05 3630      add    ax,3030h    ; quick convert to ASCII
01F0 50           push  ax
01F1 EB 01F7 R    call   outchar     ; output one char
01F4 5B           pop   ax
01F5 B6 C4         xchg  al,ah        ; and fall through to output
; the other

; OUTCHAR displays the character in AL at ES:DI using an attribute of 70h

01F7             outchar proc near

01F7 B4 70         mov    ah,70h      ; attribute in top byte
01F9 AB           stosw
; store whole word and inc DI
01FA C3           ret
; and return

outchar endp

; The program starts here
assume cs:code,ds:code,es:code,ss:code

01FB BA 0229 R    begin: mov    dx,offset signon ; print a signon message
; print a signon message
01FE B4 09        1     mov    ah,PRINT_STRING
0200 CD 21        1     int    DOS_INT
; get the current timer tick
0202 B0 1C        mov    al,TIMER_TICK_INT ; interrupt vector contents
; interrupt vector contents
0204 B4 35        1     mov    ah,GET_INT_VECTOR
0206 CB 21        1     int    DOS_INT
; and store for chaining
0208 09 1E 005C R  mov    i_OFF,bx
; and store for chaining
020C BC 06 005E R  mov    i_SEG,es
0210 1E           push  ds
0211 07           pop   es
0212 BA 0103 R    mov    dx,offset myint ; then set up vector to point
; to label 'MYINT' above
0215 B0 1C        mov    al,TIMER_TICK_INT
; to label 'MYINT' above
0217 B4 25        1     mov    ah,SET_INT_VECTOR
0219 CD 21        1     int    DOS_INT

021B 2B C0         sub    ax,ax        ; clear exit code
021D BA 020A R    mov    dx,offset begin + 15 ; address to keep up to
; address to keep up to
0220 B9 0004      mov    cx,4         ; rounded up
0223 B3 EA         shr    dx,cx        ; and converted to paragraphs
; and converted to paragraphs
; rounded up
; and converted to paragraphs
0225 B4 31        1     mov    ah,KEEP_PROCESS
0227 CB 21        1     int    DOS_INT

; Program Static Data Area

0229 59 6F 75 72 20 43 6F  signon db  'Your Computer Digital Clock'
68 70 75 74 65 72 20
44 69 67 69 74 61 6C
20 43 6C 6F 63 68
0244 0B 0A 24      db  CR,LF,'s'

0247             code  ends
end             start

```

resident

SOFT RELEASE

PSI-5 Trading
Company, Law of
the West, Hardball
Commodore 64
£9.99 cassette
Publisher: U.S. Gold

U.S. Gold has a reputation for producing some exceptional games for the Commodore 64. Putting three of its greatest hits into one package for just £9.99 would seem to be a reasonable way of consolidating that reputation, especially when one of those hits is the excellent *PSI-5 Trading Company*. However, for £9.99 you could get five Mastertronic titles, for example,

where apparently you will find a collection of starving people who are literally dying to get their hands on you and your ship of supplies. I say apparently, because I've never got there, though not through want of trying.

With my inane crew carefully selected (mad aliens abounding here) even the slightest hiccup saw my demented ship mates go into a frenzy to try to repair the damage. Aply assisted by a number of robodroids, who seemed more intent on examining their fingernails than fixing anything, I was able to ignore such sage advice as turning off the port shields to conserve energy if I were being attacked

and re-load; load and throw away, really. *Law of the West* is a bit of a disaster, although the author of the program gives himself every excuse by saying that he was trying to create a totally different type of game. A joystick controlled adventure, this sees you in the role of the sheriff of Gold Gulch, a tough wild west town so they tell me, and all you have to do is stay alive until sunset.

I could not get into this game at all. Large, two-thirds screen size graphics dominate the playing area, with the bottom part of the screen reserved for text. Being joystick controlled, however, means that you can select only one from a given number of possible responses, rather than typing in any old thing and seeing what happens. If you love the Adrian Mole adventures, you might like this, but I prefer an adventure to be of the more traditional style, and it was with some relief that I was shot to pieces by a two-bit outlaw. The game then refused to restart, and after listening to the same inane soundtrack three or four times *Law of the West* was filed away, never to be looked at again.

But, two out of three isn't bad, and the last game in this set is probably the best of them all. *Hardball!* (their exclamation mark, not mine) is a superb rendition of the game of baseball. Now, I am not over-familiar with the rules of that game, my knowledge being confined to Peanuts cartoon strips, and what seemed like several hours of reading had to pass by before attempting to play the game, but when I eventually made it, it was well worth the effort. Wonderful graphics of pitcher and striker open the game, with you controlling one or the other depending on whether you happen to be batting or fielding at the time. After a successful hit the display changes to the outfield area, with little fielders scurrying around everywhere trying to collect one of your random swishes at the ball.

It would appear that you can

control the thing, but I haven't got the hang of it yet. My only gripe about the game concerns the continuous loading of different sets of data, which halts play and slows things down considerably. Still, it does give you the opportunity to make cups of tea or something before another heroic attempt. Bases covered, third out and nine (whatever that might mean), I can only hope that one day there will be a cricket version and I might be able to understand what's happening.

The Image System
Commodore 64/128
Cassette
Publisher: CRL

Well, that's the boast on the front cover anyway. Another Commodore 64 program, this time from CRL, called *The Image System*, and as you might reasonably surmise from that it is a graphic design program. I have never seen any reason to take graphics programs seriously. They're all very well for a bit of a giggle, but when they go about proclaiming themselves to be 'the ultimate graphic system', well, pass me the bottle of whisky, John, I feel a strange thirst coming on.

After waiting an interminable age for the program to load, most of it spent admiring the illustrations on the front cover of the rather lavishly-designed packaging, one was ready on completion of the load to go into raptures and produce beautiful images to adorn some new arcade game of my own devising. Wrong. Not possessing a Wico tracker ball, the first thing the manual did (and is 12 pages really worthy of the description comprehensive?) was to tell me off and inform me that if I only had a joystick then it would just have to do. Great start.

You have to worry about only three keys on the keyboard, these being the Commodore logo key (which toggles the menu system off and on, allowing you to see your graphics screen in its entirety or not as the case may be), the CTRL key



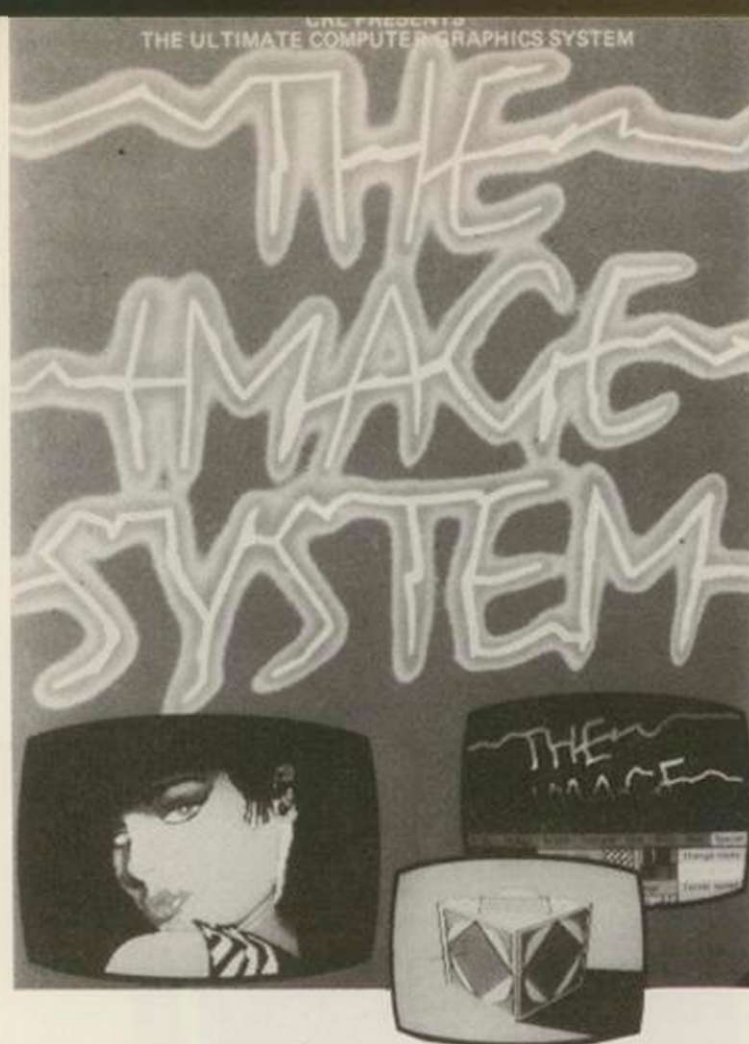
and still have a few pennies left. Do the three programs stand up against that sort of comparison?

PSI-5 Trading Company is a very good *Elite* style game. As a space freighter captain in the 35th century you have to select your crew and then boldly go where several Commodore 64 programs have gone before, in fact, to the Parvin Frontier,

by pirates on the starboard side of the ship. Check whether a passing spaceship was friend or foe? Blast it out of the skies anyway, just in case. With interesting graphics and music which wasn't written by that Hubbard chap, *PSI-5 Trading Company* is a game to keep going back to.

Unfortunately, game two in this package is not one to load

one



(which toggles control between the menu and the graphics screen, allowing you either to choose options or continue with your masterpiece) and the Run/Stop key (used, sensibly enough, to stop various graphics actions, like filling in areas in a specific colour, or whatever). Apart from those three, your joystick becomes your paint brush and away you go.

What I referred to as a menu, the company refer to as a Master Control Screen. At least it doesn't have windows floating about everywhere and getting in the way. All the options you could want of a graphics system are available, including such fun things as spray paint, and you have the choice of using a standard hi-res screen or a multicolour one. All the options on the menu have little sub-options available, so that (for example) selecting texture brings up several thousand other options for you to play with.

With all of these it is, as you might imagine, somewhat difficult to go about creating your very own Sistine chapel. When faced with things like stitch lines, different fonts, magnifying images, brush templates, the mind begins to gag somewhat and retreats. Given time and perseverance I have no doubt that someone, somewhere, will make some fabulous displays using this system.

The manual helpfully gives you a Basic program to type in, so that your hi-res screen can be loaded without *The Image System* program being resident in memory. In my case, this produced nothing more memorable than my spray-on graffiti hi-res screen, but it does show that it works.

I would have preferred it if there had been some demonstration screens to go with it, rather than pictures on package covers, but you can't win them all I suppose. Given more time a designer-panic magazine editor will allow, I could actually get to like this program. If you must have a graphic designer, you cannot really do much better than this.

UFO

Commodore 64/128
£1.99 cassette
Publisher: Firebird

Games players owe companies like Mastertronic a great debt. Now you have to pay only £1.99 to find out whether a game is terrible or not. Where one leads others are bound to follow, and Firebird is busy producing a welter of games at the same price. The one under consideration here is a Commodore 64 game called *UFO*, or ULE for Unidentified Loading Errors since it didn't make it into the machine first time around. However, a little bit of perseverance and success! The game

had made it, and was safely transferred to disk before any other disasters could befall it. Back-up security copy only, I assure you.

During abortive loading attempts I decided that I wasn't going to join the Silver Club, as advertised on the inlay card. Bumper packs of goodies? I'd prefer tapes that loaded first time. I also decided that my knowledge of foreign languages was on the increase, as I can now say "Are you destined to become a fighter ace, take on the Alien Fleet and find out!" in six languages other than English, courtesy of the packaging. Presumably people who can't speak English are meant to be psychic, since the actual playing instructions are only in the mother tongue.

If I detected hostile UFOs approaching New York City I'd let them get on with it, but that would make a very boring game and a waste of two quid. So, man the joysticks and rush to the defence, in our (as usual) superbly equipped F21 Condor Flyer - an experimental craft, so they tell me, which probably means that they have not learnt how to control the most significant bit of the X position of a sprite. I may be wrong.

The controls are simple - up, down, left, right and fire - but require an annoying rush to the keyboard every now and again to hunt out the space bar when the ship's shields needs activating. Rapid-fire joysticks are out as well, since over-firing causes the ship to overheat and short circuit the weapon systems. This, however, was not a major problem, since the UFOs might be hostile, but they are also piloted by brain-damaged aliens. They are not the most menacing of opponents anyway, and soon succumb to the strong right hand of Gerrard.

Wiping out one lot of aliens takes your ship down a transit corridor, which has to be manoeuvred through quite carefully if you're to get on to level 2. Whilst doing this, if your fingers are agile enough you can press the M and K keys, as well as the

space bar, to replenish energy and restore your shields to normal before the next bout. Some of us were not too good at this.

A cheap and cheerful little game, as they say, the kind of



thing that most of us could knock up, given something like *The Image System* to create a hi-res screen or two and a little bit of knowledge about sprites. Good fun, though, despite that, and worth a couple of quid of anyone's money. If I could overcome my loathing of British Telecom and all its subsidiaries I might even begin to like it.

Gunstar

Commodore 64/128
£1.99 cassette
Publisher: Firebird

Honestly, you would have thought that Earth would have been liberated by now. But no, away we go to the year 1997 and another game from Firebird in its £1.99 range for the Commodore 64. Apparently there has been an unprovoked attack on Earth by unknown alien life forms, who quickly managed to overwhelm our primitive Star Wars defences. Ronald Reagan, well into his eighties and still President, eh?

These nasty aliens enslaved almost all of Earth's population. Almost, for you are still free; yes, another chance to save the universe and win the undying gratitude of millions, or at least the person who wrote the game anyway. A research team, hidden in the subterranean moon base (that is

0021

SOFT RELEASE



what it says, honestly) have managed to put together an experimental fighter called a Pulse Fighter, and with only your trusty (and probably rusty by now as well) joystick to help you, it is out on to the screen and the chance to decimate thousands of unknown aliens.

Our experimental Pulse Fighter has not yet mastered the ability to move over to the right-hand side of the screen, which is reserved for a bizarre display of fuel consumed, temperature, and score, which seems to bear little relation to what you might be doing at the time.

Five stages to this game in all, so 40 pence a stage. Stage one, zap everything in sight while avoiding enemy fire, so a nice little shoot-em-up there. Stage two has you dodging asteroids to progress to stage three, where you meet the alien command ship, and a jolly tricky blighter it is too. Having blasted away the gun turrets it's time to encounter a robot who is oh-so-wittily called ALLOY, although he might as well be called Jonathan Woss for all the difference it makes; you don't actually get to shake his little robotic hand. Strange choice of companion, but there

you go.

Decimate the turrets and you're on to the fifth and final stage, which is a bit easy after all you've been through. Dock with the mothership to refuel, and then you're back to the start again, where very little seems to have changed. Your ship is still experimental, the aliens are still bobbing and weaving with the best of them, and your score is reaching suitably astronomic proportions.

Overall this is not terribly complicated, but good fun nevertheless. It was probably (although I don't know) written by the same person who wrote UFO for Firebird, since the two games bear something of a resemblance; with experimental crafts, aliens rushing about over hi-res screens they both look fairly similar. Of the two, UFO is probably the better, although *Gunstar* is worth a look if nothing else. See if you can pinch a play in the local shop, and if you don't actually get round to buying it at least you can rest easy at night, secure in the knowledge that you can walk into a German Bierkeller and say "Join the Gunstar Fleet and fly your Pulse Fighter against the alien hordes".

Strike

Spectrum 48/128/Plus 2

Cassette

Publisher: Mastertronic

Mastertronic, that pioneer of cut-price software, has produced a little gem of a game for less than £2 with *Strike*. This is available for the Spectrum and all its variants, like Spectrum 48/128, Plus 2, and probably the C5 as well. Joystick compatible with a zillion different interfaces, such as Kempston, Interface II, Cursor, you can also use the keyboard if you wish. You can play against the computer and throw it against the wall when you've finished, or play against a friend and shake his hand while gritting your teeth at yet another abysmal defeat. So what is it?

Well, for once you are not pitted against the hell hounds of outer space, but are instead playing the humble game of ten pin bowling. The cassette inlay says that you will be hooked in minutes and playing for hours, and somehow it seems a shame that Firebird's lead in reproducing that sentence in umpteen different foreign languages has not been followed. I rather like the idea of being able to say "hooked in minutes

and playing for hours" in French, somehow.

The controls are very simple to master, and if you're anything like me you will be playing it for hours. Using the joystick (much easier) you move it left and right to aim your delivery, press the fire button to move a little man forward carrying the ball, and release the button when you want him to release the ball. Carry on too long and you will foot fault, and can indulge in all the McEnroe histrionics you like, but it will still be a foot fault.

Aiming, despite sounding easy, is not quite so easy when you are playing, and it took some time before I managed to get a strike. Or even a spare, he said, reeling off the phrases as if he's known them for years. Strikes and spares were all Greek to me before I started playing this game, but I can now talk like an expert. Unfortunately talk is as far as it goes, since my playing ability is not yet up to world championship standards.

Graphically this is very good, if limited to the one main display. I do like the way the little man rushes up and delivers the ball; it's worth making a few errors just to see what hap-

three



pens. I don't really see the point of displaying a message like 'player 1 thinking' while you try and aim the ball. What are you supposed to be thinking about? Cricket? Wigan's chances of promotion to division two? It seems you are supposed to be thinking of playing ten pin bowling, but it fills the screen I suppose.

Having more or less – well, less rather than more – mastered aiming the ball, the next problem concerns releasing the thing. A simple matter of pressing and releasing the fire button on the joystick you might think, but alas, life is not that easy, and many is the disaster you will have before getting things right. A wonderful display of the ball landing on your foot is the reward for messing it up completely.

Once you get into the swing of things it isn't too bad, and I must admit to being addicted. My scores are slowly beginning to creep up a little, although I have yet to muster two strikes in a row, never mind three – this is known as a 'turkey', apparently, which leaves one to wonder what getting four in a row might be called. – For a £1.99 game this is great fun, and even if (like me) you know

nothing about ten pin bowling, it's worth getting.

Thrust II
Amstrad 464/664/6128
£1.99 cassette
Publisher: Firebird

Yes, much as I hate to admit it, the mighty right hand of Gerard was beaten by a mere arcade game. Another little jaunt from Firebird, this follow-up to *Thrust*, named with devastating originality *Thrust II*, is a £1.99 number for the Amstrad 464, 664, 6128, and probably every other Amstrad in the history of the known universe.

Once more we are waging battle in the depths of space, this time on a small, artificially created planet called P2112. We are informed that this is an essential forward base for the next offensive against the Galactic Empire, which seems reasonable to me. Being a Resistance Fighter you know which side your bread is buttered, and it is your bounden duty to make the atmosphere of this artificial planet pure. At the moment it is covered in a cloud of red dust which blocks out sunlight and thus prevents the existence of life on the surface. Fortunately you are told all this on the cassette inlay

card, because the game seems to bear little resemblance.

To go about this purification procedure, you must manoeuvre your spacecraft underground to collect orbs of varying masses. These must be brought to the surface and put in place correctly, but alas for you once they've been removed from their underground storage they become liable to explode within a short space of time if not deposited safely and correctly. This is where the fun, and problems, begin.

As if all this was not enough, the planet is still protected by Imperial Android Guards, and despite sounding like an after-shave they are a mean bunch, let me tell you. They can be killed only by using a chemical agent, and these are stored in boxes inside the planet. Certain chemicals will work only on certain aliens, and if you've got the wrong one for the alien with his hands currently around your throat it's tough luck, buster. A chemical can, however, be used on more than one alien, or android if you prefer, before it loses its potency.

Ready yet? No, because as players of the original *Thrust* will know, the program gets its name from the fact that the ship has a lot of thrust built into it. Start moving, and it is very difficult to stop. What is more, carting around chemicals and orbs for processing the atmosphere all adds to your load, and flying along with a massive orb dangling from the back of your ship is a tricky little procedure, and one which I could not for the life of me master. It all looked remarkably like one of those enormous balls used on the end of cranes for knocking down houses, and with my piloting skill I managed to achieve roughly similar results; disaster every time I took to the air.

In other words, the planet has still got a filthy atmosphere and I am no longer the darling of the resistance movement, having cost them more spaceships than they can afford.

Since my flying ability limited, I don't think the Galactic Empire has got too much to worry about. Similar in many ways to the original *Thrust* it is different enough to be worth paying £1.99 for: enjoyable, if not graphically brilliant (very jerky screen movement) game. We'll draw a polite veil over the sound effects.

Octagon
Spectrum 48/128/Plus 2
Cassette
Publisher: Rino Marketing

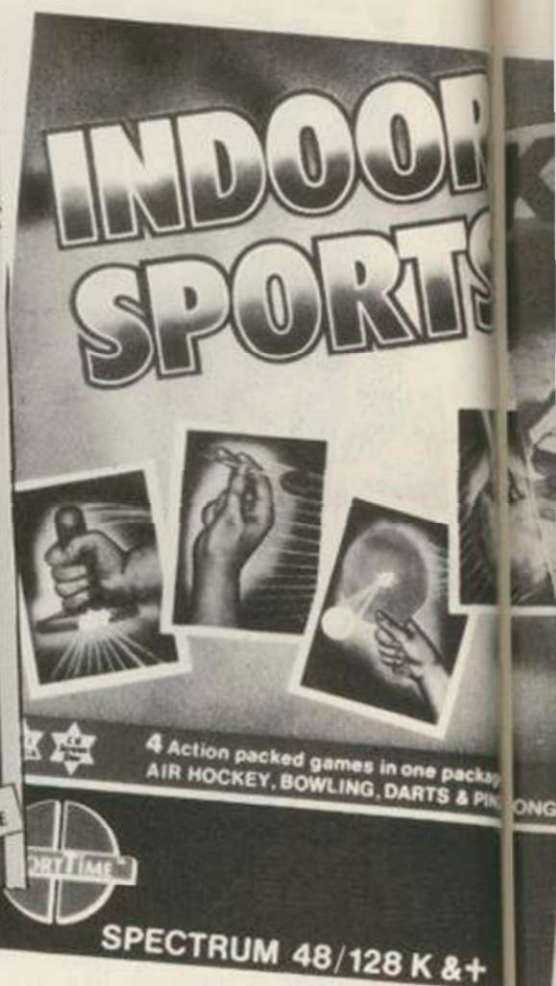
Some games are easy to play requiring at the most movement horizontally and vertically, with a fire or two thrown in. On reasonable keyboards having to choose from more than four or five keys is not too bad, but on the dreaded Spectrum keyboard having a choice of six different keys is ridiculous. That is if you're using a joystick as well, otherwise you can add another five to that list. Eleven keys to bother with, which is one of the reasons I am not totally addicted to and besotted by a game called *Octagon*, from the quaintly named Rino Marketing, available on cassette for the Spectrum family.

On the plus side, at least it is different. It would appear that you, the player, have been granted secret psychic powers derived from the Octagon symbol and must complete your quest. What is this strange and wonderful quest, one wonders? Well, when you wake up as an Octon you find you are trapped within the confines of a four level complex of 60 cells, it says on the cassette inlay card.

Your quest, should you choose to accept it, is to rebuild your octagon symbol from pieces which have been left carelessly at the core of the complex. Up to four people can play at the same time, which sounds vaguely ridiculous and was not an option I bothered with. You can save and later restore your progress to and from tape if you want to, and if

four

SOFT RELEASE



five

you intend to have a serious stab at this game you will need to, never mind want to. Me, I preferred to record a Little Feat album, but then I'm an ageing hippy.

Graphically this is not particularly awe-inspiring, and some things are not very clear which is not good news for what is really an arcade/adventure. Collecting keys as you go, you can move from one cell to another by entering a transporter, but only if you hold a key and you can also only use transporters of your own colour. Enemies abound, although you have got a gun to stun them with. Only to stun because you must never touch them, as this decreases your psychic powers, should you have any left after reading the instructions for playing the game.

Sorry chaps, but I was not impressed. It was much too complicated, though I suppose if you had plenty of time to spare you might eventually get the hang of things. You might also be able to design your own nuclear reactor, which might be slightly easier.

Koronis Rift

Spectrum 48/128K
Cassette
Activision

Whatever a techno-scavenger's dream might be I have no idea, but this game, apparently, is it. Available for the Atari, Amstrad and Spectrum at least - reviewed here on a Spectrum - *Koronis Rift* comes from Activision, and is a Lucas Films game. This means that you get an amazing amount of packaging to wade through, instructions that make the game seem marginally more complicated than do-it-yourself brain surgery, and while waiting for the thing to load you can ponder on the incredible fact that more than a dozen people were involved in the writing of it. Aric Wilmunder handles 3D environment and explosions, Tom Wahl looked after Science Droid artwork, Douglas Crockford produced the sound effects and music for the Atari version, and so on. Thousands of them, and they had to slip in a thank you to George Lucas as well. There's gratitude for you.

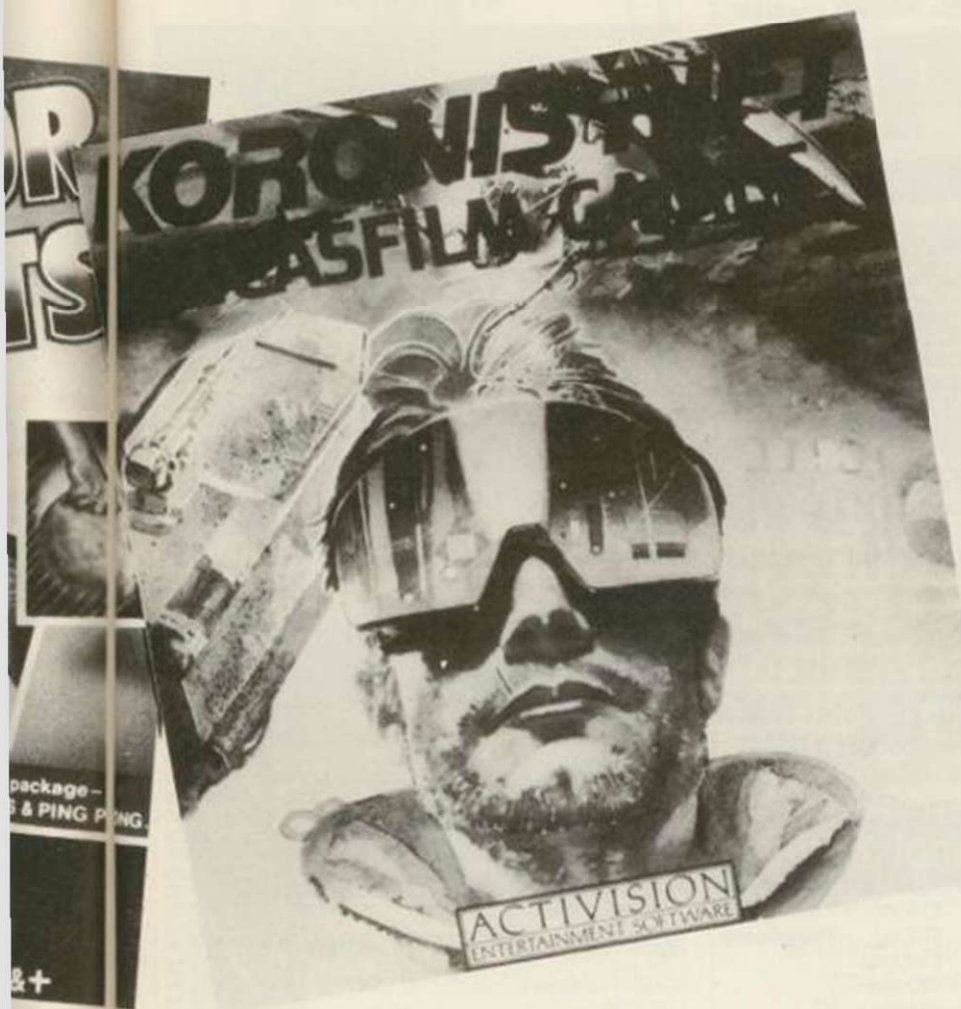
Would, however, George Lucas be grateful for this mention? In other words, is the game any good at all when you finally get to see it?

Well, yes and no. Yes it is quite good and no I won't be rushing back to play it as soon as I've finished this review. My course on do-it-yourself brain surgery is now coming along quite nicely, while I haven't mastered this game at all. The theory is simple. It would appear that I am seeking the valuable technologies of the Ancients, in the hope of striking it rich. When I stumble across the *Koronis Rift*, stuck in a desolate sector of a remote star system, it should be the answer to all my prayers. The hiding place of technological treasures beyond my wildest dreams, all there for the taking. Well, not exactly, because the guardians of the rift have other ideas. Which hulks must I loot? Which weapons and shields do I pack into my battered surface rover? Which technologies will I save? Could I possibly care less? So that's the theory, and it all seems reasonable enough.

Roam around a while, pick up a few bits and pieces, then hey ho for the Orion Nebula and a decent pint of Panther Sweat or something. I just can't get the hang of it all.

For one thing the screen display is incredibly cluttered and complicated, with loads of things to watch out for all at the same time. Electronic counter measure devices and radars look totally different in the manual, but place them on the screen and they look exactly alike to me. Half the things you're up against aren't even mentioned at all, just dismissed with the phrase 'other (military) types exist that have not yet been identified'. Well, I wish they'd identify themselves to me, I'd be rather keen to learn what I'm up against. The manual then goes on to describe the Final Objective of the game, but it might as well be printed in Greek for all the sense it makes to me, and I know I'm never, ever, going to get there.

You might like this, but I didn't, I'm afraid; it was just too much to bother with. At least you'll get some reasonable



value for your money if you do buy it, but it will take you about a week to understand the thing.

Indoor Sports
Spectrum 48/128/Plus 2
Cassette
Publisher: Advance

All right, I'll confess, I like this one. *Indoor Sports*, from Advance Software Promotions, is a great little cassette for the Spectrum family of computers, and is either keyboard or joystick (lots of interfaces to choose from) compatible. It also contains four very different games as well, which explains the rather long and tedious loading time. Be very careful that you don't manage to wipe out your copy of the game, because the tape deck can also be used to save or load high score tables. Label your tapes carefully.

On completion of loading, you are invited to enter up to four players' names, although if you just want to take on the computer — or have three friends who wish to remain anonymous — then the one name will do. You then decide

which of the four games you want to play. A significant wait then ensues while the correct game is loaded from tape.

Ten pin bowling is not a bad version of the game, using the joystick to position a little man who delivers the ball when you tell him to. Nothing brilliant, but everything you could wish for is in there, including correct scoring for strikes and spares, and a reasonable, if not quite reaching brilliant, screen display.

Air hockey is good fun and consists of moving a block around a table while whacking the living daylights out of a puck which, sitting on a mound of air, whisks off towards your opponents goal. He, needless to say, is trying to do the same as you and score, so plenty of joystick action there.

Table tennis is another good one. Just the sight of two table tennis bats floating around in mid-air kept me amused for a while. It seems marginally easier to play the real thing than it is to control the Spectrum bat, moving the joystick backwards and forwards to get

backspin or a smash, left and right of course just to return the ball if that's as far as your competence goes. It is fun, but awkward, and the screen display does only the bare essentials, as indeed it does for air hockey.

Darts is darts is darts, and somehow no computer version has ever come near to reproducing the real thing. No beer by the side of the computer is probably its biggest failing, but as far as darts games go this one's good enough and will certainly get you going for the magic one hundred and eighty. The character is definitely wrong on the screen though, since he is lacking the vast beardgut which seems to be a prerequisite for playing darts.

As individual games, they would all sit well on a £1.99 tape. For a four in one package, one can't complain at all. And for me, it's back to the darts. Shame about the absence of the beer, though.

Brainache

Spectrum 48/128K
Cassette
Code Masters

Brainache sounds as if it should be a variant on the Mastermind/Connect Four type of game, but no. The Brainache in this game is actually a person, a rotund individual, who is foolish enough to allow you to control his actions. His real name apparently is Harry Jones, a private, and the butt of his friend's humour, who call him Brainache because he is a private of very little brain, forever forgetting things or dropping them. Under your expert guiding, of course, this won't happen.

A game for the Spectrum range of computers, from Codemaster, this rather fun little game can be played using a combination of joystick and keyboard. Joystick for the simple things in life like moving around, while the keyboard is used for slightly more complicated matters like picking things up or dropping them, because this Spectrum game is

most definitely in the class of arcade/adventure. At least, that's what Codemaster would probably describe it as, if pushed.

The story so far. It would appear that you have recently been exploring the Stella mines, and while there managed to drop a vast amount of equipment and promptly forgot about it, although how anyone can drop a ladder and remain unaware of the fact is beyond me. Your crewmates aboard the Rotar 1, an interplanetary mining vessel, laugh out loud about your total inability to do anything, ho ho ho they probably go, and send you back to try to recover all the stuff that you dropped. Deep down it would appear that they really love you, but I note that they don't love you enough to accompany you back to the mines and help you. You, Brainache, private Harry Jones, are on your own, pal, with no-one to help you out. And the mines, let me tell you, are rather a nasty place to be.

In play, and in particular in the design of the screens, this game reminded me a great deal of *Boogaboo*, which is odd because *Brainache* bears as much resemblance to the flea hero of that game as I do to Robert Redford, and, as even close friends will tell you, that is not much of a resemblance. You have to explore the rather large game area, avoiding all manner of nasty creepy crawly things as you do so, collecting the odd pieces of equipment which are scattered about like confetti after a wedding. Reasonably enough, some of this equipment is too heavy to be carried with other equipment, and larger things like ladders require carrying on their own, otherwise the stuff that you have already oh so carefully collected will once more become debris on the ground. Eventually you might make it and manage to escape again, but I never managed it. Not, however, through lack of trying, because this is one game that I intend to play again.

SIX

★ **SPECTRUM** ★
COMMODORE 64
AMSTRAD CPC
COMPUTER GAMES –
TRY BEFORE YOU BUY

Review the latest games at home

- ★ One week's review
- ★ Latest titles
- ★ Lowest rates
- ★ Fast postal service
- ★ Free membership
- ★ BFPO, & European members welcome

Special discount prices less review charge to members who decide to buy

Contact:

MICROGAME

12 Bagots Oak, Stafford,
 Staffs ST17 9RS

or 'phone Stafford 211150 ANYTIME!

SPECIALS

AMSTRAD PCW8256/8512

Hardware	
RS232/Centronics	£56.95
CF2 Disks	each £3.90
CF2 Disks	Box of 10 £36.25
Dust Cover Set	£7.98
Printer Ribbons	2 for £10.85

Software

ADVICE ON SELECTION AND SET UP OF SOFTWARE IS AVAILABLE	
dBase II	£99.95
DELTA	£91.00
Cambase 2	£40.44
Cracker 2	£42.88
Newword 2 and Word+	£60.38
Prospell	£24.29

SINCLAIR QL

Microdrive cartridges now in stock:	
6 for £10	12 for £18
Sandy Mouse	£85.00
Dust Cover	£3.15
Super Q Board 512K (with toolkit 2)	£239
512K Expanderam	£115.00
10 3 1/2 in. DS/DD disks	£25.00

SEE PRESTEL FOR LATEST (*258880061)

Prices include VAT & POSTAGE

THESE ARE JUST A SELECTION –

PHONE FOR FURTHER DETAILS

Subject to availability

PERIPHERY

117 GAINSBOROUGH AVE.,
 OLDHAM OL8 1AJ. TEL: 061 626 5802

GOEL

COMPUTER SERVICES

45 Boston Road, London W7 3SH
 01 579 6133

COMMODORE 64

Title	R.R.P.	OUR PRICE
Skyrunner	£9.95	£7.25
Top Gun	£8.60	£8.60
Antirad	£8.99	£8.60
Uchi Mata	£8.95	£8.60
Fist II	£9.95	£7.25
Biggles	£9.95	£8.60
Ace of Aces	£9.95	£7.25
Kettle	£8.95	£8.60
Lightforce	£8.95	£8.60
World Games	£9.95	£7.25
AlleyKat	£8.95	£8.60
Graphic Adventure Creator	£22.95	£18.00
Space Harrier	£9.95	£7.25
Gauntlet	£9.95	£7.25
Cobra	£8.95	£8.60
Tomahawk	£9.95	£7.25
Blood and Guts	£9.95	£7.25
Leaderboard Golf	£9.95	£7.25
Infiltrator	£9.95	£7.25
They Sold a Million III	£9.95	£7.25
Five Star Games	£9.95	£7.25
Computer Hits III	£9.95	£7.25
Breakthru	£9.99	£7.25
Howard the Duck	£9.99	£7.25
Labrynth	£9.99	£7.25
Marble Madness	£9.95	£7.25
Arcticfox	£9.95	£7.25

AMSTRAD

Title	R.R.P.	OUR PRICE
Graphic Adventure Creator	£22.95	£18.00
Silent Service	£9.95	£7.25
Top Gun	£8.95	£8.60
Jailbreak	£8.95	£8.60
Space Harrier	£8.95	£8.60
Elite	£14.95	£11.75
They Sold a Million III	£9.95	£7.25
Five Star Games	£9.95	£7.25
Scooby Doo	£8.95	£8.60
Computer Hits III	£9.95	£7.25
Elite Hit Pack	£9.95	£7.25
Rogue Trooper	£9.95	£7.25
Ikan Warriors	£8.95	£8.60
Trivial Pursuit	£14.95	£11.75
Tempest	£9.99	£7.25
Legend of Kage	£8.95	£8.60
Gauntlet	£9.95	£7.25
3" Discs	£5.00	£4.00

Fuji 5 1/4" discs colour DS/DD £19.50 box of 10

Printer ribbons: re-inking £2.00 black, £3.50 red, blue green, purple yellow.

This is just a small selection from our stock. Just write the titles required with a second choice and enclose cheque/P.O. (add 75p for overseas orders per tape) or send 40p for list, refundable on first order.

SPECTRUM REPAIRS

From £3-£19 incl. all parts, labour and 3 month Guarantee.

From Bristol's Sinclair Specialists

MICRO FARE

296 Gloucester Road,
 Horfield, Bristol
 Tel: 0272 46575

COMPUTER REPAIRS

Fixed Super Low Prices!

Inclusive of parts, labour and VAT



FIRST AID FOR TECHNOLOGY

1 week turnaround

Free collection/delivery available for local area

★ **INTRODUCTORY OFFERS** ★

Spectrums	£14 inc. + Free Game
C64	£22 inc. + Free Game
C16	£18 inc.
VIC20, C+4	£22 inc.
BBC	£32 inc.
ELECTRON	£19 inc.
AMSTRAD 464	£32 inc. + Free Game
C & N CASSETTE UNITS	£19 inc.
C64 P.S.U. FOR SALE	£20 inc.

Please enclose payment with item –

3 month warranty on repair

Please enclose advert with repair.

W.T.S. ELECTRONICS

5-9 Portland Road, Luton,
 Beds LU4 8AT.

Tel: 0582 458375. Telex: 265871

BRANDED DISKS (BOX of 10)

3" MAXELL CF2 £26.50

3.5" SONY MF2-2DD 135tpi £24.00

5.25" MAXELL MD2-D 48tpi DSDD £14.50

5.25" MAXELL MD2-DD 96tpi DSQD £19.95

5.25" MAXELL MD2-HD (IBM AT) £26.50

C.W.O. PRICES INCLUDE CARRIAGE & V.A.T. (C.O.D. ON REQUEST)

★ **QUANTITY DISCOUNTS** ★

e.g. 10 Boxes SONY MF2-2DD £19.95/BOX

JOHN HOLMES COMPUTERS

FULBECK, GRANTHAM, LINCS. NG32 3LD.



TEL: (0400) 72818

OFFICIAL GOVERNMENT & EDUCATIONAL ORDERS WELCOME

turbo-rom

A MAJOR ADVANCE FOR THE COMMODORE 64, 128 AND 1541 DISK DRIVE

Totally nonobtrusive in use the Cockroach **TURBO-ROM** plugs-in in place of the normal 8K kernal ROM to immediately provide - **FAST LOAD** - will load virtually ALL commercial software with speed improvements up to 500%.

FAST FORMAT in 30 seconds

SCREEN DUMP even while program is running

FAST SAVE - save 3 times faster (with verify).

TURBO-ROM works with 1 or 2 drives, with the printer connected (some fast loaders don't) and does not tie up the cartridge socket. The **TURBO-ROM** can be fitted in minutes and left permanently installed and has an externally accessible switch to select between normal and turbo operation.

Beware "cheaper" imitations

ONLY £19.95 INCLUSIVE - SEND CHEQUE OR P.O. TO -

SOFTWARE Cockroach

26, THE CRESCENT, MACHEN, NEWPORT, GWENT, NP1 8ND 108321 440434

SAVE BEST PRICES IN UK? WHY PAY MORE!

BBC

MASTER 128K	£390 + VAT
MASTER COMPACT (TV system)	£384 + VAT
MASTER COMPACT (Mono system)	£454 + VAT
MASTER COMPACT (Colour system)	£584 + VAT

Plus EXTRA £10 Voucher off our already discounted printer prices

MicroP MP165 (Dot matrix printer) £195 + VAT

STAR POWERTYPE (Daisywheel printer) £195 + VAT

Philips TV1114 (TV-Monitor) £170 + VAT

ATPL Sideways Rom Boards £36 + VAT

MINIMUM 10% off all printers (Canon, Citizen, Epson, Mamestman, MicroPeripherals, Seikoshi, Shinwa, Star) Plus AKHTER/CUMANA/PACE Disc drives at discount

AMSTRAD

DPC 6128	£325 + VAT
PCW 8256	£379 + VAT
PCW 8512	£475 + VAT

PC range

PC 1512 50-MM	£389 + VAT
PC 1512 DD-MM	£489 + VAT
PC 1512 HD10-MM	£589 + VAT
PC 1512 HD20-MM	£789 + VAT

ADD £750 for COLOUR Monitor

All SAGE/CAYTON software for 8256/8512 at 15% OFF

SAGE/GEM/SUPERCALC/WORDSTAR for PC1512 all 10% OFF

COMMODORE

Compendium Ask for our discount prices

Commodore's Pack £208 + VAT

WILLOW SOFTWARE (YC2)

THE WILLOWS, WRINGTON LANE
 CONGRESSBURY, BRISTOL BS19 5BQ
 Tel: (0934) 834056

Prices include p&p

ADD 15% VAT

Many others available all at discount - ask for a quote

24 HOUR

COMPUTER REPAIR CENTRE

The only **AMSTRAD SPECIALISTS** recommended by Amstrad

Repairs also undertaken for all the following computers:
SPECTRUM, COMMODORE, ATARI, BBC, IBM

NO HIGH FIXED PRICE REPAIR!

FREE SOFTWARE WORTH £33 WITH EVERY SPECTRUM REPAIR

The established company with a proven reputation

Over the years we have built up an enviable reputation in the UK for computer repairs, which is second to none. This is based on many years experience in repairing Spectrum, Commodore, BBC and other leading makes – and we were the first AMSTRAD repair centre anywhere. This is why we have customers all over the world.

We are the best, forget the rest, look what we offer

DON'T DELAY – ACT TODAY
It's as easy as **ABC!**

- No high fixed price – you only pay what the repair actually costs.
- While-U-Wait Service – spare parts for all leading computers – available over the counter.
- State of the art test equipment to provide comprehensive test report and locate faults.
- Repairs to all leading makes of computer.
- Amstrad specialist.
- Spectrum rubber keyboards repaired for only £8.95.
- Commodore 64's, Vic 20's, Atari, Commodore 16's and Plus 4's repaired.
- Discounts for colleges, schools etc.
- Every computer repaired by us is completely overhauled and tested before return.
- All computers returned carriage paid and covered by insurance.
- Three months guarantee included.
- Free Software worth £33 with every Spectrum repair.

A Simply send your computer securely packed, together with a cheque or postal order for the maximum fee to the address below. Your computer will be repaired and returned to you within 24 hours together with the balance of the fee and your FREE £33 worth of software.

B Or if you prefer a written quotation just send £2.50 to cover post & packing.

C Alternatively just quote your Access or Visa card number.

DISCOUNT COMPONENTS
e.g. Power Transformers



Commodore £29.00
+ £1.50 p.p.



Spectrum £9.95
+ £1.50 p.p.

AMSTRAD REPAIRS
from
£9 to £35

BBC REPAIRS
from
£12 to £45

SPECTRUM REPAIRS
from
£7 to £19.90

COMMODORE REPAIRS
from
£12 to £35

Trade orders welcome

SPECIALIST COMPUTER REPAIR CENTRE

Dept 12, Unit 4, M.E.B. Works, Windsor Road, Enfield, Redditch, B97 6DJ. Tel: Redditch 65671.



WE SET THE STANDARD BY WHICH EVERYONE ELSE IS JUDGED

YOUR COMPUTER CLASSIFIED

CONTACT PAUL WILLIAMS
ON 01-222 9090

COPY
DATES

JULY ISSUE, 29th May
AUGUST ISSUE, 25th June

AMSTRAD SOFTWARE HIRE

- * Low Rates
- * Free Membership
- * Fast Service
- * 100s of Titles

Our members say we are the BEST

Details from:
K & M COMPUTERS
40 Fairstead, Birch Green, Skelmersdale,
Lancs WN8 6RD

RE-USE YOUR OLD PRINTER RIBBONS

We will re-ink your old fabric ribbon cassette for more cheaply than the price of a new one. Send your dry fabric ribbon (stating printer make & model) with £2 and we'll re-ink it & quote for future re-inkings.

ALADDINK, (Dept. YC),
4 Hurkur Crescent, Epsomouth,
Berwickshire TD14 5AP.
Tel: 08907 50965

BLANK CASSETTES

WITH LIBRARY CASES

	C10	C15	C20	C30
20	7.50	7.70	7.90	8.70
50	16.00	16.20	16.90	18.50
100	29.00	30.00	31.00	35.00

Superior Tapes. Don't Settle for less!

DISKS

10 5 1/4 DS/DD	£6.50
10 3 1/2 SS/DD	£16
10 3 Amsoft CF2	£26

Prices include plastic cases

MEMOTECH COMPUTERS AND ACCESSORIES

MTX 512 COMPUTER	£75.00
DMX 80 PRINTER	£150.00
RS232	£35.00
PASCAL ROM	£35.00
SPECULATOR ROM	£35.00
1/2 mb. DISK DRIVE & INTERFACE	£160
1 mb. DISK DRIVE & INTERFACE	£160

All the above prices are fully inclusive. We stock the entire Memotech Range. Orders/Enquiries to:

UK HOME COMPUTERS
82 CHURCHWARD AVENUE,
SWINDON, WILTS. SN2 1NH
24-hr Phone Service 0793 695034

Compatible AMSTRAD
ribbons in non-standard
colours. Also for most
printers.
Details from

Pearldeck Trading Ltd
FREEPOST, Billingford,
DISS, Norfolk IP21 4BR

Spectrum Repairs

£14.90 inclusive of labour, parts
+ p&p. Fast reliable service by
qualified engineers. Average repair
24 hrs. 3 mths guarantee. For help
or advice ring:

HS Computer Services
2 The Orchard, Warton
Preston, Lancs. PR4 1BE
Tel: 0772 632686 327

SPECTRUM PRINTER UTILITIES

For 48K Spectrum and
Epson-compatible printers.

OURS ARE BETTER!

WORD-MASTER - £9.50 - all the features of an
ordinary word processor and more.
Multicolumns, graphics, plus all the features your
printer offers.

CRASH COPY - £7.50 - all the screen dumps
you will ever need! Including shaded, sideways,
double-strike and half-size dumps.

TYPELINER - £10.50 - produce 24-pin quality
from an 8-pin printer! Design your own fonts and
print them in fantastic NLO.

HEADLINER - £13.00 - signs, letterheadings,
leaflets, produce GIANT SIZE print in triple pass
NLO.

Write now for full details of all our software. You'll
be disappointed if you don't.

CARDEX COMPUTING

11 Marsh Street, Barrow-in-Furness,
Cumbria LA14 2AE

DISKS 3 1/2" D/S with labels. £13 for ten. By
return, Access, Visa, Grafton Ltd, Dept
(DYL) 147 High Street, Huntingdon, Cambs
PE18 6TF. (0480) 51444.

SINCLAIR SERVICE CENTRE

Fast repair service for Spectrum; ZX81
interface 1; microdrive. All units repaired to
original standard by our H.N.C. qualified
staff average repair cost £15.00. But for free
estimate send £1.95 return postage with a
brief description of your fault; turnaround
approx 24 hours; established international
service; our work is fully guaranteed. Personal
callers welcomed.

QUANTUM 33 City Arcade,
Coventry CV1 3HX Tel: (0203) 24632

Certified bulk disks

Full user packs for 39p each -
min. quantity 50

Eg 5.25" DS/DD @ 49p min. quantity 50

Postage and packing £1 per batch of 50
ordered

All prices include V.A.T.

We also have a wide selection of
software for the Amstrad PC1512
range at 10% off R.R.P.

KBT UK (Ltd)
Carmel House,
85 The Broadway,
West Ealing,
LONDON W13 9BD

AMSTRAD (CPC/PCW) & ORIC/ATMOS

Software for sale or hire

Super Selection of Software now available

*** CPC Users - first 3 hires FREE! ***

For details, send S.A.E. (stating computer) to:

THE SOFTWARE CLUB
26 Beechley Drive, Cardiff CF5 3SN

ROTOBASE COMPUTER TURNTABLE

Move your Computer/VDU screen through 360 degrees with the Rotobase. Puts your
screen where you want it. Enables shared use of screen and offers easy viewing.
Smooth rotation with damping action. Max load 50 kilos. £13.25 plus 60p postage.

OAKDENE SERVICES LIMITED

35 Clickett Hill, Basildon, Essex.

NEW

TAPE UTILITY 9

This program gives a tape back-up of most SPECTRUM software! Even converts most jerky loaders to normal
for reliable loading. Manages very long programs (even 51K!), fast loaders, etc. etc. State type of Spectrum when
ordering (48K, 128K etc). £6.99 on tape (£4.99 if updating).

NEW

TRANSFER PACK 3 - FOR SPECTRUM TAPE TO DRIVE

A software system to convert many TAPE based programs to your DRIVE (no matter what type) + OTHER
USEFUL UTILITIES. Most jerky programs are EASILY converted to drive. Pack has at least 7 programs! Opus/Beta
owners add £1 for OPTIONAL extra program. State TYPE of Spectrum + name of DRIVE when ordering. (e.g.
128K Spectrum and Microdrive). £11.99 on tape OR £12.99 on m/drive cartridge. (£6 if updating).

INFORMATION SHEETS Approx 8 transfers of popular programs per sheet - needs TP3. **SPECIAL OFFER** (with
SAE) - No's 1-20 now £4.50, No's 21-30 only £3.50.

MICROTRANS 2b - for m/drive to m/drive back-up, easy ERASE, tape to drive (inc headerless) - does NOT convert
programs. Includes MICROTape and RUN programs. ONLY £3 on TAPE. £4.50 on Cart. For any Spectrum. **CODE
COMPRESSOR** - £3.50

AMSTRAD - TAPESPEED 2 - for tape back-up. Only £6.99 (state whether 464 or 6128)

Overseas: add £1 Europe, £2 others each product. SAE for details.

NO RISK! - ALL PROGRAMS CARRY OUR MONEY BACK GUARANTEE (not updates)

LERM, DEPT YC, 11 BEACONSFIELD CLOSE, WHITLEY BAY, NE25 9UW.
(Tel: 091-2533615)

BRADWAY SOFTWARE (YC)

LETTA-HEAD PLUS The most versatile Spectrum utility program for designing and printing business & personal stationery; receipts, letterheads, labels, posters, etc. Create the design on screen using inbuilt graphics or load any
SCREENS from an arts package, add text from the library of 25 different fonts, select the required output format & print all the copies you need. Price only £9.00.

DUMPY 3 Fast becoming the de facto standard screendump program, producing all the screen dumps you will ever need for your Spectrum! No need to understand assembler; DUMPY's code GENERATOR creates the screendump,
relocates it, and saves it ready for use in your programs. Over 1000 different size, shape and density screendumps, anywhere in RAM! Price less than 5p per dump!! £8.50.

LIN-O-TYPE Add style to your written word, print out any wordprocessor file on tape, microdrive or disk in high density NLO in a choice of 25 fonts, or turn your Spectrum into a full WYSIWYG electronic typewriter, superb for address-
ing envelopes, filling in forms or writing short notes. Price £8.50.

ASTRUM+ NEW!! The very best Z80 assembler and monitor package for the Spectrum; Exceedingly versatile, powerful and easy to use; Full wordprocessor style editor; Unlimited source code; Assembly using microdrives or the
Opus Discovery; Command driven monitor with multiple breakpoints, single stepping, slow run etc. Price £13.50 (state microdrive or Opus version).

DISC MANAGER NEWEST!! A brand new utility for users of the Discovery drives; Full disk sector editor and file management program; Erase, rename, copy groups of files; Examine, modify and understand disk directory information;
Examine, modify and recover damaged data. Price £10.50 on 3 1/2" disk only.

Bradway Software programs drive most (currently 16 different) interfaces; Letta-Head, Dumpy & Lin-O-Type require an Epson compatible printer and are compatible with Microdrive, Wafadrive & Disk. Prices are for cassettes, include
full instructions and p&p within Europe; please add £2.00 worldwide airmail postage, £1.50 for microdrive cartridge or disk. Send for further details!

33 CONALAN AVENUE, SHEFFIELD, S17 4PG

TECHNOLOGY SO ADVANCED ...

MEMORY

- * 512Kbytes RAM (520ST-M, FM)
- * 1024Kbytes RAM (1040ST-F)
- * 192Kbytes ROM
- * 128Kbytes external plug-in ROM option

ARCHITECTURE

- * Motorola 68000 Central Processing Unit (CPU) with a clock speed of 8MHz
- * 16-bit external data bus
- * 32-bit internal data bus
- * 24-bit address bus
- * 8x32-bit data & address registers
- * 7 levels of interrupts
- * 56 instructions
- * 14 addressing modes
- * 5 data types
- * DMA (Direct Memory Access)
- * real time clock as standard

GRAPHICS

- * full bit-mapped display
- * palette of 512 colours
- Using Atari Monitors (on 520 & 1040):
 - * 640x400 high resolution - monochrome
 - * 640x200 medium resolution - 4 colours
 - * 320x200 low resolution - 16 colours
 - * 80 column text display (40 col low res)
- Using Domestic TV (on 520):
 - * 640x200 medium resolution - 4 colours
 - * 320x200 low resolution - 16 colours
 - * 40 columns = 25 line text display

SOUND AND MUSIC

- * 3 programmable sound channels
- * frequency programmable 30Hz - 125KHz
- * programmable volume
- * wave & dynamic envelope shaping
- * programmable attack, decay, sustain, release
- * Musical Instrument Digital Interface (MIDI)
- * MIDI allows connection of synthesizers etc.



MOUSE

- * high precision
- * 2 button control
- * free with 520ST-FM/1040ST-F
- * non slip ball motion sensor
- * removable ball for easy cleaning

STANDARD SOFTWARE

- * GEM desktop + TOS operating system
- * ST BASIC interpreter/language system

INPUT/OUTPUT

- * MIDI out (5 pin DIN) 31.25K baud
- * MIDI in (5 pin DIN) 31.25K baud
- * audio out 1.0V DC peak to peak, 10K ohm
- * audio in 1.0V DC peak to peak, 10K ohm
- * RGB monitor 1.0V DC, 75 ohm
- * mono monitor 1.0V DC, 75 ohm
- * mono horizontal scan rate 35.7KHz
- * mono vertical scan rate 71.2KHz
- * sync 5V DC (active low) 3.3K ohm
- * modem/serial RS232C, 50 to 19,200 baud/s
- * floppy disk 250 Kbits/s
- * hard disk 11.3 Mbits/s
- * mouse standard Atari connector
- * joystick standard Atari connector
- * cartridge port 128K capacity
- * RF output (520ST-FM) for TV use

OPERATING SYSTEM

- * TOS with GEM environment in ROM
- * hierarchical file structure with sub-directories and path names
- * user interface via GEM, with self explanatory command functions
- * multiple windows + icons
- * window resizing, re-positioning and erasing
- * drop down menus (selected by mouse)
- * GEM virtual device interface

COMMUNICATIONS

- * RS-232C serial modem port
- * 6-bit parallel printer port
- * MIDI port (also for networking use)
- * VTS2 terminal emulation

KEYBOARD

- * standard QWERTY typewriter format
- * 95 full stroke keys
- * 10 function keys
- * 18 key numeric keypad + cursor keys
- * variable auto-repeat & key click response
- * keyboard processor reduces CPU overhead

... IT'S AFFORDABLE

ONLY FROM SILICA

Finally, there's a personal computer that not only solves problems like other computers, but also solves the one problem that other computers have created. Affordability. Silica Shop are pleased to present the ST range of personal/business computers from Atari. The ST was designed utilizing the most recent breakthroughs in semiconductor technology, producing a personal computer that performs tasks with fewer parts. Which means it costs less to make. And less to buy. The latest ST computers now include built in power supplies and built in disk drives. The TOS operating system and GEM window environment are now on ROM chips which are already installed in the ST keyboard. This enables automatic instant booting when you switch on. Silica Shop are pleased to offer the complete Atari ST range. Our mail order department is situated in Sidcup and we have 4 retail outlets at Sidcup, Orpington, Lion House (Tottenham Court Rd) and Selfridges (Oxford Street). We have eight years experience of Atari products, longer than any other UK company, and are well established as the UK's No.1 Atari specialist. With a group turnover of over £5 million and in excess of 70 staff, we provide unbeatable service and support. We provide several facilities which you will find invaluable during your Atari computing life and most of these facilities are available **ONLY FROM SILICA**. We suggest that you read through what we have to offer, before you decide where to purchase your Atari ST.

FREE STARTER KIT - Only From Silica

When you purchase any Atari ST keyboard, you will not only receive the best value for money computer on the market, but you will also receive the following from Atari Corporation as part of the package:

- * BASIC Language Disk
- * BASIC Manual
- * ST Owners Manual
- * TOS/GEM on ROM

If you buy your ST from Silica Shop, you will also receive:

- * NEOchrome - colour graphics program
- * 1st Word - Word Processor

In addition, we at Silica would like to see you get off to a flying start with your new computer, so we have put together a special **ST STARTER KIT** worth over £100, which we are giving away **FREE OF CHARGE** with every ST computer purchased at our normal retail prices. This kit is available **ONLY FROM SILICA** and is aimed at providing users with a valuable introduction to the world of computing. We are continually upgrading the ST Starter Kit, which contains public domain and other licensed software, as well as books, magazines and accessories all relevant to ST computing. Return the coupon below for full details.

DEDICATED SERVICING - Only From Silica

At Silica Shop, we have a dedicated service department of five full time Atari trained technical staff. This team is totally dedicated to servicing Atari computer products. Their accumulated knowledge, skill and experience makes them second to none in their field. You can be sure that any work carried out by them is of the highest standard. A standard of servicing which we believe you will find **ONLY FROM SILICA**. In addition to providing full servicing facilities for Atari ST computers (both in and out of warranty), our team is also able to offer memory and modulator upgrades to ST computers.

1Mb RAM UPGRADE: Our upgrade on the standard Atari 520ST-M or 520ST-FM keyboard will increase the memory from 512K to a massive 1024K. It has a full 1 year warranty and is available from Silica at an additional retail price of only £86.96 (+VAT = £100).

TV MODULATOR UPGRADE: Silica can upgrade the 1040ST-F to include a TV modulator so that you can then use it with your TV set. This is an internal upgrade and does not involve any untidy external boxes. A cable to connect your ST to any domestic TV is included in the price of the upgrade which is only £49 (inc VAT). The upgrade is also available for early 520ST computers at the same price.

THE FULL STOCK RANGE - Only From Silica

We aim to keep stocks of all Atari related products and our warehouse carries a stock of £1 million. We import many software titles direct from the USA and you will find that we have new releases in advance of many of our competitors. Unlike dealers who may only stock selected titles, we have the full range. In addition, we carry a complete line of all books which have been written about the Atari ST. A range as wide as ours is something you will find is available **ONLY FROM SILICA**.

AFTER SALES SUPPORT - Only From Silica

Rest assured that when you buy your ST from Silica Shop, you will be fully supported. Our free mailings give news of releases and developments. This will help to keep you fully up to date with what's happening in the Atari market. And in addition, our sales staff are at the end of a telephone line to service all of your Atari requirements. If you purchase an ST from Silica and would like any programming or technical advice, we have a full time technical support team to help you get the best from your computer. Because we have both the staff and the systems specifically dedicated to providing after sales service on Atari ST computers, we are confident that our users enjoy an exceptionally high level of support. This can be received **ONLY FROM SILICA**.

FREE CATALOGUES - Only From Silica

At Silica Shop, we recognise that serious users require an in-depth information service, which is why we mail free newsletters and price lists to our ST owners. These are up to 48 pages long and are crammed with technical details as well as special offers and product descriptions. If you have already purchased an ST and would like to have your name added to our mailing list, please complete the coupon & return it to us. The information service is available **ONLY FROM SILICA**.

FREE OVERNIGHT DELIVERY - From Silica

Most orders are processed through our computer within 24 hours of receiving them. Most hardware orders are sent by the overnight METRO courier service **FREE OF CHARGE** to customers within the UK. This method helps to ensure minimum delay and maximum protection.

PRICE MATCH - Only From Silica

We hope that the combination of our low prices, FREE UK delivery service, FREE Starter Kit and FREE after sales support, will be enough to make you buy your Atari equipment from Silica Shop. If however, there is something you wish to purchase, and you find one of our competitors offering it at a lower price, then please contact our sales department, providing us with our competitor's name, address and telephone number. If our competitor has the goods in stock, we will normally match the offer (on a 'same product - same price' basis) and still provide you with our normal free delivery. We realise that we are not the only company who will match a competitor's price. However, if you come to us for a price match, you will also be entitled to our after sales service, including free newsletters and technical support. This makes our price match promise rather special, something you will receive **ONLY FROM SILICA**. We don't want you to go anywhere else for your Atari products. So shop at Silica, the UK's No.1 Atari Specialist.

- SIDCUP (& Mail Order)** 01-309 1111
1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
- LONDON** 01-580 4839
Lion House (1st floor), 227 Tottenham Court Rd, London, W1
- LONDON** 01-629 1234 ext 3677
Selfridges (1st floor), Oxford Street, London, W1A 1AB

520ST-M

The affordability of Atari computers is reflected in the price of the 520ST-M keyboard, which is a mere £259 (inc VAT). This version of the ST comes with 512K RAM, as well as a modulator and lead for direct connection to any domestic TV. The price does not include a mouse. In addition, when you buy your 520ST-M from Silica, you will also receive the FREE Silica 'ST Starter Kit'. During 1987, many software houses will be producing games software on ROM cartridges, which will plug directly into the cartridge slot on the 520ST-M keyboard, giving instant loading without the expense of purchasing a disk drive. With the enormous power of the ST, you can expect some excellent titles to be produced, making this the ultimate games machine! If your requirement is for a terminal, then the 520ST-M can fulfill this role too. Leads are available to connect the ST to a variety of monitors, and with the imminent introduction of terminal software on ROM cartridges, the ST provides a low price terminal for business use. If you wish to take advantage of the massive range of disk software available for the ST range, you will need to purchase a disk drive. Atari have two floppy disk drives available, a 1/2 Mbyte model £149 and a 1Mbyte model £199. Full details of these drives, as well as the Atari 20Mbyte hard disk are available on request. If required at a later date, the mouse may be purchased separately.

£259

520ST-FM

The 520ST-FM with 512K RAM and free mouse, represents a further breakthrough by Atari Corporation in the world of high power, low cost personal computing. This model is the latest addition to the ST family, and is not only powerful, but compact. It is priced at only £399 (inc VAT) a level which brings it within the reach of a whole new generation of computer enthusiasts. When purchased from us, it comes with the FREE Silica 'ST Starter Kit' see paragraph on the left. To make the 520ST-FM ready for use straight away, Atari have built into the keyboard a 1/2 megabyte disk drive for information storage and retrieval, allowing you easy access to the massive range of disk based software which is available for the ST. This new computer comes with all the correct cables and connections you will need to plug it straight into any standard domestic television set. You do not therefore have to purchase an Atari monitor. If you do require a monitor however, these are available with the 520ST in the following money saving packages:

- 520ST-FM Keyboard Without Monitor - £399 (inc VAT)
- 520ST-FM Keyboard + High res mono monitor - £499 (inc VAT)
- 520ST-FM Keyboard + Low res colour monitor - £599 (inc VAT)
- 520ST-FM Keyboard + Med res colour monitor - £699 (inc VAT)

Because the 520ST-FM has its own power transformer built into the keyboard, there are no messy external adaptors to clutter up your desk space. You are left with only one mains lead, serving both the disk drive and the computer. You couldn't ask for a more stylish and compact unit.

£399

1040ST-F

For the businessman and the more serious home user, Atari have their most powerful model, the 1040ST-F with 1024K RAM. This low cost powerhouse can be introduced into a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The 1040ST-F not only features twice as much memory as the 520ST-F, but also includes a more powerful built-in disk drive. The drive featured on the 1040ST-F is a one megabyte double sided model. The extra memory facility of the 1040ST-F makes it ideal for applications such as large databases or spreadsheets. Like the 520ST-FM, the 1040ST-F has a mains transformer built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied from Silica Shop with a free software package and 'ST STARTER KIT'. In the USA, the 1040ST-F has been sold with a TV modulator like the 520ST-FM. However, for the UK market, Atari are manufacturing the 1040ST-F solely with business use in mind and it does not currently include an RF modulator, this means that you cannot use it with a domestic TV (Silica Shop do offer a modulator upgrade for only £49). The 1040ST-F keyboard costs only £599 (inc VAT) and, unless a modulator upgrade is fitted, will require an Atari or third party monitor. There are three Atari monitors available and the prices for the 1040 with these monitors are as follows:

- 1040ST-F Keyboard Without Monitor - £599 (inc VAT)
- 1040ST-F Keyboard + High res mono monitor - £699 (inc VAT)
- 1040ST-F Keyboard + Low res col monitor - £799 (inc VAT)
- 1040ST-F Keyboard + Med res col monitor - £899 (inc VAT)

The 1040ST-F comes with a mouse controller and includes 1Mbyte of RAM. It has a 1Mbyte double sided disk drive and mains transformer, both built into the keyboard to give a compact and stylish unit, with only one mains lead.

£599

ATARI ST

To: Silica Shop Ltd, Dept YC 0687, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE ON THE ATARI ST

Mr/Mrs/Ms: Initials: Surname:

Address:

.....

.....

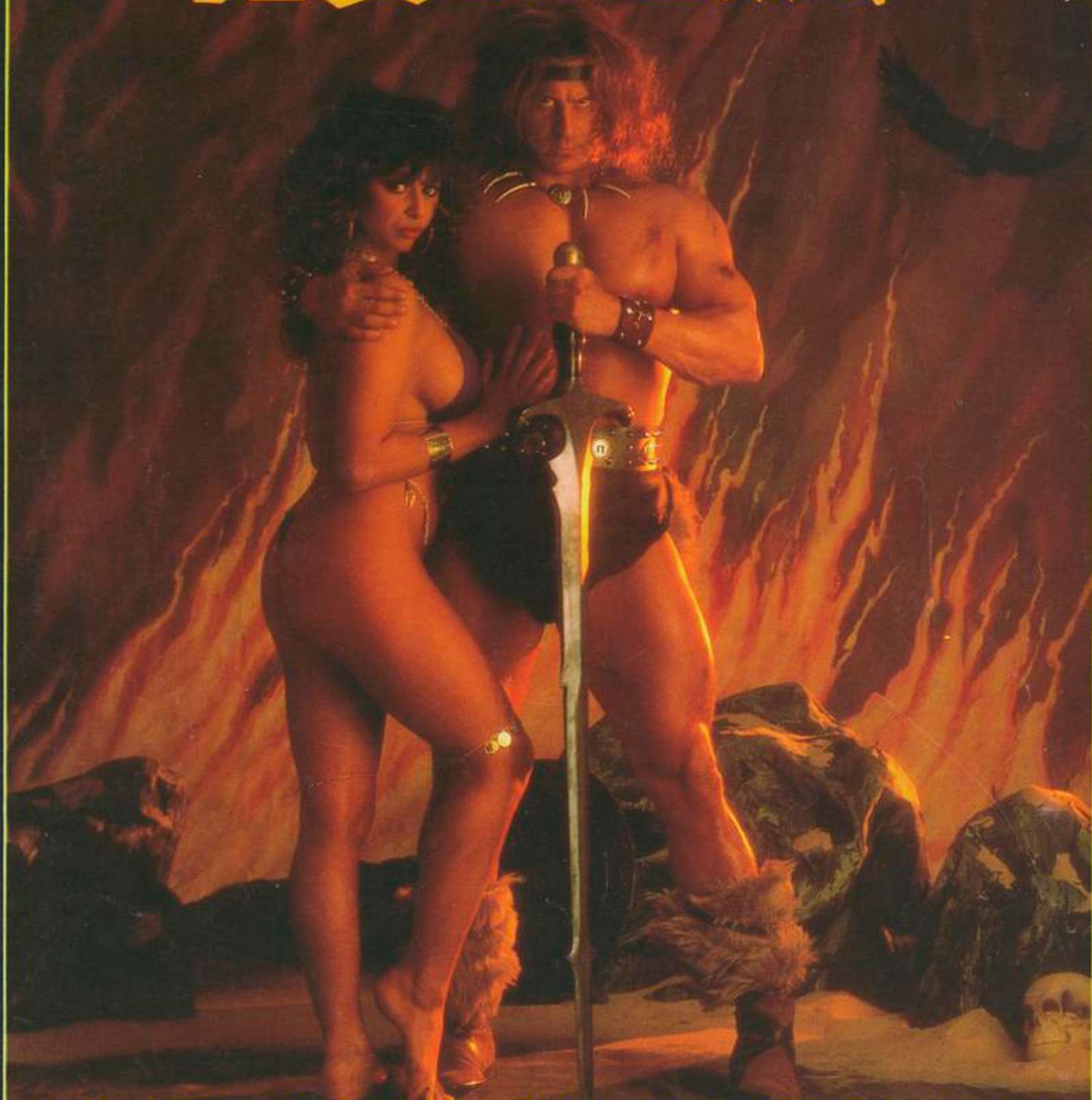
Postcode:

Do you already own a computer
If so, which one do you own?

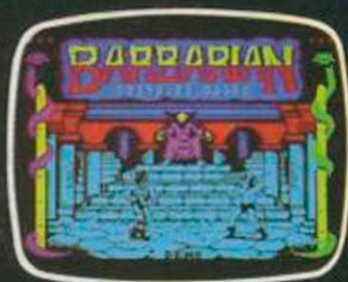


BARBARIAN

The Ultimate Warrior



THE ULTIMATE WARRIOR THE ULTIMATE GAME



SPECTRUM VERSION

AVAILABLE FOR:
COMMODORE 64
48k SPECTRUM
AMSTRAD CPC



PALACE SOFTWARE



AMSTRAD VERSION

Available from all good computer game stockists,
or by mail order from: Palace Software,
275 Pentonville Road, London N1 9NL.

Send cheque or postal order for £9.99 (Cassette),
or £12.99 (Commodore or Amstrad Disk) plus 80p P&P.
Access and Barclaycard holders telephone 01-278 0751.