

MARCH 1982  
75p

# COMPUTER & VIDEO GAMES



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# COMPUTER & VIDEO GAMES

No. 5 MARCH 1983

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**W**HEN (some people say "if") *Frontal* takes off, its games pages will enjoy a huge following. Even now, with *Frontal* sets mainly in business hands, the games pages are the most popular thing on the system. Next month we look at *Frontal* games and the limitations it imposes on its designers.

**A** CHANCE to take on your computer at the classic *Acad* warriors game of *Elegiacal* next month. We also feature *Sub Attack* on the VIC-20, *Engineer* and *Yakzee* among our other games listings.

**P**ISBALL machines are now talking back! Hear what they've got to say as we look at the latest arcade imitations.

Editor Tony Pratt

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NEXT ISSUE ON SALE MARCH 16th

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Every issue's packed with

pages of games programs for you to key-in to your machine. And you don't have to be a computer expert. Each month there's reviews of new computer and video games, regular pages on chess, adventure and kit-building.

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brain-teasers, prices plus hints on how to beat arcade video machines.

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makes computers fun.



# THREE PET TITLES

## from

## Nick Hampshire

### LIBRARY OF PET SUBROUTINES

A book which will save the software designer considerable time by providing 55 proven subroutines to integrate with his own programmes.

Each subroutine is provided five pages of general information then diving to purpose and implementation and possible problems that may arise. Basic machine language and a combination of both are used throughout this publication.

"We like this book very much and thoroughly recommend it"

*Postcard*

"... well prepared, fun to use, and will help in faster program development"

*Compu*

All 3 publications are widely used by Commercial Business Machines

### THE PET REVEALED

nick hampshire

### THE PET REVEALED

A reference book which details everything you need to know about the workings of the PET. Containing information helpful to writing those elaborate programmes, which in turn contain more interesting functions.

"Should be compulsory. Supplies some much needed, useful and correct documentation"

*Compu*

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# MAILBAG

## THE CASE AGAINST ...

Dear Sir,  
I am disgusted to read your article on Softporn in the January issue of your magazine. The magazine is purchased each month by my 15-year-old son, and I feel that articles of this nature are nothing less than criminal.

I appreciate that your magazine is not aimed specifically at children, but you must realise that it has a great attraction to those in my son's age group due to the increasing interest in computers in school. I know that you are not responsible for producing the Softporn program, but it is because of the irresponsible action you have taken in reviewing such trash that people become aware of the availability of these items, the sale of which further encourages their production.

In future can I ask you to take a more responsible stand against such items by refusing to review them, advertise them or include them in any way in your magazine, as I am certain that programs such as these are not only a direct conflict against my own Christian principles, but also offend many people and encourage a lowering of moral standards.  
A. Stander  
Radford  
Herts  
Cheshire

## ... AND FOR, SOFTPORNO

Dear Sir,  
Many thanks for a very enjoyable review of the Softporn game featured in your January issue. It sounds an entertaining and humorous game which I would certainly love to try — if only I owned a BBC Apple. Unfortunately my computer facilities are rather more humble.  
I noticed you claimed that Softporn was one of a "new generation" of



Do you have any views or comments on Computer & Video Games? If so we would love to hear from you. We will also do our best to find answers to any queries you may have or solve problems you might be experiencing with your computer. Please drop us a line at: Computer & Video Games, EMAP, Dartford House, 8 Hatched Hill, London SE18 5SR. If you have already sent in a letter which has not yet been published, please bear with us as we have been overwhelmed by mail after our early issues. We will get around to your query as soon as possible.

software aimed at the adult user. Is it likely that we will soon be seeing a computerised version of Little and do you know of any similar "fun" adventures for the Amos Award?

C. Jacks  
Chesham  
Berkshire  
Werts  
Editor's reply: Apart from its misleading title, Softporn seemed an innocent piece of fun and quite typical of this genre of adventure game presently reaching our shores from America. This magazine's function is to inform its readers about new trends in the computer games industry and I don't feel we can fulfil this properly if we hide from any aspects of that industry.

## A DEALER TO RELY ON

Dear Sir,

At the time of writing I would like you to mention to your readers a company whose trading standards are second to none. A. J. Hocking & Co. (Maidenhead) have looked us up.

Two months ago I purchased a "disassembler" program from them and when I purchased my printer (locally) last week, I found that I could not get a print out due to incompatibility between TRS-80 and Video Games. However, I wrote to Maidenhead and by return of post, I received another tape compatible with my machine. They didn't even ask me to return my original purchase. The point of this is I have had my share of sending money off for software and waiting weeks, and eventually other numerous letters receiving my goods.

I come to this company through sending a similar letter to this and I have never been let down. Orders are despatched return of post. I should now be writing to Mr Hocking to thank him personally (and return the other tape).

I have no connection with the company, my only motive is to thank them, and perhaps help newcomers to computing find a reliable software dealer. Because, they will soon learn, there are a lot of shabby dealers in this game.

Keep up the good work. I am looking forward to the next edition.

E. Moss  
Bursley  
Lancs.

## ADVENTURE ON COURSE

Dear Sir,

As a student taking a course in computing I am considering writing a program on the theme of adventure. Because of this, I am very interested in Keith Campbell's article and look forward to reading it each month.

I would, however, be grateful if you could possibly include in your article certain details of the program which can be incorporated into a TRS-2 computer on this is the computer with which most of my project work is based.

Also, I was wondering if articles on flowcharts and how they work, hardware computer storage, would be included in future editions because I'm sure if this were done, it would generate a great deal of interest among beginners.

Am Clark  
Dorset  
Maidenhead  
Yorkshire

Editor's reply: I hope you have been able to follow the Adventure column as far as, as Keith Campbell has taken care to keep the instructions within the range of any home users.

We have not featured Research Machines' TRS-2 computer in the magazine as yet because it is a specialist educational computer for out of the price range of most home users. But we will try to rectify that for school and college computer users in the future.



AT LAST!

2 DISKETTES

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BUG-BYTE

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86-100 THE ALBANY,  
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THE PROGRAMmer'S BEST FRIEND! This program is a complete chess program for the Acorn Atom. It's a simple matter of moving the pieces and waiting for a winning move.

## 747



FLIGHT SIMULATOR PROGRAM FOR THE 747. This program is a complete flight simulator for the Acorn Atom. It's a simple matter of moving the plane and waiting for a winning move.



## GALAXIAN

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ACORN ATOM SOFTWARE is a series of software programs for the Acorn Atom. It's a simple matter of moving the plane and waiting for a winning move.

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# MAILBAG



## WIZARD COVERS

Dear Sir,  
I can always spot your magazine without any trouble in my local newsagents — those fabulous front covers are the best in the trade!

I particularly enjoyed the wizard and dragon issue which featured on your January cover and feel Paul Rosner should be kept in mind for future issues. Did he also draw the Dragons which went with the Pet game?

I do not own a Pet, which is a pity because I liked the sound of the Dragon Druggin' game and the write-up that went with it had me in stitches.

All the best for the new year and thanks for being the best thing to come out of 1981.

Gerry Cusack  
Reddingham  
Middx.

**Editor's reply:** We will certainly keep Paul Rosner in mind for future front covers Gerry, but he didn't draw the dragons which featured inside the magazine. These came from the pen of Dorian Cross and you will be seeing a lot more of his work in the magazine.

## PACK UP YOUR TROUBLES

Dear Sir,  
Having purchased a Sinclair ZX81, and finding email with some money left after Christmas, I decided to purchase the 18C RAM pack (despite warnings of the technicians crashing). I think I should have heeded the warnings on pack No. 1, passed to be the cause of much unpleasant language. I returned the pack to my local Mr. Smith and set off home again with pack No. 2.

This worked perfectly

and I have had no trouble at all with it.

I hope to see your excellent magazine printing a 18C games program for the ZX81 in the not too distant future, after all I can't be the only Sinclair owner with a working RAM pack, or can I?

David Freeman  
Rogers Park  
London SW20  
**Editor's reply:** We have a 18C advertisement for your Sinclair coming soon David.

## VERY BASIC ON THE IBMS

Dear Sir,

I do not own a computer myself but I am a computer programmer by profession and have access to an IBM system 34 at work. We have a few games on it but they are all very basic games written by IBM business, I think. Are there any games available for such a computer, particularly adventure games?

F. A. Johnson  
South Aspinth  
Redbank  
Cheshire

**Editor's reply:** The only games available for IBM machines are written by individuals and not by the firm itself. These are some tapes in installations which are used for demonstration purposes, but these are usually passed around to people interested in playing games.

According to IBM no other firm is involved in writing games software for its computers, so your only chance is to exchange games with your fellow machine game enthusiasts. But, be warned, playing games on machine computers is notoriously clandestine activity and neither companies or individuals are very forthcoming on the subject.

## RESPONSIVE READERS

Dear Sir,

Much as I admire your splendid magazine which I have read from the first month, I have one grumble. The free information service which was in the first two issues looked a very good idea, but, as I was to find out, when put into practice the idea did not work out as well as I expected it would.

Being a TRS-80 model I, level II microcomputer user, I used the information service to get replies and data on the Tandy.

I waited and waited after sending off the card on 1 November. I have not even had a wisp of a reply.

Incidentally I notice with interest that the information service was taken off the magazine in the January issue.

Also I would like to ask if you are intending on publishing reviews on various microcomputers especially the new BBC computer in addition to the reviews on software, excellent though they are.

Finally could you confirm for me if it is true that Commodore are bringing out a new computer called the VIC-40, presumably containing a double amount of characters. Wayne Smith  
West Bromwich  
West Midlands

**Editor's reply:** It is time to make a full and frank apology about the reader reply card service we offered with our first two issues. It was supposed to benefit both readers and advertisers and free information service as well in many months. Unfortunately the service to contact advertisers was abandoned and the service to readers was not as good as we had hoped.

We are sorry that the service was not as good as we had hoped and we are sorry that the service was not as good as we had hoped.

process the cards found itself swamped and a backlog built up.

As the service was swamping advertisers and therefore, disappointing readers we decided to drop it. All the cards we received have been processed and sent out.

Turn to the Hardware section, Wayne, and you will see that we are giving space to machine reviews.

Finally, there are plans for Commodore to bring out a VIC-40 computer which will have double the amount of characters of the current VIC. It may be introduced to the U.K. later this year.

## PHILIPS' "MICRO" PAC

Dear Sir,

I am the owner of a Philips G7000 Videopac computer, and I would like some information on which cartridge is supposed to turn your Videopac into a home computer, instead of a T.V. game. The two questions I have to ask are in the game programmable to such games as Adventure, Space Invaders etc.

Paul Owens  
Widow  
Sheffields  
Southend

**Editor's reply:** The Videopac Computer cartridge was brought out when Philips first launched the G7000 two years ago. Then there were lower microcomputers on the market and it was hoped that this, too, would be a Philips product. However, it was not. The Philips G7000 was a T.V. game, and it was not a home computer. It was a T.V. game, and it was not a home computer. It was a T.V. game, and it was not a home computer.

Being in 1982 there is no longer a Philips G7000.







# MAILBAG



## CASE FOR DECODING

Dear Sir,

In last month's issue of *Computer and Video Games* I read in one of the articles that games programs written in machine code are better than games written in any other language because they are faster.

I don't know much about how computers work and wondered if you could explain how machine code works and why all games are not written in it.

Frank Green  
Gaulthier  
Sussex

Editor's reply: Machine language is difficult to use. It's all right for machines to machine communicate but not for man-machine communication. It is possible to group the binary code words together so that each step in the program can be represented by a word, or mnemonic, describing that operation. This is called mnemonic machine code.

Machine language is the most primitive programming language from the human point of view, but it is the only language which the computer can really understand. The manufacturer of a particular processor provides the user with a set of instructions. Each instruction relates to the operation required. The instructions may be quite simple to add the contents of two registers and place them in a third.

A program of this type may look like this:

```
LDI D1 D2
ADD D2 D3
MVI D3 D4
MVI D4 D5
MVI D5 D6
MVI D6 D7
MVI D7 D8
MVI D8 D9
MVI D9 D0
```

It needs a well-trained eye to see what this program is supposed to do in simple additions.

The computer must perform considerably more

complex operations than this, which makes it extremely inconvenient to program in machine code.

One way of simplifying the machine language is to equip the computer with a small conversion program to translate the binary figures into hexadecimal code. The program example given above will then read like this: AD, 40, 00, 00, 41, 00, 00, 42, 00.

The programmer can make life a bit easier for himself by assigning a mnemonic to each hex byte. For example, the instruction "load the contents of memory address 0000 into the accumulator" could be written as LDA 0000 instead of AD 0000. This type of machine code programming still needs the programmer to know the address location of the data and instructions.

Our program now becomes:  
LDA 0040 I.e. load accumulator with contents of 0040

ADC 0041 I.e. add contents of address 0041 to number in accumulator

STA 0042 I.e. store result in 0042

The programmer has to know that the first number is in address 0040, the second in 0041 and that the answer will be found in 0042.

High-level languages are oriented towards the user and his problems rather than to the machine. A high-level language is comparatively easy to learn and relatively simple to read and write.

A simple addition in Basic, for instance, is written as a single line: LET C = A + B.

Programming in a high-level language is very efficient as far as programming time is concerned. It is normally estimated to be at least three to five times as quick as assembly programming.

On the other hand, high-level languages make less efficient use of the computer's speed and storage capacity.

Programs written in high-level language generally require 50%-60% greater storage capacity than those written in assembly language or machine code.

## REMEMBER THE REMS

Dear Sir,

I am writing to endorse the request of Mr R. A. Moore in the December issue of your excellent (as far as I know) for rather more explanatory notes in the write-up of the programs you publish us.

Alternatively, more "REMs" in the program listings themselves — these latter may always be edited out when entering the program in one's own machine.

I would also mention that it is not usually the Basic dialects which prove difficult — after all, if one sees "CLS" is a listing the meaning is rather obvious, even though it may not be contained in one's own version.

Also I would venture to bring to your notice the excellent Basic Handbook by David A. Lien, the preface to which states that the handbook addresses the problem of Basic programs which, after entering, will not run on one's own computer by "observing in detail every commonly used Basic Statement, Function, Operator and Command." In my opinion this claim is fully justified.

The real problem when transferring programs from one machine to another arises from the use of "peek", "poke" and "col" commands.

I realize that the provision of both explanatory matter and "REMs" lies in the hands of your contributors, and you cannot print what is not included in the submission to you, but it is so frustrating to see an interesting program which one cannot use because it is liberally peppered with "peek" and "poke" various addresses that perhaps you could make a special appeal to everyone thinking of sending in a program for publication.

L. S. Ford  
Summerlands Close  
Alderm  
Dorset



## COSMOS COLLAPSE

Dear Sir,

A marvelous magazine, but I spotted several errors in your December Cosmos Landing program. For example there is no COSMOS 2000 referred to in line 4 and line 335 has a surplus GOTO in it. Luckily these errors are easily sorted out but I thought you might consider to check through games thoroughly before they reach their end?

David Wain  
Aldon  
Purton

Editor's reply: Lines 4, 335 and 378 all suffered from errors in the Cosmos Landing program. They should read:

```
IF INKEY $ = "T" THEN
COSMOS 200
335 IF W 1 AND W 4 THEN
PRINT D4
378 IF REFS $ = " " THEN
GOTO 374
```

Can I request requests that readers check their program listings through carefully before submitting them to prevent errors slipping through into the magazine.







# HUW KNOWS HIS WAY AROUND THE MACHINES

Instantly recognising the numerous creatures featured in arcade games is a daunting task even for the most adroit player.

But Huw Roberts of Maidenhead has got his finger on the pulse when it comes to creatures. Huw emerged the winner of our Know Your Creatures competition by correctly identifying eight of the nine creatures we asked you to name.

No-one managed to name all nine creatures correctly but our thanks and commendations go to everybody who took part.

"At the moment I'm keen on playing Galaxian and Mooncrest but on average only spend about 20p a week in the arcade," said 18-year-old Huw.

"I worked out what the creatures were by playing the games myself and also spent a lot of time watching other people playing."

What he really likes about arcade games is converting them to run on his own computer, an Eddi Sorcerer, or his school's Research Machines 3862. "I really like to watch other people play and try writing my own versions," he added.

He has been playing arcade games for about four or five years ever since the original bat and ball games were introduced. "Ever since Space Invaders came out I've kept reasonably well up on the new developments."

His top scores to date are 48,000 on Mooncrest and 17,000 on Galaxian. They bring out the aggressive streak in him: "I like the fact that you can kill things! But also because you can keep increasing your score and bettering your own experience."

He's hoping his Taito Electronics Space Invader table will grace his parents' lounge when it is delivered.

Huw thought quite a few of the creatures we posed in the competition were obvious. But two of them caused him problems. Galaxian was the little beast that made him slip up, and he guessed at two of the creatures, the Wizard of War, and Space Frog.

Already with 4 level competing under his belt he has a place at Cambridge University to study computing at the end of this year.

Asteroids expert Peter Edwards, took on the best in the arcade world and came second last month.

Only world snooker champion Steve Davis could beat Peter's score on the deciding game of Qix. But by that time, Peter had already been heralded as Britain's top arcade player.

In conjunction with Taste Electronics, Computer & Video Games magazine organised the Best Arcade Player trials at the Embassy Club in London's West End. Nine finalists who could prove their top scores on Britain's three most popular machines travelled down from all over the country to compete for the title on January 26th.

But it was the finalist with the shortest journey, 16-year-old Peter from Whotton in Middlesex who came away with the prize, his favourite arcade machine, Asteroids, generously donated by Taito.



Steve Davis concentrating on Qix

Unemployed Peter plays mostly in his local Whotton pub. "I like playing where there is an atmosphere. It's not beating the machine I like, but beating my mates."

Before the actual final Peter hadn't played Asteroids for a couple of weeks and he put his win down to the fact: "I was the only one not wearing a Computer and Video Games T-Shirt."

He usually plays arcade

# MEET OUR TOP ARCADE

games a couple of hours a day and is now concentrating on perfecting his Defender technique.

After being beaten by Steve Davis in the specially arranged play-off between the champions, Peter admitted that he may not have put on much earlier into that as he had the earlier rounds: "After all the competition proper was over then."

And Steve Davis was generous in his victory, confessing that he had played the new Qix machine "about 50 times" before this competition.

Steve is often seen relaxing between televised snooker competitions by playing arcade games, and his favourite one is Defender. "I use them just to mess about with during the sessions," he said.

"I find them very relaxing even though if you watch 90% of the players you'll see their feet twitching which can be very amusing."

"They are a form of competition but it doesn't really matter if you get blown up."

Steve found the Qix game an interesting and original concept. "It's certainly a different idea to most of them. But it's timing and co-ordination that is vital in all these games."

Steve put his victory down to the fact that he had just come in "fresh as a daisy", while Peter had been competing since the early morning.



Steve Davis presents trophy Peter Edmunds with his opponent

# PLAYER

The Qix machine has already proved very popular in America and was launched in Britain at the Amusements Trade Exhibition on January 18.

It is a game of space capture with the player taking the part of a crawling line which can fill in areas of the screen. But every time he leaves the borders of the screen he has to be careful to avoid the Qix — a deadly moving spark which patrols the open space on the screen.

If 70% of the screen is filled a new screen is conjured up.

Play began early that morning with the nine finalists practising on their respective machines.

But the competition proper began with the 150s of entries we received from arcade game players from all over the country, who gave us their highest scores on their favourite machines. Asteroids and Defender were undoubtedly the most popular.

Pacman came a narrow third, just in front of Scramble and Moon Cresta, and the high scores in these two brackets were very unlikely not to be included in the finals.

Because all the Defender and Asteroids finalists had already proved they can stay on the machine almost indefinitely and the Pacman finalists were capable of scoring over 300,000, it was decided to limit each player to 15 minutes on their chosen machine and the winner would be the one with the highest score after that time.

Peter was joined in the final proper by Christopher Jackson and Stephen Mainwaring. Taito expert Paul Moriarty showed the three how to play the Qix machine and gave them some tips.

## THE NINE FINALISTS

The Embassy Club was alive with the sound of sleeping and humming machines and the sight of hectic fingers pushing buttons and pulling levers on the nine finalists bottled # one.

Each contender had five minutes' practice play before they went through 15 minutes of tense, competitive play.

The winner from the three Asteroids contestants was Peter Edmunds who achieved a high score of 339,610. Runner-up was Vincent Mulholland of Buckhurst Hill, who plays in Tote 'n' Toys and scored 30,430, while Karl Booth a regular on the Gipsies Hotel's machine in Leeds came third with 9,750 points.

The Defender champion was Christopher Jackson, a familiar face at Funland in Bridlington, who went through to the semi-finals with 104,300 points. He beat Richard Carr who scored 85,575 after hours of practice at the Scarborough Casino. David Rose from the Isle of Wight notched up 34,350. His arcade haunt is Southsea's Jubilee Clarence Parade.

Stephen Mainwaring of Swanssea perfected his technique at Pompey's Cafe and reached the finals with the top Pacman score of 43,200. Runner-up was the only girl to reach the final line up, Karla Stricker from Fleetwood, Lancs. She amassed 37,060 after qualifying at her local Church Army Youth Club.

Third in the Pacman contest was Michael Cygan from Derby. Michael's final score was 38,730 after practising in Kathy's Arcade in his home town.



From Qix expert Paul Moriarty shows the finalists the rules of the game

# TION COMPETITION COMP

## OUR WINNERS DON'T HAVE LONG TO WAIT

Next month the three winners who managed to solve the free Oregon puzzle we put on the cover of the very first issue of *Computer and Video Games* will be announced.

When the closing date of the competition had crept upon us our office was swamped with entries and anxious telephone calls from entrants making sure the post hadn't delayed the arrival of their entries.

Getting on for 1,000 people submitted a solution to the "best war" puzzle hence the delay in choosing the three winners of the VIC-20 computers. These are now in the process of being sorted and tested, a mammoth task for those involved.

But by February 15 our judges will have found the three programs which met the criteria laid down.

Generally the standard of the programs submitted was good. They covered a variety of computers ranging from the Sinclair ZENI at the micro end through to the DEC PDP/11 representing mini-computers, and up to a mainframe ICL computer.

Sinclair owners were keen to upgrade their machine to a VIC-20 and accounted for the largest proportion of the entries.

Following a close joint second were solutions programmed by the Sharp M280E and the Tandy TNE-80 with the Acorn Atom the fourth most popular machine.

Many people obviously spend a lot of time and effort not only writing a program to match the sides of the puzzle, but also in

presenting it. Some entrants included additional documentation with flow charts, instructions, diagrams and photographs.

The final decision rests on the quality itself, whether or not there are any bugs in it and the quality of the programming.



### GET AN EYEFUL OF THIS TOWER—ON US!

The delights of Paris are waiting for you. That's the price up for grabs if a program listing you send to us at *Computer and Video Games* is judged to be the best of the year.

Not only will you spend a weekend in Paris — and you can take a friend too — but we will also fill your pockets with money.

October is the month when our panel of judges will put their heads together to find the winning listing. Each listing submitted will be thoroughly played and tested by the judges taking into account the originality of the game, the size of the facilities offered by that particular computer, playability, presentation and skill in programming.

No matter what computer you have written the game for, or how old you are, you can enter the competition and stand the chance of being named best programmer. All entries are valid until October so you've still got seven months to knock off a games program good enough to put you on a plane to Paris.

## BRAINWARE ANSWERS

The answer to our February Mind Boggler is that 72, 74 and 76 are the lowest 3 consecutive integers whose factorials contain the digits 0-9 in ascending order. (72 factorial has 106 digits).

The correct solution to last month's *Nevera Crossword* is printed on the right and we will publish the names of the winners next month.

Turn to page 78 for this month's Brainware problems.

|   |   |   |   |   |   |   |   |
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| C | R | S |   | M |   | H | P |
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| H | E | E | C | S | S | V | T |
|   |   | R | C | S | A | E |   |
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| R | L | U | M | A |   |   |   |
| E | A | E | P | N | S | E |   |
| A | D | V | E | N | T | U | R |
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| I | N |   | T | H | E | O | L |
| N | O |   |   | R |   | O | E |

**COMPUTER & VIDEO GAMES** free competitions are open to anyone except EMIAP employees and their relatives.

Entries to our *Mind Boggler*, *Nevera Crossword*, *Know your Computers*, *Game of the Year* and *Arcade Player of the World* competitions, should be sent to **COMPUTER & VIDEO GAMES**, Current House, 8 Market Hill, London EC3R 4JH. Judges' decisions are final and no correspondence can be entered into.

Send entries to *Mind Boggler* on a postcard and in all cases please include a name, address and, where possible, a telephone number.



# Sinclair ZX81 Personal Computer

## the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £49.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

**Lower price, higher capability**  
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, and to drive the new ZX Printer.



Every ZX81 comes with an incorporation, specially written manual – a complete course in BASIC programming, from first principles to complex programs.

## Kit: £49.<sup>95</sup>

**Higher specification, lower price – how's it done?**

Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 31. The ZX81 reduces the 31 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 16 chips from the ZX80!

### **New, improved specification**

● Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.

● Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.

● Unique syntax-check and report codes identify programming errors immediately.

● Full range of mathematical and scientific functions accurate to eight decimal places.

● Graph drawing and animated display facilities.

● Multi-dimensional string and numerical arrays.

● Up to 30 FOR/NEXT loops.

● Randomise function – useful for games as well as serious applications.

● Cassette LOAD and SAVE with named programs.

● 1K-byte RAM, expandable to 16K, bytes with Sinclair RAM pack.

● Able to drive the new Sinclair printer.

● Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 16 ZX80 chips.



## Built: £69.<sup>95</sup>

### **Kit or built – it's up to you!**

You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



# puter-



## Available now- the ZX Printer for only £49.<sup>95</sup>

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics and highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further instructions.

At last you can have a hard copy of your program listings - particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer - using a stackable connector so you can plug in a RAM pack as well. A roll of paper (85 ft long x 4 in wide) is supplied, along with full instructions.

## 16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software - the Business & Household management systems for example.

**How to order your ZX81 BY PHONE** - Access, Barclaycard or Trustcard holders can call 01-200-0200 for personal attention 24 hours a day, every day. **BY FREEPOST** - use the no-stamp-needed coupon below. You can pay

by cheque, postal order, Access, Barclaycard or Trustcard. **EITHER WAY** - please allow up to 20 days for delivery. And there's a 14-day money-back option. We want you to be satisfied beyond doubt - and we have no doubt that you will be.

To Sinclair Research Ltd, FREEPOST 7, Cambridge, CB2 1HY.

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|     | 16K (2716) RAM pack   | 15   | 40.00        |               |
|     | Sinclair ZX Printer.  | 27   | 49.95        |               |
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# NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS N GAMES NEWS

## TUMBLEWEED AND THE MORGs

### TOMBSTONE CITY

There's a far-off planet with a desert atmosphere where plants grow and turn into vicious creatures which devour any out-world visitors.

You are stuck in that desert, in command of a spaceship which is equipped with laser guns capable of widespread extermination. A protective field is your only safeguard.

Two types of evil creature inhabit Tombstone City. The Pink Tumbleweed and the green colored Morg.

Scattered around the infertile sands are Gash and even they are harmful. When the top of the plant turns white it is a warning that it is on the verge of changing into a Morg.

The Morgs move around the perimeter of your safety grid, represented by five colored squares. Between each square is a path which you can travel along, at win your game between 10 and 4 green Morgs.

When you fire your guns at a Morg and score a direct hit they instantly transform into cactus plants. It's a vicious cycle. The

best strategy is to get out of the grid to kill the Morgs. That way your exits from the safety grid will not be blocked by stationary cacti.

If the Morgs are a little too close for comfort the panic button is there to help you. Press it and you will automatically disappear from the screen for a couple of seconds. But your spaceship will reappear in a different and possibly more vulnerable place.

There are three skill levels for



you to try — novice, master and insane. The game is difficult, but that is itself makes it compulsive and you will want to keep playing until you have mastered the strategy.

Texas Instruments is the brain behind this new game which has been developed to run on a T-1 80/80. Cartridges should retail at around £28.

## BATTLE FOR THE SUEZ CANAL

### SOUTHERN COMMAND

Put yourself under pressure taking charge of an Israeli command unit during the October war of 1973.

As an Israeli commander you must smash enemy camps and cross the Suez Canal to establish a bridgehead for your side.

Your country's airforce is at your disposal but to put down Egyptian resistance.

This new wargame is called Southern Command running on an Apple II with 48K.

With the game comes a comprehensive instruction book detailing how to play the game, which ways to use and giving hints for the best strategic plans to take. The book also contains various historical scenes which you can re-enact on the computer. It's essential to read the book thoroughly to get the best out of the game, and at £24.95 it's worth spending time doing so.

Richmond-based S&B Software is the U.K. supplier.

## LIFE, DON'T TALK TO ME ABOUT LIFE...

Complete an entire life cycle from conception to death in this amusing adult game with the apt name *Love and Death*.

[£20] IC gamers should get to grips with this game for a few entertaining hours in which you travel through every stage of life. It's being an extra mile to your fate listen to the cassette playing an amusing soundtrack which adds flavour to the game.

It begins with the Seduction, the first game and you can guess what it's about! The supposing "loving verbs" to the computer corresponding to various parts of the anatomy pictured on the screen, the seduction of a woman takes place.

Next you will see yourself as a father figure without feeling your own age into the world — no easy task this — but if all goes well you can move on to the next game, Birth.

If you can manage to bring a

### LOVE AND DEATH

child into the world avoided the game is really on. Your offspring has already been named for you — *Ruby's Puke*. It's up to you to make sure he grows into a fine specimen of a man by building up the circumstances in his body.

Baby Ruby's life isn't all a bed of roses. He has to take his place in the working world. Is he the job he goes off to work and has to battle with good and evil.

Also, he has already begun his descent down the slippery slope of life. As middle age strikes so does *Dr Death*. You have to battle for his life against a deadly disease similar to the Black Death.





# NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS



## BATTLE OF THE PLANETS

**ASTRIKE**

Inter-planet brutal warfare is raging and as chief in command of the plastic space cruiser force you direct all craft in a bid to fend off enemy beings.

But the territory in which you and your space fleet are fighting is uncharted. You are flying blind.

Your only aid is your radar on which the horizon unfolds seconds before you fly over the terrain.

Minelayers are fired at you from all sides. On the ground are bases which you must destroy — if you don't there's a chance they will shoot you down. Enemy craft litter the sky, constantly blasting your ship with lethal laser fire.

Fortunately your unique space cruiser has angle adjustment facilities. You can spin your sights to drop bombs on craft flying below you or on ground stations. Or you can make use of your laser guns fitted to the front and back of your vessel.

The horizon is not straightforward. There are mountains which appear suddenly in front of you, and which occasionally develop into narrow tunnels through which you must navigate your ship.

Astriket has been developed for the Atari 488 and requires 128 memory capacity. It comes in either cassette or disc form. Gamet Electronics is the supplier and the price is £15.95 for tape and £19.95 for disc.

## IN LUKE'S KINGDOM

**STAR WARS**

In the movie *Star Wars*, Luke Skywalker's life was one long conflict with the Empire's heavy voiced leader Darth Vader.

In this new *Star Wars* adventure — which runs on a Maccom 2 with 128 memory — you assume the role of Luke and kick the game off by creating a 100 quadrant galaxy which contains 17,000 cells and a multitude of stars.

Once the various robots, starships and planets have been randomly placed in the galaxy by the computer, the battle begins.

Your object is to locate and destroy the Empire's giant laser quarters — the Death Star.

But before you attempt that you have to rescue the Princess Leia from the clutches of cruel Darth Vader.

On your way there is plenty of action. From space battles with Empire forces, collecting R2D2, the astro-droid and C3PO, the well spoken humanoid robot, to rescuing Princess Leia and killing Darth Vader for the good of mankind.

## RUBBISH FROM SPACE

**SPACE DEBRIS**

Space Debris is almost the reverse of *Space Invaders*. The green machines remain in banks at the top of the screen and you are forced to move your firing ship upwards, instead of the aliens gradually moving down towards you.

What forces your firing base to fly into the machines' close range is the debris. If you let one of the little devils escape your laser fire, when it hits the ground you'll find it transforms into a piece of debris. You must shoot them down before they build up into too much rubbish, blocking your flight path. If you get a direct hit you score points.

Space Debris was written for a Pet computer by software specialists Supersoft of Harlow. The price is £9 plus VAT.

To help you in your space quest you have some of the most advanced equipment on your ship providing you with information about your current situation and giving you help and guidance on your mission.

At your disposal are a variety of sophisticated weapons including a turbo laser cannon, twist lasers and laser pulses, plus force fields and energy absorbing shields for your ship's protection.

If you succeed in completing each mission given you get the chance to fly your X-wing star-

fighter down the Death Star's Trench. But it is a risky and dangerous task and one, suitable only for expert starfighter pilots.

While under heavy bombardment from enemy fire you have to navigate your X-wing down the Trench and aim for the weak spots.

Accurate accuracy is vital to your success and you must judge the exact moment to release a Photon Bomb to wipe out the Death Star.

*Star Wars* is a product of Chelmsford based Future Software making use of real time graphics and machine code programming for extra fast action, and 4 levels (75).

## MARAUDING INVADERS

**RED ALERT**

Your civilization is at red alert under threat from a race of marauding invaders intent on destroying all your planet's defence sites.

It's Intensely Red Alert as you leap to action stations to save your people. Armageddon weapons are two multi-barrelled precision centred missile blasters.

One ultra sensitive wide range multi frequency radar, one government complex anti-radar rocket.

The machines fill the night sky, constantly firing missiles at the surface of your planet. Move your radar sights close to the marauders and press the space bar to zap them into oblivion.

If the creatures blow up your two missile blasters you lose the game. The best strategy is to protect your radar from destruction to achieve a high score.

Red Alert runs on Apple II computers and requires 128 memory space. Copies can be bought from S&S Software of Richmond for £19.95.



# INNOVATIVE TRS 80-GENIE SOFTWARE

*from the professionals*

## Defend!



First there was *Invaders*, then came *Asteroids*, and now **DEFEND!!**

Continuing in the same tradition, *Defend!!* is a fast arcade type action game, complete with sound effects. Enemy spacecraft come at you fast and furiously. If you succeed in shooting them down before they get your ships, you must still get yourself through a missile shower (but at least they don't shoot at you) and finally, if you emerge unscathed, you must navigate a tunnel in order to get yourself completely out of danger. An exhilarating game with excellent graphics, personalisation of highest scores and points bonuses. One of its best features is the "2550" machine language, of course, for speed. A matter of taste, but we think it beats *Invaders* and *Asteroids*. Suitable for TRS-80 Models I and II and all Genie models.

Tape (MRP) ..... £15.00 + V.A.T. = £16.95  
Disk ..... £18.00 + V.A.T. = £19.80



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# NEW PRODUCTS NEW PRODUCTS NEW PRODUCT GAMESNEWS

## TAKE ON THE TANKS

### TANK RAID

The lines of your tank battalion are in your hands as they take on enemy forces.

Somewhere in the battlefield a bomb is set to go off. You must destroy it before time runs out.

Sixteen waves of enemy tanks roll before you, and you must defeat each unit in turn. After you have defeated one wave you move on to the next and the location changes as if you are taking part in a live battle.

You must complete your mission within a set time limit. As you progress through the game more enemy tanks are upon you. Be careful to aim your missiles accurately. Because your firepower is limited, if you destroy a tank you receive bonus missiles to bolster your supply.

With 50 tanks for you to wipe out your task is not easy, especially as there is cover for them to hide behind and wait until you are in firing range.

To make your life more hazardous some tanks in the opposition force are indestructible, some are not. And you never know which is which.

Tank Raid runs on the Microsoft 68 and if you fancy taking up the challenge of the tanks you can buy a copy from the Tangerine User Group for just under £20. Remember, it needs 18K memory to run.

## HAUNTING EXPERIENCE

### GHOST HUNT

Hunting ghosts along the corridors of a mansion on Bucklebury Hill is a daunting task.

They multiply without warning and suddenly appear from behind walls, from low corridors they change roles and start off a frantic pursuit of your hunter.

In essence Ghost Hunter is a version of the arcade game Pac-Man. But this is the first version available for the Atari 400 and 800 personal computers. It has been



specifically imported from America by Manchester and London based Gemini Electronics.

The screen fills with a maze in the centre of which is a square forming the central meeting place of the ghosts. Governing the path of the maze is a line of dots which your hunter has to eat to earn points.

Four energy points are in the corners of the maze, when you eat that in your trail hunt for the ghosts you automatically become the hunted instead of the hunter.

Altogether there are 64 variations of the game and it can be played by either one or two players, each moving a hunter about the maze gobbling up dots and ghosts.

With 16 different floor plans (each featuring) there is plenty of scope to stop boredom creeping in. If you want to be surprised you can let the computer choose a floor plan for you.

A couple of special features have been written into the game to add excitement. By amassing points you get a bonus hunter to help you take on the ghosts. You'll need it because as the game progresses more and more ghosts haunt the maze.

The 'Hide Instantly' facility speaks for itself. At the press of a button you can make your hunter disappear momentarily.

It's available now from Gemini on disc or cassette for 18K Atari computers. Cassette costs £14.95 and the disc version is £18.95, with an extra 50p for postage and packing.

## HELP SAVE THE DWARF!

### SIX KEYS OF TANGRIN

Here's two adventures games for Tangerine systems, both with original sounding names.

They are Tangle Adventure and the Six Keys of Tangrin from the Tangerine User Group (TUG). Running on the Microsoft 68 you will need a maximum of 18K

memory space to get the games going.

The central figure in Tangle Adventure isn't a Dwarfman, but a dwarf. He has committed a

crime so heinous that it is clocked in memory. Only the authorities know the full details.

It is for that crime that he has been locked up in a jail which makes Condit seem like an open prison.

You become the accomplice and your task is to get him out of jail. The game follows the traditional principles of adventure. You tell the computer what to do and where to go by typing in command instructions for direction and movement.

As you go you must pick up objects which could come in handy for the dwarf's escape, and avoid the police guards patrolling the jail.

The Six Keys of Tangrin is a different story. They are hidden throughout a series of damp caverns. By trial and error you must use your cunning and intuition to locate each of the keys.

It's not an easy job, as each one is made a locked box. When you've found the box your next task is to open it. You win the game when you have managed to find all six keys.

The Six Keys is written in Basic and you only need a machine with an 8K memory.

Tangle Adventure needs 18K memory and its machine code written. Both can be bought from TUG, and both cost £5.95.





# "Give me one good reason why I should choose a VIC 20 home computer."



**1.** VIC is outstanding value for money. No other colour home computer can give so much for under £200.

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**6.** Connects direct to monitor or standard television.

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**8.** Full colour and sound.

**9.** All colours directly controllable from the keyboard.

**10.** 62 predefined graphic characters direct from the keyboard.

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**12.** 512 displayable characters direct from the keyboard.

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**14.** Programmable function keys.

**15.** Automatic repeat on cursor function keys.

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**18.** Standard interfaces for hardware peripherals.

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# ARCADE

## KEEP ON DOCKING

TIPS • MOON CRESTA • TIPS

The whirling aliens of Moon Cresta have captured many an arcade player and also produced some of the more colorful slang arcade expressions.

The game begins with a small craft at the bottom of the screen and the aliens trailing above it. These split up on being hit and the safest way to approach this first encounter is to blow up both halves of each alien before tackling the next one.

After two screens of these, the Super Riss appear — these move up the screen and to the

right. These are best dispatched by shooting from the middle of the screen, moving right and finally tackling the ones on the left-hand side.

After the second set of Super Riss, move into the centre of the screen ready for docking. Try not to use the thrust at all during docking as this wastes points.

If it becomes obvious that you

will not dock successfully, use the thrust to move to the side, rather than salvage a bad docking. This way you don't earn a docking bonus but at least you won't lose a life. A successful docking results in more fire power.

The next life form (with the unlikely name, G-Div) are quite unpredictable and must be dealt with as best you can. But make

sure that after the second set your craft is on the right-hand side so you don't get hit straight away by the Meteorites which follow them.

These come down in eight pairs and beginners make the mistake of shooting one and taking from the other. The way to a good points score is to hit them both.

Finally and most dangerous are the Apogee Flies, which get harder after each sequence.

The second time around two of these fall down in the left-hand side straight away (by the sixth time around the only safe spot is on the far right-hand corner). Next time the only hope is to blast a hole for yourself.

## STREET TALK

Among the descriptive expressions which Moon Cresta fans have learned for their game is Christmas Tree.

This is a slang term for all three stages docked on together to resemble a fir tree.

A Double Disaster is the phrase to describe the huffing your docking of the first and second stages.

The third stage is popularly known as Fat Yid (especially in the Sheffield region) because of its size and shape.

The meteorites are popularly known as "Fuffy Balls".



## THE GAME NOW STANDING AT...

### GUTTING GÖTTONG

Although the era when all children wanted to be engine drivers is behind us, railways still attract many enthusiasts.

And the spartan, model railway builders and steam railway buffs have been catered for by the arcade industry with a game called Guttang Götting (I think it loses something in the translation from Japanese).

The screen is divided into a series of squares, each with some features of the railways, like track intersections, points, buffers or just plain lines. The edge of the screen is made up with stations — these are every side.

The aim of the game is survival, keep your train running and reach up points to going to the stations, with a bonus score reaching up on them.

All this requires some careful track manoeuvring to achieve and the player has control of a black block which he moves around to change the layout of the tracks.

Bonuses can also be achieved by going over the four track intersections but the danger here is that you have no control over which track your train will take and if a dead end is lurking close by...

The train's course is plotted by a change of colour and this helps in seeing where the next dead end is and in wait for your locomotive.

Other hazards are enemy trains which materialise if a player takes too long reaching a station

showing a bonus. These travel around the track and hope to crash into your train. A good player will arrange the rails to lead so that enemy trains crash into each other but this will create a single one on the lines.

The accelerator button will speed your train through a likely crash point or to the next bonus station.

One way to seemingly avoid trouble is to make a loop which includes a couple of stations and wait for the bonus to crop up there. But this possibility has been foreseen by the game writers and a loop sweeper will appear on the line to prevent an overlong stay on a feature of this kind.

## CROSSING THE BORDER

### CUE BALL

The Video Pool which featured in our Arcade Action spot last month has several rivals out at the moment.

There are two ways of playing the game: by lining up the crockers on the balls (as described in Video Pool in the January issue) or by lining up the crock behind the ball on a cushion.

Cue Ball has such a method. In this game the player has just six balls to play with and runs the crock right or left along the cushion. When the crock is lined up behind the ball of your choice press the fire button and hope your eye is good enough.

If you do not fire within the time limit the cue ball will shoot off at whichever angle the crock is that it.

The balls do not have to be knocked down in sequence (it is) but experienced players can improve their score by potting the balls in the hole with that number over it.

It is a game for people who can accurately judge an angle and takes a lot of potting need to.

If all six balls are potted whether six are set up for the break, but take care to look at the angle the cue ball will rebound at, as it is important to keep that on the table.

The disadvantage of this game is that the cue ball always shoots off at the same velocity and a bad deflection could lose you the ball.

# ACTION

## SHOWING A LONG LEG

### SNAP JACK

Dangers abound in the imaginative game of Snap Jack which features a very mobile space-bug.

The craft in question moves backwards and forwards, fast or slow and also up and down an extendable leg at a push of the control lever.

The craft feeds on mysterious globules which hang in strings in the atmosphere which it reaches up to consume.

It has some of the elements of Pacman and Scramble in the game which sees the car running from all manner of weird dangers, using its extendable legs to good effect.

The main danger in this surreal world are the Medusa Jacks. These are airborne craft which swirl through the atmosphere and destroy the player's craft if they come in contact with it.

Other threats come in the form of cable cars which soar across the top of the screen and blowing barrels, both of which cause instant death at a touch.

The player can turn the tables on the Medusa Jacks though, by using a feeding dot which then enables him to chase after them and eat them up in the way of bonus points.

The difficulty of the game is increased by the extremely unusual terrain which the craft must travel over. And after a while the craft enters a subterranean cavern, where the cavern ceiling bulges just as dangerously as the floor. This makes things hard for the Medusa Jacks as well and the floor is soon littered with these creatures which have flown into the ceiling.

Large gaping holes lie in wait for our intrepid craft here but it is after this section that the game really takes off, when a sleeping dragon lies in wait, ready to pursue the craft.

Marvellous graphics and the machine I played gave six lives, which was just as well — I needed all of them to reach the dragon.



## IN THE CORRIDORS OF SPACE

Tempest blows up a storm of ever-changing action for the arcade player.

There is no attempt to spin an earth-shaking theme around the game of Tempest — it relies on brightly coloured graphics, spectacular sound effects and a fast, frantic affair with 26 skill level possibilities.

The player starts the game by selecting a "hole" to play his first challenge on. Five possible hole patterns are available.

These represent a three-dimensional display rotating on its channels from a story background (see photograph of screen below).

From this centre the evil creatures radiate out towards the edge, along which the player moves. The player takes the form of a claw-like blaster which encompasses the end of

### TEMPEST

whichever channel he has moved to.

From this vantage point he can rain down missiles to destroy the burgeoning life which is rushing towards him.

Among the "badies" there are Poppers, starlike creatures which run around the edge of the Hole upon reaching it, Pussballs, pop up and down the corridors; Pulsers, lightning like monsters which appear at level 12. All of these also appear in "Taster" form — which split into two of whichever creature is being hit. Spikers, leave deadly green spikes around the corridors, which can impale the player at the end of a hole's life.

At the end of a "playfield" (as soon as all the creatures are killed) a new more difficult

design appears on the screen with fiercer inhabitants.

The player's blaster is not helpless when a creature makes it to the edge as it can turn to fire along the edge as the monster approaches.

Among the many Hole designs are circles, heart shapes, ovals, a selection of crosses and "Y"s.

The player's controls include a knob which rotates his blaster, a fire button and a copper zipper, which can only be used twice. First time it eliminates all life, on the second occasion it kills off just one creature.

Three bars are available at the start but bonus blasters are earned for high scores.

## THE NEXT STEP?

Atari's Tempest has got round the problem of making expert players run through the early stages of games which will be far too easy for them.

Once a player has reached one of the 26 skill level possibilities, he can start the game at the same level without going through the beginning levels again.

The company calls this feature Skill Step and rewards the good players who attempt a high level start with bigger scoring opportunities.

This feature may soon catch on across the arcade game scene.



# STARFLEET

**RUNS ON A TANDY TRS-80 IN 24K**

**BY LANCE MICKLUS**

Message from Star Fleet H.Q. Star Date 2000.

Orders for Captain James T. Kirk, Starship Enterprise.

1) Collect data on Sector Omega VI. Sector is divided into 192 quadrants for exploratory purposes (8x3x3 quadrants).

2) Preliminary reports indicate 5 C-class M planets in the sector. Locate, orbit and gather data on each of them.

3) Intelligence reports 30 Klingon warships in sector. You are to locate and destroy them.

4) You are to complete your mission and report to Starbase in Quadrant 7,7,2 by Star Date 2500.

Star Fleet Command

| 6        | 7             | 8            |     |
|----------|---------------|--------------|-----|
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| void     | void          | Unknown Quad | 2   |
| void     | void          | Unknown Quad | 8   |
| 808101P1 | void          | Unknown Quad | 1 8 |
| 808051P1 | 808051P2      | Unknown Quad | 2   |
| void     | void          | Unknown Quad | 8   |
| void     | 808101P1      | Unknown Quad | 1 7 |
| void     | Star Fleet HQ | Unknown Quad | 2   |

LONG RANGE SENSOR SCAN      QUADRANT 7 8 1  
80 (ENTER) to continue

The sample display, above, shows what a typical Long Range Sensor scan might look like. It was taken when the ship was located at quadrant 7 8 1 which is the quadrant in the middle of the display. There's a Klingon, one star and one planet in quadrant 8,5,1. Do you see the starbase in quadrant 8,8,1? If you do, good. That means you know how to interpret the Long Range Sensor Scan. The right-most column is all "Unknown Quadrant" because they are not in the galaxy. In other words, they don't exist.



# Star Trek II-4

First, you must never forget the Prime Directive: You should not shoot at anything except Klingons, otherwise you will go to jail.

Also, you want to be careful maneuvering your ship. If you collide with a star-base they will complain to Star Fleet Command. This will result in a loss of points, making it impossible to get a perfect score.

If you want to play to game to lose, try flying into a quadrant where there is a black hole or a class O star. The ship will be destroyed immediately and the game terminated. Another effective method is to ignore your crew and ship's reports, and just keep flying until you run out of energy.

The only honorable way to die is to be destroyed in a Klingon battle.

In this simulation of the Starship Enterprise, you will work with two computers — the ship's computer and the science computer. Their function, and that of the long range sensors, is of prime importance to the game.

To achieve your first objective, your ship's computer must have information about the number of Klingons, starbases, stars and planets in each quadrant of the galaxy. More detailed information is not necessary to achieve your number one, but may be helpful to you.

Each time you operate your long range sensors, the data displayed on the screen is also transferred and stored in the ship's computer.

The ship's computer can also provide you with information. It can scan its data bank to locate any area of the galaxy for which it does not have any basic data.

When Klingon vessels are encountered it's time to use the Phaser or the Photon torpedoes. Phasers are themselves, but sometimes they miss. Also, Phasers use up energy from those big 4,000 gallon gas tanks.

The destructive power of the Phasers decreases with distance. On the other hand, Photon torpedoes destroy anything they hit, and they use no power, but you must aim them.

The Klingons shoot back. That's why you go to RED alert and get those deflector shields up. At least if they do hit you, the damage is minimized.

You will be notified of any damage to the ship by Damage Control. That is where they are themselves damaged. If you want the full report, use the Damage Control command. You can also use a scan to speed repairs to the

ship by using the Repair command.

After you've destroyed all of the Klingons, you will want to go back to condition GREEN. That way your deflector shields will be at a minimum power to save energy.

You might have noticed that there is an alert condition which is YELLOW. This is a standby battle ready condition that brings the shield power up part way to offer some protection from Klingon fire power, and get all necessary energy. Why ever use condition YELLOW? Because quadrants near the Pulsar show up as noise on the LONG RANGE SENSOR scan.

Whenever you are on YELLOW alert an RED alert, you get a status report automatically each turn.

The science computer is the counterpart of the long range

sensors. It provides both you and the ship's computer with detailed information about the quadrant. This includes the classification of stars and planets, and the location and energy level of Klingons.

Since long range sensors only scan the immediate adjacent quadrants, you're going to have to move the ship. This is the function of the Warp Drive. The command lets you move from one quadrant to another, and automatically navigates around things like stars and black holes. You must provide the destination quadrant and the speed in warp units. The faster you go, the more energy you use. The slower you go, the more time it takes for your trip will take.

You can think of the Enterprise as having a 4,000 gallon gas tank. By using the Status command, you can find out how much fuel

# SWAN



# TR34

you have left. You must keep your eye on this, lest you run out of fuel. To get more gas, or fuel, you must dock at a starbase.

To do this, you must first find a starbase by using your long range sensors, the ship's computer or a combination of both. But, don't try to dock at the starbase in quadrant T/T2 or you'll end the game — probably in disgrace (see your Warp Drive by *fy* in the quadrant where the starbase is located).

Now you must maneuver the ship within the quadrant. This is the function of the Impulse System. You must supply the direction and speed, like the compass before to give the direction. A unit of speed is approximately equal to one space. To dock, you must try to move the Enterprise into the same space that the starbase occupies. But don't try to move through it, or a collision will result. When that happens, other things will go wrong for you and a perfect score will no longer be possible.

After a successful docking, good things will happen. For one, you'll get a full fuel supply. Also, your check of topologies will be set back to three, and must done up to the ship repaired.

But let's say you have plenty of fuel and your long range sensors turn up a quadrant with a planet: go to that quadrant using your warp drive. Now you

the science computer to classify the planet(s). If it is an unexplored class M, then you will want to explore it. To do this, simply orbit the planet the same way you would dock in a starbase. Once orbit is achieved, the planet will be classified as an explored Class M planet and points scored. When you have orbited all five class M planets, objective number two will have been achieved.

You are now ready for objective number three, called "Kill the Klingons." First you've got to find them. If you've been doing much exploring, that won't be hard. They'll show up on the long range sensor scans. You must now get ready for battle.

First, you must put the deflector shields up to full power, like the Dist Command and go to condition RED. Next, use the Warp Drive to enter the quadrant where the Klingons are.

A Pulsar is a giant static maker. The static is so strong near the Pulsar that the Long Range Sensors can not detect what is in the quadrant. Therefore, you must go to the quadrant using your Warp Drive to see if anything is there.

Don't be surprised if you suddenly find some Klingons. They know you can't see them from any distance, so they like to lurk in the Pulsar noise, ready for a surprise attack.

Some players like to explore the noise quadrants in condition YELLOW to conserve energy and yet be ready for a surprise attack. Others prefer to explore these areas in condition RED.

One other thing you will find in the galaxy is a void. That's what the Long Range Sensors will display when they scan a quadrant which has nothing in it. Otherwise, it will display the number of Klingons (K), Starbases (B), Stars (S) and Planets (P).

Now I'm going to let you in on a little secret. If you should return to Base, and want to continue, you can get back to the command level by typing GO TO 1 (ENTER). This is only to be used if, for some reason, the program

should wrap unexpectedly. It gives you a way to restart the game. Except for such an emergency, it should not be used.

Because it can take up to two hours to play an entire game, a save-game load-game feature has been added. When you are at the command level, type S. The program will ask whether you are saving the current game, or loading a previously saved game. (Your cassette recorder should be ready prior to using this command.)

If you have only 16K of memory then in addition to entering all ROMs, you will also need to delete the Disk I/O routines in Lines 10000-10400.

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BY RICHARD JOHNSON



# DODGER

## RUNS ON AN APPLE

Watch out there's a gangster about and a contest has been put out on you. Dodger is a neat graphics and sound game which features a crowd of Chicago headlines crowded with nothing more closely than empty victim cases.

But they are out to get you. There's a fence around the screen and a small hole at the top through which you have to escape. There are 1 to 50 bad guys, you choose how many. The object is simply to get out of the exit before one of the bad guys catches you.

You are able to shoot some of the gangsters — but how many bullets you get depends upon the number of bad guys you've chosen. It's simple but very addictive and trying to escape from all 50 villains is a real challenge.



170 REM # DODGER #  
110 REM COPYRIGHT B.A. JOHNSON  
120 DIM A(110),J(100),P(100)  
130 GOTO 10

140 REM # THE GAME OF DODGER #  
150 REM # BAK JOHNSON 01/17/80 #  
160 GOTO 1450

170 GOTO 440: REM GET READY  
180 CALL -RND(1) FOR 10 POINT "YOUR NO  
190 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"  
200 FOR 10 TO 100:PRINT "YOUR 1  
210 PRINT "BULLETS" NEXT I  
220 GOTO 1450: REM IF 11/17/80 REM  
230

240 FOR 10 TO 100:PRINT "YOUR 1  
250 PRINT "BULLETS" NEXT I  
260 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"  
270 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"  
280 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"  
290 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"  
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600 IF 1,2,3,4,5,6,7,8,9,10 "BULLETS"



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Everyone's talking about home computers but few have seen them yet. The new £400 8088 & 8088 computers and Commodore Vc 20 are now on show at Microchips.

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Both systems have sound and colour graphics, are expandable and easily programmed in your own home.



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(Winchester)

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505 Missile Command. Multitask. Destroyers destroyed city. 505 Missile Command. Chrysler Missions sighted. 505 Missile Command. Plasma Projection assault. 505 Missile Command. Satellite bombs in range. 505 Missile Command. Megan Annihilator destroyed further city. 505

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# AIR ATTACK

BY CHRISTOPHER EDE

Enemy planes on the station and how Captain. The odds are overwhelming as the fleet of bombers is inexhaustible and your warship has few chances to live back.

As bombs crash into the ocean, you fire back with a rocket launcher at the back of the boat. If fired diagonally and cannot be moved up or down, if the plane dodge this fire you can open up with your ack-ack guns.

But with only 12 rockets to fire it is important you are accurate

and choose your targets carefully.

At the end of the game the computer reads out your score and shows how long you lasted.

To play Air Attack you use four keys and a mouse button.

- Key "4" places your A.A. gun in the horizontal.
- Key "5" places your A.A. gun at a diagonal angle.
- Key "6" places your A.A. gun in a vertical position.
- Key "A" fires your A.A. gun.
- The "Space" bar fires your rocket launcher.

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```

100 IF I1=1 THEN I340
105 A=INT(RND(1)*2)
110 PRINTAB:GOTO3
120 PRINTAB:GOTO3
130 POKETS+859.32
140 Z=PEEK(146)
141 IF V0=1 THEN I340
142 IF P0<12 THEN IF Z=5 THEN I300
143 IF V0=1 THEN I300
144 IF Z=48 THEN I300
150 IF Z=42 THEN H=70:POKEP,N
160 IF Z=34 THEN H=28:POKEP,N
170 IF Z=41 THEN H=93:POKEP,N

```

```

175 POKEP+1,121
200 IF K=3 THEN I2015
210 IF INT(RND(1)*5)=2 THEN K=3:GOTO2000
990 GOTO100
1000 IF H=78 THEN I30=-1
1010 IF H=28 THEN I30=-41
1020 IF H=93 THEN I30=-40
1030 FORT=17015
1040 H=ORT+P:POKEH,N
1050 IF PEEK(H+2)=32 THEN I050
1055 POKEH,32:GOTO1500
1060 POKEH,32:NEXTT
1070 GOTO100
1100 F0=F0+1
1105 F0R0=17020
1110 O=V0-41+P+5:POKEO,28
1120 IF PEEK(O+41)=32 THEN I140
1130 POKEO,32:GOTO1500
1140 POKEO,32:NEXTV
1150 GOTO100
1500 POKEH,42:POKEH+1,42:POKEH+2,42:POKEH+3,42:POKEH-39,42:POKEH+41,42
1501 POKEH-38,42:POKEH+42,42
1503 FORTT=17050:NEXTT
1510 POKEH,32:POKEH+1,32:POKEH+2,32:POKEH+3,32:POKEH-39,32:POKEH+41,32
1520 POKEH-38,32:POKEH+42,32
1530 CC=CC+1:LP=0:K=0:GOTO100
2000 J=INT(RND(1)*25)

```

## RUNS ON A PET IN 8K

```

2005 IF J>19 AND V0=1 THEN J=10
2010 IF J>19 THEN J=21
2015 LP=LP+2:IF LP>=36 THEN I2040
2016 X=J*48+TS+LP
2017 IF J=21 AND LP=38 THEN I2250
2020 POKEH,127:POKEH+1,90:POKEH+2,121:POKEH+3,188:POKEH-1,32:POKEH-2,32
2021 IF LP>16 THEN I000
2022 IF INT(RND(1)*100)=5 THEN I2100
2024 GOTO100
2040 POKEH,32:POKEH+1,32:POKEH+2,32:POKEH+3,32

```







# AIR ATTACK



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2290 IFB#247OR#227THENPOKEZX,32:GOTO100
2291 IFB#777THEN#V=1:GOTO2210
2292 IFB#169THEN#2250
2293 IFB#280R#930R#707THEN#V=1:GOTO2210
2294 IFB#103THENPOKEZX+42,32:GOTO2210
2295 IFB#121THENPOKEYS+863,32:VA=1:GOTO2210
2296 IFB#95THENI1=1:POKEYS+908,32
2210 POKEZX,32:POKEZX+41,42:FORIU=1TO30:NENTIU:POKEZX+41,32
2220 GOTO100
2250 PRINTATAB(10)"T1"
2260 PRINTATAB(15)"T1"
2270 PRINTATAB(18)"T1"
2280 PRINTATAB(17)"T1"
2290 PRINTATAB(20)"T1"
2310 PRINTATAB(15)"T1"
2320 PRINTATAB(17)"T1"
2330 PRINTATAB(17)"T1"
2340 PRINTATAB(17)"T1"
2350 PRINTATAB(10)"*****YOU HIT '00' PLANES"
2310 PRINTTAB(12)"MIN "MID$(T14,3,2)" MINUTES"
2320 PRINTTAB(12)"AND "RIGHT$(T14,2)" SECONDS"
2325 PRINTTAB(9)"YOU USE 'R' ROCKETS"
2330 PRINTTAB(11)"ANOTHER '0' CY/10"
2340 GETU$
2350 IFU$="V"THEN#000
2360 IFU$="N"THENPRINT"J":END
2370 GOTO2340
2400 PRINT"YOU ARE THE CAPTAIN OF A SHIP."
2410 PRINT"YOU ARE UNDER ATTACK BY ENEMY PLANES."
2460 PRINT"THE OBJECT OF THE GAME IS TO SHOOT DOWN"
2470 PRINT"AS MANY ENEMY PLANES AS YOU CAN BEFORE"
2480 PRINT"THEY BLOW YOU UP."
2490 PRINT"YOU HAVE A ROCKET LAUNCHER AND A.R. GUNS"
2495 PRINT"YOU HAVE ONLY 12 ROCKETS"
2500 PRINT"TO FIRE THE LAUNCHER PRESS 'SPACE'"
2510 PRINT"TO FIRE THE A.R. GUNS PRESS 'R'"
2520 PRINT"TO MOVE THE GUN USE '4','5','6'"
2525 PRINT"AS FOR THE NUMBER HIGHER THE GUN."
2530 PRINT"*****PRESS SPACE TO START"
2540 GETV$ IFV$<>" "THEN#240
2550 CLR:GOTO5

```

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Telephone No: \_\_\_\_\_



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# REVERSI

RELOAD RUNS IN JUST OVER 1K

BY GORDON STEVENS

Take on your Sinclair at the recently revitalized game of Reversi.

The old English game of Reversi — now popular, since being re-invented as Othello — is a two-player strategy game. Those of you who have been following Tom Nupier's occasional columns on the game in this magazine will know that computers are capable of beating us poor humans. Your Sinclair may not actually be able to defeat you every time but it will give all but the best Reversi players a real challenge.

Gordon Stevens has utilized some machine code in his program which needs careful handling on the Sinclair.

The BASIC routine is used for a preliminary screening procedure in the selection of the computers best move. This allows the main part of the evaluation routine to be written in Basic while still achieving a good response time.

The machine code section is held in REM statements 1, entry point 40868 (16333 in decimal) Locations 4082H-4087H (16304-16316 Dec) are used for transferring data to and from the Basic program via PEEK and POKE commands.

REM statement 1 can be written from the keyboard, provided that the function keys are used where appropriate.

Commands such as RETURN can be entered by first using THEN followed by the command and deleting THEN afterwards. Statements 10 to 19 modify statement 1 where the code cannot be loaded directly.

Alternatively the routine may be loaded via a Hex encoder, such as Reupload into blank REM statements from the Hex dump given at the end of the General program.

Strategy is based on three main factors:

- A value for each position on the board, held in array "V" and which is modified when certain positions have been occupied.
- The nature of the end positions formed by the newly laid piece. For example a line ending at an edge position at each end is worth more than one with a space at each end. The values are held in a table in array A.
- The number of pieces captured. The significance of this increases as the game progresses.
- Move tips as Reversi will be coming in our May issue.

```

100 POINT = 1 2 3 4 5 6 7 8
101 FOR M=1 TO 8
102   POINT AT A+B,M:G
103   FOR N=1 TO 8
104     POINT AT A+B-1,B+N-1:"+";M
105   NEXT N
106   PRINT AT A+B-1,10:" ";TAB 1
107   PRINT AT 10,0:"
108   PRINT AT 0,0:"O" AT 10,8;
109   SLOW
110   PRINT AT 10,1:"PLEASE ENTER
111   MOVE
112   INPUT M
113   PRINT AT 10,1:"
114
115 IF A+B=M THEN GOTO 116
116 IF LEN A<2 THEN GOTO 200
117 IF LEN B<2 THEN GOTO 200
118 IF A(1)<1 OR A(1)>5 THEN GO
119 TO 200
120 LET X=VAL A(1);
121 LET Y=VAL B(1);
122 LET X=X+Y-6;Y=Y+X-6;
123 IF DEER POS=127 THEN GOTO 2
124 LET PRINT=1
125 LET MORE=83
126 LET MORE=100
127 GOSUB 200
128 IF NOT VALID THEN GOTO 200
129 LET A=B-1
130 PRINT
131 LET MORE=100

```

```

200 LET P=0;P=0
201 LET H=BLACK
202 LET W=WHITE
203 FOR M=1 TO 130
204   GOSUB 1200
205   IF H=H THEN GOTO 206
206 IF A="H" THEN GOTO 1200
207 PRINT AT 20,1:"I CAN'T DO"
208 GOTO 200
209 LET P=DEER
210 LET POINT=1
211 GOSUB 200
212 LET B=B-1
213 GOTO 200
214 LET VALID=0
215 LET A=1
216 FOR M=1 TO 4
217   LET B=B(1)
218   GOSUB 1210
219   IF A=H THEN GOSUB 1200
220 LET B=127;A=127;P=P+1;
221 LET B=127;A=127;P=P+1;
222 GOSUB 1210
223 IF PRINT THEN GOTO 240
224 IF A=H THEN GOSUB 1100
225 LET A=127;P=P+1;A=127;P=P+1;
226 LET B=127;A=127;P=P+1;
227 IF NOT PRINT THEN RETURN
228 IF X<1 AND X<18 OR Y<1 AND

```





```

D Y:1.8 THEN RETURN
1000 LET X0=50H (1-2)
1005 LET Y0=50H (1-2)
1010 LET F(X,Y)=0
1015 LET F(X+X0,Y)=0
1020 LET F(X+X0,Y+Y0)=5+(HOME=10)
1025 LET F(X+340,Y)=10
1030 LET F(X,Y+Y0)=10
1035 RETURN
1040 FOR S=1 TO 7
1045 IF P=0 THEN (2005=S+0)
1050 C=S+1 THEN PRINT S
1055 IF S=1 THEN RETURN
1060 IF P=HOME THEN GOTO 1000
1065 LET P=0
1070 RETURN
1075 LET UNLID=1
1080 IF POINT THEN GOTO 1140
1085 LET T=0.5 (10.5)
1090 LET EXT=200+50
1095 FOR S=1 TO 7
1100 LET P=PEEK (EXT+S*5)
1105 IF P=0 THEN NEXT S
1110 RETURN
1115 FOR C=0 TO S-1
1120 FOR E=1 TO 3
1125 PORE P05+C*50,S
1130 PORE P05+C*50,HOME
1135 NEXT E
1140 NEXT S
1145 LET P=0
1150 RETURN
1155 LET P05=50+0FILE
1160 LET UNLID=0
1165 LET S=0
1170 PRINT AT 21,0;"COUNTING 500"
1175
1180 FOR S=0 TO 7
1185 FOR E=0 TO 7
1190 LET C=PEEK (P05+S*5+E*50)
1195 BL=BL+C (1000)
1200 LET UNLID=1 (100)
1205 NEXT E
1210 NEXT S
1215 PRINT AT 21,0;"WHITE: ";UNLID
1220
1225 STOP
1230 IF POINT THEN GOTO 1000
1235 LET P05=0
1240 PORE P05+0.45
1245 PORE P05+0.55
1250 IF NOT UNLID THEN RETURN
1255 LET P05=0FILE+PEEK GRID0+50
1260 LET T=0
1265 GOSUB 200
1270 IF NOT UNLID THEN GOTO 1440
1275 LET T=T+1000
1280 IF T=MAX THEN GOTO 1440

```

```

1030 LET MAX=T
1035 LET EXT=0
1040 GOTO 1140
1045
1050
1055 PRINT AT 2,7;"REVERSE:OTHER"
1060 TAB 2;"THE GAME IS PLAYED ON"
1065 TAB 2;"AN 8 X 8 BOARD. YOUR COUNTERS"
1070 TAB 2;"ARE ""O"" AND THE COMPUTER'S ""X""
1075
1080 PRINT TAB 2;"THE FIRST FOUR"
1085 TAB 2;"COUNTERS ARE IN PLACE. YOU TAKE"
1090 TAB 2;"TURNS TO PLAY A ""COUNTER SO THE"
1095 TAB 2;"IT IS YOUR TURN TO MOVE AN ENEMY C"
1100 TAB 2;"OUNTER. SAKAICHIGORE OR HOME E"
1105 TAB 2;"HONY PIECES IN LINESEEN IT AND"
1110 TAB 2;"ANOTHER FRIENDLY PIECE. MAY B"
1115 TAB 2;"EES 50 CAPTURED. SCORE YOURS."
1120
1125 PRINT TAB 2;"IF YOU ARE UNA"
1130 TAB 2;"BLE TO CAPTURE, ""THE TURN IS FO"
1135 TAB 2;"RETS ""
1140 PRINT TAB 2;"TO MAKE YOUR M"
1145 TAB 2;"OVE. ENTER THE ""COLUMN. THEN TH"
1150 TAB 2;"E ROW. AND PRESSE THE "" "" IF YO"
1155 TAB 2;"U CAN'T "" THEN ENTER "" ""
1160 PRINT TAB 2;"THE SCORE BL"
1165 TAB 2;"E FOR 10-20 SECONDS WHILE SE"
1170 TAB 2;"LECTING A "" ""
1175 PRINT TAB 2;"PRESS ""NEWLIN"
1180 TAB 2;" "" WHEN READY."
1185 INPUT S
1190 RETURN
1195 FOR T=0 TO 3
1200 LET A(14-1)=CHR$ (10+10*INT
1205 (10/10+20)
1210 LET A=INT (10-10)
1215 NEXT I
1220 RETURN

```

END OF PROGRAM FORM OF CODE ROUTINE IN STATEMENT 1

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**RUNS ON AN ATARI IN 8K**

**WITH A JOYSTICK**

**BY JAMES GARRETT**

# OCTAP



# DRAW



If you thought Etch-a-Sketch was the last word in automated art, Octadraw will prove you wrong.

As the name suggests, Octadraw enables the player to draw in eight directions at once. This use of symmetry will suggest all kinds of new ideas to the amateur artist and produce some interesting results from those who previously believed they possessed no artistic bent whatsoever.

The program is designed for an Atari with 8K and at least one joystick.

Run the program, then press the start button at the right of the keyboard. You will see a blinking cursor in the centre of the screen. Using the joystick in slot #1, you may move the cursor around the screen. With the fire-button pressed, the cursor will leave a trail of colour as it moves. Seven mirror images of the line will also appear, three will match the cursor colour, and four will be a different colour.

Pressing the select button (just above most at the right of the keyboard) will select the computer to do the drawing, while you sit back and watch. When you wish to continue drawing, just move joystick #1 and hold it until the computer finishes the line it is currently drawing. You may then add to the computer's drawing.

Pressing the button with the

word "clear" on it will erase the current picture.

If a joystick is placed in slot #2, you can control the colours that Octadraw uses. Pressing forward will change the background colour; pressing left changes one of the drawing colours while pressing right changes the other. Holding the fire-button down during any of these three operations will change not the colour but the luminance of the corresponding colour. With eight shades of 16 colours for each of the three parts of the drawing, there are over two million possible colour combinations!

## VARIABLES USED

A=32: Added to x-value to centre drawing.

C=3: COLOUR value

H1, H2, H4: Colours used in SETCOLOUR x, Hx, Ly statements

I: Loop variable

KEY=768: PEEK address to determine which key has been pressed

L: Used in line 10 to create mixed mode display

Used in line 620 to determine length of line to be drawn by the computer

L1, L2, L4: Luminances used in SETCOLOUR x, Hx, Ly statements

P=32: Used to calculate reflections across X-axis

Q=128: Used to calculate reflections across Y-axis

# AUTOMATED ART MADE EASY



S: In line 100 S is the value of STICK00. This determines the direction in which the cursor will move.

In line 800, the computer "makes up" a value for S, and this value determines the direction of cursor movement.

START=00% PEEKing at this location reveals which of the START, SELECT, or OPTION buttons are pressed.

T: In line 500, T gives the status of the fire-button: 0 if pressed, 1 if not. This determines whether a line will be drawn or not.

Similarly, in lines 800 and 810 the computer "pretends" to press the fire-button about 9/10ths of the time. You may change this fraction by changing "0.1" in line 800 to some other fraction between 0 and 1.

W: Reflects any activity from joystick #2. This changes the colour of the drawing.

W: Tests for the fire-button on joystick #2. This affects the brightness of the colour.

X, Y: The coordinates of the point to be PLOTTed.

Z: Temporary storage used when X and Y are switched on the end of the drawing sub-routine.

10 GRAPHICS SCREEN 320,160:POS(X0)

<DRAW(X0+140):POSITION 1,0: "DRAW"

W:POSITION 21,0: "IF JAMES GAMES"

20 POSITION 0,0: "Press START"

30 SETCOLOR 1,0,0:SETCOLOR 0,1,0:SETC

OLR 0,0,0:MOVE L=0,0:MOVE L=0,0:SETC=0

4:START=00%

40 IF PEEK(START)=0 THEN 40

50 S=0:IF=0:GRAPHICS 210,0:W=0:Z=0

60:Z=0:Z=0:W=0:Z=0:W=0:Z=0:W=0

70:W=0:Z=0

80 IF PEEK(START)=0 THEN 40

90 S=0:IF=0:GRAPHICS 210,0:W=0:Z=0

100:W=0:Z=0

110:W=0:Z=0

120:W=0:Z=0

130:W=0:Z=0

140:W=0:Z=0

150:W=0:Z=0

160:W=0:Z=0

170:W=0:Z=0

180:W=0:Z=0

190:W=0:Z=0

200:W=0:Z=0

210:W=0:Z=0

220:W=0:Z=0

230:W=0:Z=0

240:W=0:Z=0

250:W=0:Z=0

260:W=0

270 IF S=0 AND S=0 THEN S=0:IF=0

280 IF S=0 AND S=0 THEN S=0:IF=0

290:W=0:Z=0

300:W=0:Z=0

310 IF S=0 THEN S=0:IF=0

320:W=0:Z=0

330 IF S=0 THEN S=0

340 IF S=0 THEN S=0

350 IF S=0 THEN S=0

360 IF S=0 THEN S=0

370 IF S=0 THEN S=0

380 IF S=0 THEN S=0

390 IF S=0 THEN S=0

400 IF S=0 THEN S=0

410 IF S=0 THEN S=0

420 IF S=0 THEN S=0

430 IF S=0 THEN S=0

440 IF S=0 THEN S=0

450 IF S=0 THEN S=0

460 IF S=0 THEN S=0

470 IF S=0 THEN S=0

480 IF S=0 THEN S=0

490 IF S=0 THEN S=0

500 IF S=0 THEN S=0

510 IF S=0 THEN S=0

520 IF S=0 THEN S=0

530 IF S=0 THEN S=0

540 IF S=0 THEN S=0

550 IF S=0 THEN S=0

560 IF S=0 THEN S=0

570 IF S=0 THEN S=0

580 IF S=0 THEN S=0

590 IF S=0 THEN S=0

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# ENTON

10 REM ENTON BY MURRAY ALLEN

11 REM

12 G=0

20 P=0:Q=0:G=1:Q=0000:P=0000:E=0000

30 DIM A\$(99):A\$="--32:RQ2=1:RQ3="--1:RPA=32:1H."TO DIFFICULTY 1-32"

40 G=0

50 F=P=0000 TO #01FF:TS=00:H.

60 REM DRAW PAGE

70 F,P=45 TO 549 5,94

80 F,P=0 TO 35:1P9,37>1 G,100

90 B7C=0000+R>=0FF

100 H.

110 F,P=48 TO 79:1P8,37>1 B7C=0000+R>=0FF

120 H,1H.

130 F,P=0001F TO 00244 5,48:1C0=30>=0FF:1C0=30>=0FF

140 TS=0FF:1C0=1>=0FF:1H.

150 F,P=0 TO 32:RPA=0000=0FF:1H.

160 F,P=1 TO 5:0=0,H,1,32>=1:07=0000=0FF:1H,1T=0

170 REM START

180 A7C=000:TS=0FF:TS=00

190 0=0

200 0=0,H,34=1

210 0=0=00

220 IF 0=0000 0=0=32

230 IF 10=00F:0=0=1

240 1P1C1A=32>=0FF 0A 1C0=32>=0FF 0A 1C0=1>=0FF 0A 1C0=1>=0FF 0A,2

250 L1,000

260 1P1=000=32 H=0=32

270 1P1=000=54 H=0=32

280 1P1=000=39 H=0=1

290 1P1=000=36 H=0=1

300 1P1C1=000 0A G=1 0=0:1C0=32>=00

310 1P1C0=0001FF) G=0

320 1P1C0=0000TS=0

330 1P1C1=0=0FF) H=0:70=70=4

340 1P1C0=00F 0=0=1

350 G=0

3600P,012,"you made it YOU SCORED",07/G,0

3700P,012,"you're entoned":G,0

**RUNS ON AN ATOM IN 2K**

**BY MURRAY ALLEN**

MB

```

3980P, @G1D1R R@3.P-1.L.#PF7]
399C:( @B@ J@B L:STY@B.RT@J
400 P,@G.G.@B
401@P, "ENTER@""@@"
402 P,"GUIDE YOUR 'X' SYMBOL TO THE ""BOTTOM OF THE SCREEN.""
403 P,"CONTROL KEYS ARE:"
404 P,"↑-UP""↓-DOWN""→-RIGHT""←-LEFT""
405 P,"BUT BEWARE THE WALLS ARE COLLAPSING AROUND YOU AND"
406 P,"TO MAKE IT ""HARDER YOU HAVE TO CAPTURE THE O"
407 P,"SYMBOLS. THE NUMBER OF SYMBOLS IS EQUIVALENT TO THE "
408 P,"DIFFICULTY." "PRESS RETURN TO START".L.I.#PF3.G.@B

```

[illegible]

---

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## BY ALLAN SCARFF

The popular Eastern strategy game of Go is one of the few games which is quite simple to represent on a computer screen.

This is the first step in turning your computer into a Go opponent. To tackle this problem, you will need a computer: Pet, Apple, Deep Thought — any computer will do! You'll need at least 1K of RAM and a video terminal. Color graphics would be super and so would disc storage but neither are essential.

I will attempt in this and future articles to describe the building blocks of Micro Go. These are designed to minimize effort in the long run. Each rectangle shown in diagram 1 represents a function which, coded separately, can be used unchanged in future iterations of the Micro Go program.



Declare a 3 x 3 array (call it "Board") to simplify testing. (You can upgrade to 19 x 19 later). Each element of the Board, representing an intersection, must hold one of three values: "empty", "black" or "white" (say, 0, 1 or 2). Initializing the Board is merely putting "empty" values into every element. Storing a move is putting one of the three values into the element specified by coordinates.

The Display Board function should be coded to display the entire board both at the start and after each move. It may be possible to overwrite any previous display, giving the effect of showing only a single stone.

If you have graphics, try to

## THE BASIC RULES OF GO

1. One player uses black stones. The other white.
2. The board starts empty. Play consists of the contestants placing, in turn, a single stone on the intersections of a 19 x 19 grid. Black starts first. Once placed, stones are not moved unless captured.
3. The object of the game is to surround territory. 1 point is awarded for each vacant intersection surrounded and also for each opponent stone captured.
4. Suicide (capturing your own stones) is forbidden!
5. A player may pass his turn.
6. A game is ended by resignation or by three consecutive passes.
7. The player with the most points wins.



FIGURE 2: A single stone is placed on the board. The board is 19 x 19. The board is shown with a single black stone placed at the intersection of the 4th column and 12th row from the top-left corner.



FIGURE 3: A single white stone is placed on the board. The board is 19 x 19. The board is shown with a single white stone placed at the intersection of the 12th column and 4th row from the top-left corner.



FIGURE 4: A single stone is placed on the board. The board is 19 x 19. The board is shown with a single black stone placed at the intersection of the 12th column and 4th row from the top-left corner.

FIGURE 5: A single white stone is placed on the board. The board is 19 x 19. The board is shown with a single white stone placed at the intersection of the 4th column and 12th row from the top-left corner.

FIGURE 6: A single black stone is placed on the board. The board is 19 x 19. The board is shown with a single black stone placed at the intersection of the 12th column and 4th row from the top-left corner.

FIGURE 7: A single white stone is placed on the board. The board is 19 x 19. The board is shown with a single white stone placed at the intersection of the 4th column and 12th row from the top-left corner.

FIGURE 8: A single black stone is placed on the board. The board is 19 x 19. The board is shown with a single black stone placed at the intersection of the 12th column and 4th row from the top-left corner.

FIGURE 9: A single white stone is placed on the board. The board is 19 x 19. The board is shown with a single white stone placed at the intersection of the 4th column and 12th row from the top-left corner.

represent the board as shown in the diagrams (then you won't shock those Go players used to the traditional board and stones).

If you haven't a graphics terminal, a fair representation can be achieved with "B" for black stones, "O" for white, and "." for vacant points.

There are many schemes for accepting moves. Here is just one example: Each move is entered by typing a command character followed by coordinates. The command characters are:

"B" add a black stone  
 "W" add a white stone  
 "." remove a stone  
 "A" abandon game and reinitiate the board.

For example, the stones in diagram 2 could be played by B04, B04 and B04. The Accept move function must also translate the coordinates into numbers suitable for addressing the elements of the Board array and should reject coordinates outside of the permissible range. All that the Store move function will then be required to do is offer a specific element to empty, black or white.

You can now play Go with a friend using your computer as if it were the old fashioned board and stones (except you'll find it harder to spill the stones!). My next article will bring out some of the advantages a computer has over the traditional Go equipment.

# Adventure

## NAME OF THE GAME

Adventure is the name given to the dragons and castles game which features on the Atari T.8 games console.

If you own an Atari games console and have wondered about the Adventure cartridge, be warned that it is not the sort of game I usually describe on these pages.

This game is purely graphical and is played with a joystick control. The player has to guide his "puppet" through a maze which is shown from above and consists of several discrete "pages".

The aim is to get the treasure, avoid or kill the dragons, keep an inventory list from disrupting your tactics too much and win home through a maze.

Three games are provided according to the package — this really means one basic game with additional features that increase the interest and difficulty level. This game, written by Warren Robinett, is popular with Atari owners, but not what you'd really call an Adventure!

Adventures would be very dull if you couldn't pick up and drop things — all those treasures — so let us take a look at possession commands, TAKE, DROP and INVENTORY.

To "take" an object, the following conditions must be met:

- The verb "take" or equivalent must be decoded from the input.
- The noun decoded must be an object in the current location.
- The player must not already be carrying too much.
- The object, player and environment may have to pass other condition tests for a successful "take".

In the example used last month, the decoded number (K1) for TAKE was 2. To check the second condition above, the array Pn1 must be scanned. Refer to Figure 1. Suppose the current location (LN) is 1 and the player types "TAKE COW". The scanning may be done as follows:

```
1030 FOR I=0 TO 3: IF
```

```
LEFT$(Pn1-I-30) THEN K2=1
ELSE NEXT: GOTO 3040.
```

Line 3030 will be a standard reply like "I don't know what a 'Pn1' is".

However, we have found the word COW and the FOR/NEXT loop is exited with K2=2. But where is the cow?

```
1010 IF Pn2 <> LN THEN 3010
ELSE LET Pn2=30: IN=IN+1:
GOTO 3040.
```

Line 3010 is another standard reply like "I don't see it here" since Pn2=3 and LN=2.

If the player is in location 2 then the ELSE statement executes. Line 3040 is a reply, saying "OK". IN is the inventory count which is incremented to keep track of how many objects are being carried. 50 is an imaginary location number, which we will use for objects being carried. When the screen is updated, since Pn2 now=30, location 3 will not show a cow.

Condition 3 has not been checked yet however, so we must expand line 1030 to cover both that and the miscellaneous condition check:

```
1010 IF Pn2 <> LN THEN 3010
ELSE IF IN > 3 THEN 3030 ELSE IF
Cn2 < 0 THEN 3030 ELSE LET
Pn1=30: IN=IN+1: GOTO 3040.
```

Notice that an arbitrary limit of six has been set on the total number of objects carried. Cn1 is an array used as a flag for objects, and I will describe this in detail later. At this stage we can establish a convention that if Cn1 is negative then for some reason the object can't be taken even though it is in the current location.

Dropping an object is simpler than taking one. After "DROP" is decoded and K2 for the object has been set:

```
1020 IF Pn2 <> 50 THEN 3030
ELSE LET Pn2=LN: IN=IN-1:
GOTO 3040: REM If not carrying
it say so else deposit at current
location and decrement inven-
```

tory.

We now have quite a collection of "standard replies":

```
3010 (reply) = "I DON'T SEE IT
HERE": GOTO (start).
3020 (reply) = "I'M CARRYING
TOO MUCH": GOTO (start).
3030 (reply) = "IMPOSSIBLE":
```

```
GOTO (start).
3040 (reply) = "OK": GOTO
(start).
```

```
3050 (reply) = "I'M NOT CARRY-
ING IT": GOTO (start).
```

The method of screening replies is dependent upon the structure of the program.

To complete our session on possession, we need a reply to INVENTORY. This is simply a matter of concatenating all the objects whose current location is 50 into one reply string:

```
1200 (reply) = "I'M CARRYING":
1210 FOR I=0 TO 3: IF Pn1 = 50
THEN LET (reply) = (reply) +
Cn1:
1220 NEXT: GOTO (start).
```

FIGURE 1:  
Inventory

1 Player  
(K1)  
2 Dragon  
(K2)  
3 Cow  
(K3)

FIG. 2: Simplified  
version of location data-

ing current positions  
of objects in locations  
then objects and loca-  
tions independently  
numbered.

## ROOMS AT THE TOP

I was particularly pleased to receive a copy of Wizard's Mountain in review from the Software House. It is written in Basic so I was keen to see the speed and size of the game, not to mention the program listing. The speed for most commands is good — after taking notes there is only a slight delay before the response.

Written by Jeremy Jarrold, the setting is a mountainside castle with a number of well described rooms. Objects appear at different locations each time the game is played, making for multiple solutions. Some of these objects look very much like treasures but seemed to have a negative score when carried. Frequently and without warning it gets dark and one's taps are often paralysed by an evil spell preventing movement for five turns.

Among the objects are a telescope that tells to pieces for a reason I didn't discover and a digital watch, which when read caused the computer to break out of the program with an illegal function command error. This turned out to be because it was trying to compute the log of zero — for a watch? Fascinating!

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### ZX81 CHESS

- Look at these features:
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  - Plays all legal moves including Castling and Enpassant but if an illegal move is entered will return illegal move.
  - 10 levels of play.
  - Randomly weighting computer doesn't always play the same move in an identical situation.
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# CHESS



Last month I demonstrated the use of the minimax algorithm which finds a move in any position by looking a few moves ahead and assigning values to each of the positions which can arise at the end of such an analysis. Each "half-move" looked ahead in the game tree is called a ply. Thus, if White is to move, a five-ply search would examine sequences of three moves for White and two for Black.

This month I consider the horizon effect, a phenomenon which arises because a program is effectively blind beyond the limits of its analysis, i.e. its search horizon.

The term "horizon effect" was introduced into the computer chess literature by Hans Berliner, a strong U.S. master and former world correspondence champion, in his Ph.D. thesis which appeared in 1974. However, the effect had been noticed as long ago as 1952. I can best illustrate it by quoting — with slight changes — two examples given by Berliner himself.

In figure 1, it is White to move. He is a piece ahead but cannot avoid losing his Bishop. Suppose that White is searching four ply ahead. The program will consider trying to save the Bishop by 1. B-QN3 but after 1... P-B3 2. P-KN3 (say), P-B3 the Bishop would be lost anyway.

Eventually the program would consider 1. P-K3 and recognize that if now 1... P-B3 then 2. P-B3 is good for White. However, if Black were to play this best move! 1... P-B3, White would play 2. B-N3 and there would be no way for Black to capture the Bishop in one move. Thus, within the four-ply search horizon, White would have saved his Bishop for only a Pawn!

Of course, this is absurd, since Black could still win the Bishop by 1... P-B3. All White would have achieved would be to delay the dreaded moment by a completely worthless sacrifice of a

Fig. 1  
White to move



Fig. 2  
White to move



Fig. 3  
White to move



Pawn. However, as far as White is concerned, events more than four-ply in the future do not exist, so it will happily play 1. P-K3.

Unfortunately, after 1. P-K3, P-B3, White is again faced with the loss of a Bishop in four-ply. To avoid this, it might consider a further sacrifice by 2. P-B4 or even 2. R-B1, but again this could simply make matters worse eventually.

This is the negative horizon effect, the attempt to avert some unavoidable consequence. In this particular case, a deeper search would prevent the wrong first move being made.

However, shifting the horizon cannot eliminate the horizon effect, just "bury" it more deeply.

The second form of the horizon effect, called positive, is more subtle than the negative kind and even harder to deal with. In this case, the program plays an attractive move prematurely when it could be played later to much greater effect.

In Figure 2, it is White to move and the search is being conducted to a depth of three ply.

The program notices that it can play 1. P-Q7 and promote the Pawn, next move if Black does not play 1... N-B7; then after 2. N-B7, White has gained further material.

Unfortunately, this leaves White with only Bishop and Knight to checkmate the lone Black King, very difficult.

Instead White were to play 1. B-K3 followed by 2. B-Q4 White would win the Black Knight without giving up the Pawn, with a simple win based on promoting the Pawn. The program insists on winning material immediately, because if it does not do so within the horizon of the search the gain of material does not exist.

In practical play, examples constantly occur — not necessarily involving any gain of material — where it is much better to delay playing a strong move, following the old adage "the threat is greater than its execution".

Finally, here is another example of the negative horizon effect from a game between Chess 4.4 and Time Ping from the Sixth North American Computer Chess Championship (1975).

Figure 3 shows the position after Black's 12th move. White had an indestructible Pawn on the seventh rank. However, since it gave a high value to such Pawns, White tried to save it for as long as possible by playing the sequence 13. P-EF3, B-EF4; 14. P-GF3, B-B4; 15. P-KN4.

These moves delayed the recapture of the Pawn, but only for another few moves and at the cost of ruining the Kingside Pawn structure.

By Max Brammer



## TABLE TOP ACTION

Atari has come to an agreement with a number of the larger arcade game manufacturers to make table top versions of their most popular games.

They are all powered by batteries and use multicolored fluorescent displays.

All games follow faithfully their big brothers in the arcades. *Image Race* features a player controlled ship that maneuvers through space and is in peril from star-like opponents.

*Pac-Man* has the usual monster munching its way round a maze.

*Century King* features a girl chessman-age which kidnaps a prince and takes her to the top of a steel fortress.

*Berzerk* utilizes a joystick control to manipulate a humanoid through a difficult maze while being attacked by armed robots.

*Trapper* takes on a frog in a swamp who has 60 seconds to get back to his home. Unfortunately, all sorts of things get in the way.

## A COMIC LOOK AT GAMING

Not only have Atari announced price reductions on their computers in the U.S. — the 800 has dropped 10% to around \$450 but they have also increased the price of some programs.

They explain this increase as a reflection of an increase in manufacturing costs.

A new catalogue of programs from the Program Exchange (PEX) has been published and contains over 80 user generated programs.

One of these, *Caverns of Mist*, was written by a 13-year-old schoolboy and last year's winner

# american DREAMS

## PLAIN VIDEO CRAZY

The 25th Consumer Electronics Show, held recently in Las Vegas, showed very clearly that one thing continues to dominate the media and electronics business, in the U.S.A.

This is not the personal computer — which seems to be causing far more interest in Europe than in America — but the video game. Perhaps this is just a reflection of the trend for Americans to play at home for their entertainment.

After all, with petrol costing all of 10¢ a gallon, which they consider very expensive, where else can you get it even costs the equivalent of £1.50 to go to a movie — again a price we British would consider reasonable, but not to our American cousins. So the video game is all the rage.

The two big names that dominate the U.S. video game industry are Atari and Mattel. Both systems are distributed in the U.K. by Ingramell and Davies (Atlanta, GA), respectively.

Coming up strong is revolutionary of Atari, the arcade people, with a new company called Adventure.

As they have just signed an agreement with U.T.I. to manufacture a version of the game in Europe we can expect an interesting marketing situation to arise. More from the U.S. next month.



## FROM CHICKS TO CATTLE

*Activision*, who scored in the U.K. with the *Chickens Crossing* the Freedom during Christmas, have brought out four new games that will be distributed in the U.K. by Computer Games Ltd.

*Roundabout* is a simulation of the busy town scenarios of the twenties and thirties; *Stomped* (shown above) is a very good cowboy round-up game with some very deft work on the joystick needed to lasso a cow! *Grand Prix* speaks for itself.

A new version of *Space Flight* simulation will also be with us in the near future.

## OUTZAP THE MONSTERS

Bally practically gave up on the video games some last year but have now rescued the Arcade video computer from oblivion.

*Adventure* unveiled seven new video game cartridges which run on the *Bally Professional Arcade* — formerly the *Bally Professional Arcade*. These are: *Monsters*, which is similar to *Pac-Man*, the world's most popular coin-up video game.

The *Wizard*, who challenges players to team up and outzap attacking monsters.

*Cosmos Raiders* is a fast action Defender style game in which players read a sector of the universe to take back stolen Energy Stars.

*Spider Computer* is an Adventure game. Using webs, spins, travel and other tricks, players attempt to conquer the entire galaxy.

In *Space Fortress* up to four players jointly defend their fortress against alien spaceships and insane kamikaze fighters.

*Quest for the Orb* is a totally different and engrossing adventure-style game. The object is to find the Orb.

Bangers in your quest include demons, traps, monsters. But you'll be given magical spells and will find enchanted weapons and ancient treasures.

In *Pirate's Chase* players try to evade a pirate while tricking him out of his treasures.

*Colouring Book with Light Pen* is a highly entertaining educational and fun game that lets you create multicoloured pictures on your T.V. screen, using built-in stylus or optional "light pen."

*Music Maker* includes learning and fun. Just move your joystick controls to select a note.

The *Adventure Video* game can be upgraded to a talking computer system, in the same way as *Matig*'s *Intelligence*. The upgrade is known as the *2500A55.33*. The language is the *2500A55.33* computer is based on an extended basic that allows animated graphics to be achieved by a non-professional programmer in a matter of hours (see below).



# COMBATANT'S VIEW OF SPACE CONFLICT

Mattel have also introduced six new hand-held games.

These pocket-sized games feature multi-level play and sound effects.

**Space Battle** gives you a cockpit view of the universe and split-second, three-colour space action. Destroy enemy craft with twin laser beams on one of four skill levels. You have four minutes to complete your mission and return to base without crashing or running out of fuel.

Combat continues in **Armour Battle** with tank against tank and tank versus helicopter.

In **Dragon Rider** you're behind the wheel for Grand Prix excitement on four different tracks.

Experience the challenge of American football in **Long Bomb Football**, a strategy-oriented game with four levels of skill.

Control the attack or defenders in **Competitive Football**, a realistic two-player game.

You're caught in a medieval warth with **Dungeons and Dragons Computer Ransack**. As the *Avatar*, you must find the arrow and slay the dragon. But beware of flying bats and bottomless pits, or you may become the dragon's next meal.

The *Intellivision* has now been expanded with a Master Unit that has Basic language and speech synthesizer.

## ATARI COMES TO TERMS

More than compatible cartridge games are being churned up in America by a new firm in the arena league.

Image is also aiming to capture some of the Mattel video games market with new plug-in cartridges. (see new to Atari video computer systems are *Demon Attack*, *The Voyager* and *Video Shot*, while *Dungeons and Dragons* on the Mattel system.

This firm was set up in a similar way to the first outfit to bring out Atari compatible cartridges, Activision. It was formed by ex-Atari people and both companies were fighting lawsuits with Atari to stop the two firms using its expertise.

Activision recently settled its differences with Atari and is continuing cartridge production.

BY ROBIN BRADBEE

## DUNGEONS AND DRAGONS

Mattel reinforced their top level position with Atari in the TX games centre league — by taking up 12 new games for Intellivision.

Quick thinking and fast action are needed to play two new games in the space network. It's you against the computer in *Star Strike* (shown above left). Destroy five minute projectiles on the enemy planet and your mission is accomplished. If you fail, earth is destroyed.

In *Space Hawks*, you command a space man with five protective "shields". Gain points by destroying 25 P.E. combatant-aliens that appear on the screen. The game becomes more difficult as it progresses. Play with a friend or play alone and telegraph your team into hyperspace to avoid catastrophes.

## FIND YOUR WAY OUT OF 1,000 MAZES

25 arcade firm Exxon Electronics has coming into 1982 with four additions to its hand-held electronics line.

**Treasure Island** is a 3D-Maze game, that uses one of the most complex L.C.D. displays ever developed for a hand-held game. The player is pitted against 1000 increasingly difficult mazes and has the option of facing greater challenges by switching to the adventure mode. *Space Invaders* is a version of the original game, while *Select-A-Game* is a two player system that can support a whole host of games, such as *Space Invaders* (right), *Basketball*, *Baseball*, *Football* and *Hockey* by changing a cartridge and



in the *Advanced Dungeons and Dragons* cartridge, based on the popular role-playing game, avoid the dragon as you attempt to capture the treasure in a computer-controlled labyrinth. Then, carefully return the treasure to your secret room. The game is designed for one or two players.

Control the destiny of your own island in *Islands Accomplish* points by feeding, housing and educating your people; don't let hurricanes or pirates destroy their harmony.

Several presents a video ver-



the overlay on the display. A two colour L.C.D. display is used.

Finally, looking, accelerating, steering, passing and parking your car to the limit are some of the action on another 3D display game called *Grand Prix*. Perspective visual effects make it appear that the player is actually and dodging through new traffic.

sion of *Orbital*.

In *Night Stalker* you control a man in a "suits" coat surrounded by a maze containing bats, spiders and a continuing parade of evil robots. Start with three weapons. As the game goes on, your weapons are replenished and the creatures become more difficult to subdue.

Defend your submarine fleet from P.E. boats, carriers and alien subs in *Sub Hunt*. Control your sub's speed, depth, direction and torpedo supply.

Two firm cartridges, based on a concept from the new *Galaxy* movie of the same name, provide space-age action. In *True 1*, you're Tron, and you use "laser discs" to fight off the evil line warrior. *True 2*, designed for one or two people, lets you win points by destroying aliens while trying to penetrate the master control program's inner circle.

*Pinball* is a video version of the popular arcade game — with all the sounds and action of the real thing. The game contains several skill levels as well as surprise trap doors and disappearing figures.

Designed for the young-at-heart, *Frog Bog* (shown) lets you control a frog that can catch flies with its tongue while keeping him one fly pad to another. Don't land your frog in the water — there's a possible bonus!

If you are a card player, let *Card* take the place of your card playing partner. It provides five popular card games: *Craps*, *Eight*, *Hearts*, *Flummy*, *Go*, *Monopoly* and *Monopoly 500*. The computer deals the cards and keeps score.

# Graphics

## THE SHAPE OF THINGS TO COME

Moving your graphic shapes around on the screen can be a lot simpler than most computer books would have you believe.

A shape can be drawn by joining up a set of points and stored by storing the positions of all these points.

Once a shape is stored, it can be transformed in various ways, like shifting, scaling or rotating it before it is plotted again.

The transformation processes are interesting in themselves, but they also form the basis for many of the more advanced applications involving computer graphics, such as animated graphics and computer-aided design.

With the vertical column positions of the points in the shape stored in an array, XX, and the corresponding horizontal row positions stored in the same order in an array, YY, as shown in lines 30 and 40 of the accompanying program, the shape can be drawn by lines 60 and 70.

Transformations of a shape can be achieved quite simply. Books on computer graphics are inclined to introduce fairly sophisticated matrix methods for transformations, but they can be achieved with the use of arithmetic and some simple trigonometry.

To illustrate this, a shape can be moved to the right by increasing the column positions of all its points by the same amount. The effect on a single point is illustrated in the first figure.

Similarly, movement to the left is achieved by decreasing all the column positions by a fixed amount. Movement up and down the screen is achieved by changing the row positions of all the points in the shape, while a combination of a sideways movement with an up and down movement gives a shift in any



other direction to the shape. This is also illustrated by the first figure.

A shape can be scaled by multiplying all the row positions and all the column positions by a constant scaling factor. If the scaling factor exceeds one, the shape is magnified; if it is less than one, the shape is reduced in size.

Rotation is a little more difficult to achieve than shifting or scaling. The location of a point after it has been rotated through an angle,  $\alpha$ , is shown in the second figure. The expression giving the location of the transformed point can be obtained by using the properties of right-angled triangles.

The following program, written for the Acorn Atom in its high-resolution graphics mode, stores and plots a square, and then interactively accepts commands to transform it before plotting it again. The inputs T, S and R, respectively, cause a translation, or shift, a scaling, and a rotation.

Line 130 achieves a shift to the right of 10 columns, a magnifica-



tion by a factor of two is achieved at line 140, and rotation through 0.2 radians, approximately 11 degrees, anticlockwise is carried out by lines 150 to 160.

The percentage signs are necessary in Atom Basic to indicate floating point variables and calculations.

The final figure shows a pattern created by shifting and rotating a simple four line shape.



```

10 DIM XX(4), YY(4), R(1)
20 GOSUB 200: GOTO 300: GOTO 100
30 XX(0)=10:XX(1)=10:XX(2)=20:XX(3)=20:XX(4)=10
40 YY(0)=10:YY(1)=20:YY(2)=20:YY(3)=10:YY(4)=10
50 CLS:GOTO 4
60 MOVE (0,0): YEND
70 FOR I=1 TO 4: DRAW XX(I)-YY(I): NEXT I
80 INPUT A$
90 IF A$="T" GOTO 130
100 IF A$="S" GOTO 140
110 IF A$="R" GOTO 150
120 GOTO 60
130 FOR I=0 TO 4: XX(I)=XX(I)+10: NEXT I: GOTO 60
140 FOR I=0 TO 4: XX(I)=XX(I)*2: YY(I)=YY(I)*2: NEXT I: GOTO 60
150 FOR I=0 TO 4: XX(I)=XX(I)*COS(.2)+YY(I)*SIN(.2)
160 YY(I)=XX(I)*SIN(.2)+XX(I)*COS(.2): XX(I)=XX(I): NEXT I: GOTO 60

```





## TRUTH IS NOT AS SIMPLE . .

Honesty may be the best policy in life but in computing, truth can be the cause of a few problems. George Boole ran into some of these problems in the True and False statements.

Boolean algebra is fundamental to computing and is among the first topics covered in the study of computer hardware and assembly language programming.

Boolean algebra is not often covered in courses on Basic, but because the subject is so fundamental it has applications in Basic programming and most dialects of Basic include the Boolean for logical functions AND, OR, NOT.

A Boolean expression has one of the values True or False, and is usually met in Basic in IF ... THEN ... statements.

IF condition THEN statement creates a branch in the program, with a different path taken according to the condition being True or False. The condition is usually a simple expression as in IF A=B THEN ... or IF XX="YES" THEN ..., but sometimes a branch will depend on more than one condition and the logical functions provide the means for combining multiple conditions into a single compound condition.

X and Y are conditions we can form the compound conditions NOT X, X AND Y, X OR Y, whose values are shown in the tables. Note that NOT and AND behave just as in ordinary English: NOT True is False and NOT False is True; X AND Y is True only when X and Y are simultaneously True.

"Or" in English, however, is ambiguous. It may mean one or the other, or both, as in "I don't like cabbage or spinach".

In logic, the first meaning, called "inclusive or" has been taken, as OR, while the second

meaning, called "exclusive or" is a separate function usually abbreviated as EXOR or XOR.

| X | Y | X AND Y |
|---|---|---------|
| T | T | T       |
| T | F | F       |
| F | T | F       |
| F | F | F       |
| X | Y | X OR Y  |
| T | T | T       |
| T | F | T       |
| F | T | T       |
| F | F | F       |
| X | Y | NOT X   |
| T | T | F       |
| F | F | T       |

## COMPOUND CONDITIONS

We can use compound conditions in IF ... THEN ... statements, for example:

```
100 IF (A>0) OR (B>0) THEN 300
200 IF (A>0) AND (B>0) THEN 300
```

These can be written without the logical functions, as:

```
100 IF A>0 THEN 300
110 IF B>0 THEN 300
200 IF A<0 AND B THEN 300
210 IF B>0 THEN 300
220 ...
```

It is often possible to write a compound condition whose meaning is immediately obvious, but is not at all easy to understand when converted to a sequence of simple conditions. For example, it is clear that:

```
100 IF (A>B) AND (B>C) OR (A<B) AND (B<C) THEN 300
```

tests for A,B,C, being in ascending or descending order, but the equivalent:

```
100 IF A<C THEN 110
105 IF B>C THEN 300
110 IF A >= B THEN 320
115 IF B<C THEN 300
```

is not at all easy to follow and would probably require some pencil and paper work before its meaning was understood.

Some Basic dialects allow a truth value to be assigned to a variable, for example:

```
10 LET A=(B=C)
20 LET A=(B=0)
```

The actual values assigned to True and False vary but are usually 1 and 0 or -1 and 0. In many cases, although 1 or -1 is assigned For True the BASIC will accept any non-zero value as meaning True, so that

```
10 LET A = 100
30 IF A THEN PRINT "TRUE"
```

would output TRUE when run.

The logical functions may also be applied to numbers and variables, or to a mixture of numbers, variable and relational expressions. For example, LET X = (Y AND (Y>X)) may be a valid expression. However, the result depends on the particular Basic which evaluates the expression.

In BASIC such expressions are evaluated as follows:

```
X AND Y is 1 if Y is not 0
OR Y is 0
X OR Y is 1 if Y is not 0
X if Y is 0
NOT X is 0 if X is not 0
1 if X is 0
```



This is covered in the BASIC manual, which gives examples of how these expressions can be used in programs.

Microsoft Basic, which is used in most personal computers, evaluates logical expressions in a totally different way. It requires that the numbers involved be integers between -32768 and 32767 (so that they can be represented in binary with 16 bits), and the result is obtained by applying the appropriate function to corresponding bits. For example, 12 AND 10 is evaluated as 8, because:

```
12 in binary is 0000000000001100
10 in binary is 0000000000001010
applying the AND function (on the truth table, with 1 for T and 0 for F) we get 8 AND 0 = 0 in the first 12 places, then 1 AND 1 = 1,
```



1 AND 0 = 0, 0 AND 1 = 1, 0 AND 0 = 0. Collecting these together we get the answer 0000000000001000 in binary, which is 8 in decimal.

Negative numbers in binary are represented in a form known as "2's complement". To negate a binary number we change the 0s to 1s and the 1s to 0s and then add 1 (addition in binary is very simple: 0+0=0, 0+1=1, 1+0=1, 1+1=1 and carry 1). For example, to calculate -12:

12 in binary is 000000000001100; changing 0s to 1s and 1s to 0s gives

```
11111111110001
and adding 1:
11111111110010
```

To see that this is sensible we can add 12 to -12:

```
000000000001100
+11111111110010
100000000000000
```

We actually get a 1 in the 17th place, but because we are working with 16 bit numbers this 17th bit is ignored and the result is then zero, as we could expect.

The demonstration program will print out decimal and binary values which will allow you to see how X AND Y is evaluated for any pair of values. The program can easily be altered to work with OR, NOT, or any other logical function.

The program uses most of the features discussed above, and studying how it works should help you to understand the logical functions in Basic.

The 16 bit AND function is used in line 600 to test the individual bits of the number X which is to be converted to binary. P is always a power of 2 and has one bit set to 1 and all other bits 0. Since 0 and 0=0 and 0 AND 1=0, whatever the value of the bit b, X AND P will be 1 when X has a 1 in the same position as the single 1 in P, and zero otherwise.

## NOW TRY THE PROGRAM

```
100 PRINT "AND FUNCTION DEMONSTRATION"
110 PRINT
120 INPUT "FIRST ARGUMENT", A1
130 LET X = A1
140 GOSUB 500
150 IF E THEN 120
160 INPUT "SECOND ARGUMENT", A2
170 LET Y = A2
180 GOSUB 500
190 IF E THEN 160
200 LET X = A1
210 GOSUB 500
220 LET A18=X8
230 LET X=A2
240 GOSUB 500
250 LET A18=X8
260 LET X=A1 AND A2
270 GOSUB 500
280 LET A8=X8
290 PRINT A1;"AND"A2;"="A8 AND A2
300 PRINT
310 PRINT A1;"TABLE" IN BINARY IS "A18
320 PRINT A2;"TABLE" IN BINARY IS "A28
330 PRINT A1 AND A2;"TABLE" IN BINARY IS "A8
340 PRINT
350 PRINT
360 GOTO 120
400 REM CHECK VALIDITY OF INPUT
500 LET E = 0
610 IF (X=INT(X) AND (X >= -32768 AND X <= 32767)) THEN
    RETURN
520 PRINT " ARGUMENT MUST BE AN INTEGER BETWEEN -32768
    and 32767"
530 LET E = 1
540 RETURN
550 REM CONVERT X TO 16 BIT BINARY STRING X8
600 LET X8 = ""
610 LET P = 1
620 LET B = X AND P
630 LET B8 = "0"
640 IF B THEN LET B8 = "1"
650 LET X8 = B8 + X8
660 LET P = P * 2
670 IF P = 32768 THEN LET P = -P
680 IF P <= -32768 THEN GOTO 620
690 RETURN
```



# Sounds

## SOPHISTICATED STRINGS...

The new generation of computers are equipped with quite sophisticated sound facilities.

Last month I dealt with the production of speech sounds. With this, a designer or electronic organ can be equipped using the computer to record or play back keys.

Computers such as the Sharp M2000 contain a single on-board sound generator which can output notes via a small speaker which is also built in.

Basic commands are provided in the operating system which control the sound generator directly. The system is limited to single notes and covers only three octaves but it is extremely easy to use. A note is entered into a string variable as a series of notes to be sounded as they appear in the music. A-G.

The octave to be used is marked by a simple graphic symbol and the length of notes by the number 0-9, 0 being a 1/32nd note and 9, a whole note. Notes are entered directly into the string as R. Tempo is set by a Basic statement: TEMPO=, followed by a number.

To play the tune set up in M0, one now enters the Basic word MUSIC=M0 and away it goes! Because the system is resident in Basic, many strings can be set up and played in any order and they can be repeated by enclosing them in a loop. Older generation computers like the Pet and Macrom can all be made to act as music generators in the same way but, because no Basic commands are in-built, the user has to set up his own system. This is now fairly easy as so much software exists which does just that.

When we come to discuss the production of more than one note at a time, things obviously become much more complicated. However, this objective can be achieved in several ways.

The computer can be used to control an existing external synthesiser or a specially designed sound generating circuit. Keyboards may also be used with an interface which drives the computer and uses it as a music maker. Such methods might appeal to those with an existing synthesiser but tend to be very expensive indeed.

But what about music actually generated by the computer itself? For computers such as the Dat and the M-C, the computer are provided with sound generating chips which are capable of generating three or four notes at once.

Sophisticated operating systems are included by means of which different sound voices can be used to represent various instruments.

This is helped by a facility which changes the note envelope — the time a note takes to build up, how long it stays at maximum and how long it decays away.

Musik produced by one of these computers sounds bright and lively and has depth and harmony as required. The operating software is complicated but easy to use since it is understood.

The amount of information required by the computer to play even a single tune is quite vast and the less you know about music, the more ones finally such a program must become. Ultimately it should be possible to enter a piece of music into the computer from a music manuscript without knowing anything about music at all. The Acorn computer is one of those supplied with a built-in sound generator capable of producing four notes at once. Such a provision might be useful to those of us who could write programs to control it.

However, Apple have supplied a software package named 'Music Maker' and now, it seems, others. It is very easy to use and takes the 'musician' through the inputting of information in easy

stages. A wide variety of control is possible including: key signature, tempo, meter and volume. Music is entered phrase by phrase. Each phrase is remembered and can be recalled to be played. Phrases can be repeated in a set order. Entering a phrase is done using the screen by using the A-G notation of ordinary music. Accidental sharps and flats, ranges of octave, note durations, dotted notes, bars, ties and slurs are all entered for. Once entered, notes can be added, deleted or transposed and the phrase can be played to check how it sounds.

Finally, the whole composition can be played by joining the phrases together. The tune can be monitored on the screen, all four notes will play but only one can be visualised. An experienced musician could find a few faults with the system — like the number of phrases available (10) is very limiting — but on the whole a good example of how to present a complex problem in a simple friendly way.

How can owners of computers which do not have such facilities achieve like results? Well, by using a digital-to-analogue converter such as the EM200, or an even simpler resistor network, it is possible to simulate all the above. Things are made much easier by commercial packages which are now available for many computers.

These range from the Alpha Synthesizer system for the Apple at a few hundred pounds, to the very versatile and inexpensive Visible Music Monitor for the Pet. The latter is supplied complete with plug-in board containing a D/A converter, filters and small amplifier with provision made for feeding the output to a more powerful one.

Once such systems become available, whole libraries of music soon accumulate on tape and disc contributed to by home enthusiasts.

BY DAVID ANNAL

# EXPAND YOUR VIC



From  
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## ARFON PRINTER

A low-cost stand-alone printer which will be almost essential for your larger programs will be launched in the Spring of 1982. The power plug for this unit is already on your expanded system.

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# Arfon Micro



# CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN



## WARRIORS FROM THE STARS

### SUPER INVADER

Wiping out alien invaders as they sweep down from the outer galaxies is a tougher job than ever in this souped-up version now on the streets.

Super Invader — running on the Intertec VC4000 — provides you with a more difficult challenge than the traditional VC4000 master game.

The basic concept remains the same. Your role as an intergalactic hero is to save your planet from the onslaught of a race of space warriors whose singular aim is to obliterate all life.

The aliens swarm down upon your living base. They start off high in the sky but as the game progresses the invaders descend everwards, firing missiles at your base.

On the right-hand side of the screen is a cloud which slowly but surely fills the action area — growing in regular blocks. That spells extra danger.

When the cloud form covers the aliens your missiles become useless. So the quicker you clear the invading creatures out of the sky the more chance you have of surviving.

To make the game more treacherous your living base is stationary so you have to keep alert for alien missiles coming

## HAZARDS ON THE TRACK

### GRAND PRIX

Topping the sales list for the Acornsoft MPU 1000 is surprisingly, the car racing cartridge Grand Prix.

It's unusual for this type of game to be so popular with games centre owners because space theme games have stolen the show since space invaders was introduced. The fact that Ace supplies its Invader pack with the console undoubtedly has something to do with it.

Grand Prix contains 10 different game versions, for one or two players. The Grand Prix game itself is first on the list and is simple in concept.

On the screen is a straight race track with a car placed at the bottom of the screen. Using the joystick controls you can

turn off angles, shooting them down before they get to you.

Super Invader is one of the latest batch of games cartridges brought out by Hammer for the Intertec TV games centre and costs about £11 from stockists.

drive the car to the left or right of the race course.

A few seconds after the game has started a fleet of racing cars zooms down from the top of the screen. You have to move your car to avoid the others. Be careful not to be over-eager with the joystick. It's very sensitive and if you move it too far to the left or right it will cause the car to veer into the barrier never mind the other cars.

Once you have worked out the technique you can try speeding up the action by moving the joystick forwards, which takes some fine control of the joystick.

The second game is Monte Carlo Rally. Again for one or two players the idea is to navigate your car around a race track which is lined with small white posts.

The track winds before your car revealing hazardous bends and tortuous twists. You are given a pre-set time limit to try and have as few crashes as possible.

The third game in the package is named Brands Hatch and is the

most difficult to master. In fact, I found it almost impossible.

Your task is to complete a circuit of a rectangular track which gets progressively more difficult. But, however, it's not a piece of cake. I never did get the hang of controlling the car. When the flag went up for the off I thought I was doing well — the car was going straight forward. Well, I need to repeat.

Then came disaster. The corner was upon me before I knew it. And crash, smack into the barrier. Turning the car left or right presented immense problems. Actually turning the wheel was easy — it just wouldn't stop turning.

So I ended up driving the wrong way creating barriers on both sides of the course, and bumping my way round. The only conclusion I drew when I finally put the controls down was that its popularity is because it provides a challenge. There are practice versions for you to build up expertise before you attempt the really difficult course.

If you want to be thoroughly frustrated Grand Prix cartridges are obtainable from Wembley-based Ace for £18.95.

## IN PURSUIT OF THE ENEMY

### CAPTURE THE GENERAL

With a battalion of men under your command you have to try and capture an enemy general.

On the screen you see a battlefield with two camps located in opposite corners. Scattered across the field are clumps of trees giving you and your soldiers vital cover from enemy fire. With the joystick you control your general's unit but troop movements are under the com-

mand of Colonel Computer!

If they get in the way of opposing soldiers they risk being shot.

The generals are busier. They have extra protection and can resist a bullet shot. The generals also have healing fingers, and at the touch can cure a dying soldier.

To get your troops to follow you in pursuit of the enemy general just press the action button.

Capturing a general is not easy. You must make sure he has no soldiers left to come to his defence.

Then you must move your own general close enough to demand his surrender. It runs on a Philips

CP900 and costs

£14.95.



# TV GAMES CENTRES TV GAMES CENTRES TV GAMES VIDEO SCREEN

## SEARCH IN THE DARK LANDS

Deep in adventure in lands inhabited by weird creatures in a new concept in video games combining a board and the television.

Featured in Philips G7000's *Quest of the Rings* are a handful of characters and monsters which the player — or players — encounter and have to deal with. In principle the game is similar to most adventure games. The player takes the role of a small band of legendary heroes. The difference is that you also have a board to work out your strategy of play.

Their job is to search for 10 rings which hold a hidden power but which are concealed in the Dark Lands created by a malevolent Ringmaster.

### QUEST FOR THE RINGS

Being out of the pain of his land are several slaves who are equally vicious. In their power and ready to injure or destroy you at the slightest provocation are Gnos and Frownsides, the spider Soggoth Tyantulus, the Dauntminded Bloodthirsts and firebreathing dragons.

The players take you through dungeons, crystal caverns with invisible walls and the shifting halls which change position every few seconds.

Using the board to place your figures representing whichever role you decide to play, you can work out the best plan of action. On the board itself is a map of the Dark Lands revealing the surrounding seas and the dangerous areas you have to traverse.

At the same time you can see the action as it takes place on the television screen.

More than one player can join in the *Quest for the Rings*, each taking a different character, ranging from a warrior — when you own a magic sword — a wizard who has the power to cast spells on monsters, a mysterious phantom who can walk through walls with ease, and finally a changeling, who has the advantage of wearing an invisible cloak.

*Quest of the Rings* comes with a keyboard overlay which is used for locating places marked on the map of the Dark Lands, as well as areas where dangerous beasts lurk. By passing that part of the

keyboard you will be instantly transported to the selected area.

Exactly when *Quest for the Rings* will be on shop shelves in the U.K. is not unascertainable, but Philips hope it will be readily available within a couple of months time. The price has not been finalised but Computer and Video Games will keep you posted.

## ATLANTIC CROSSING

### COCKPIT

Ever wanted to fly a Jumbo jet? Now the controls of this huge aircraft can be at your fingertips.

Your job is to pilot the jet on a flight across the Atlantic and to execute a successful take-off and landing.

You have in front of you a display of the dials and pressure gauges necessary to fly the jet.

The joystick controls are used to manoeuvre the Jumbo. Take care not to fly too low, it might crash into the side of a mountain.

Cockpit runs on the Intertron WD4000 video computer centre which is available from selected U.K. dealers. The console itself retails at just under the £100 mark, but prices vary depending on the supplies.

The Cockpit cartridge will sell for about £20.95 — more expensive than most others in the range, but the distributors Banex claim it is more sophisticated than previous simulation games.



## MASTERING THE MAZE

### SUPERMIND AND LABYRINTH

You get two games for the price of one in one of the latest Philips G7000 cartridges, *Labyrinth* and *Supermind*.

In *Labyrinth* you must move a pawn through a convoluted maze and find the exit within a set time limit. Sections of the maze are revealed as you travel through it. But take care to move your pawn in the middle of the path, if you don't the pawn's movement stops there.

There are 16 variations of this game on tap and each one consists of ten mazes for you to work through before you win. Options include mazes which

move and change as you go. This means your pawn could get trapped in thereby ending the game.

One to really fix the action is when exits change position. Then you have to make sure you act quickly and don't get caught up in the maze. The speed of the game can be altered too.

One of the most frustrating variations is when a cat is hidden in the walls of the maze. If you are unlucky he will leap out and gobble you up.

If you don't find that taxing enough then turn your talents to *Supermind*, an improved version

of the old favourite *Mastermind*. There are multiple skill levels in *Supermind*.

The object of the game is to break the code set by the computer — but you are limited to a certain number of guesses. The code is represented by symbols which can be any one of 47 labelled on your G7000.

To let you know how close you are to cracking the code the computer brain shows a red figure from one to four corresponding to the correct number of the code.

Either tackle the computer's brain or take on a friend. As an alternative you can also take turns with a friend to complete a guess set by the chip.

A copy can be obtained from G7000 stockists for £14.95.



# DOWN TO BASIC DOWN TO

BY MOIRA MORRIS

## THE POWER OF IF...

"If", as the saying goes, is one of the most powerful words in the English language. And the same is true of the Basic language.

Last month, I introduced the IF statement with the example:  
10 IF RND>0.5 THEN 40

I explained the operation of this statement as follows:  
if the condition RND>0.5 is true, then the computer will "jump" to line 40;  
if the condition is not true, then the jump will be ignored and the computer will continue with the line following the IF statement.

In general, an IF statement will have the following format:  
(line number) IF (condition) THEN (line number)

The method I have used for describing the general format of the IF statement is commonly used in programming. The parts enclosed in angular brackets, e.g. (condition), are descriptions of what should be placed in that part of the IF statement. The parts not enclosed in angular brackets, e.g. IF, indicate exactly what must be placed in that part of the IF statement.

The first line number is simply the line number that must appear at the beginning of every line of a Basic program. The second line number is the number of the line that the computer will "jump" to if the condition specified is true.

What sort of conditions can be tested for in an IF statement? A condition will involve the comparison of two arithmetic expressions. In my earlier example, the value of "RND" would be compared with the value 0.5. If the value of "RND" turned out to be less than 0.5, then the condition would be satisfied.

Using the method described

above, I can give the general format of a (condition) as:  
(arith, expr.) (relational operator) (arith, expr.)

A relational operator is a mathematical sign used when comparing two values and can be one of:

- < less than
- <= less than or equal to
- > greater than
- >= greater than or equal to
- = equal to
- <> not equal to

To illustrate these formats, I will now give a selection of examples of IF statements. (Note that each line is a separate example and this is not intended to be considered linked in some way as part of a program!)

```
30 IF X=0 THEN 120
50 IF A+B <= C+D THEN 10
85 IF INT(RND*10)>5 THEN
20
```

Notice that, as a result of an IF



statement, the computer may "jump" either "forwards" or "backwards" in a program — it will simply jump to the line specified in the IF statement, wherever that might be.

Many versions of Basic allow more advanced forms of the IF statement. Rather than "jumping" to another section of the program if the condition is true, it may be possible to specify a simple action to be performed, e.g. printing a message. In some versions, it is possible to specify alternative actions to be performed depending upon whether the condition is true or false — all within a single IF statement. These forms will be discussed later in the series.

## JUMPING TO NEW LINES

The GOTO statement, also introduced last month, takes the general form:

(line number) GOTO (line number)

Again, the first line number simply labels the GOTO statement. The second line number specifies the line to which the computer should jump. The GOTO statement is referred to as an "unconditional jump" as the jump will always take place. On its own, the GOTO statement is not of much use. However, used in conjunction with the IF statement, it can be used to set up alternative sections within a program.

## SOLVING A PROBLEM

By looking at a simple example, I will demonstrate the steps involved in writing a program. First, let's look at the problem.

"In a sponsored walk, each entrant is given a number in the range 1 to 100. The entrants are all sponsored at a rate of 25p per km for the first 10km, and 50p per km beyond that. Write a program that could be used to print the amount earned by each entrant."

I can start with the general program outline:

```
repeat for each entrant
  input data
  print results
and repeat
```

For each entrant, I will need a pair of data values — the entrant number and the distance walked. The statement of the problem specifies that the entrant number will be in the range 1 to 100 and, clearly, the distance walked must be a positive number. However, it is not stated whether that number must be an integer, or, if it can be any real positive real number e.g. would the pair of values 23.225 be acceptable? I will assume that real numbers are acceptable, but, strictly speaking, I should say that the statement of the problem does not



provide all the information required!

Now that I have decided upon the format of the data for each entrant, I will require some way of determining when the end of the data is reached so that the computer will repeat the "loop" the correct number of times. If I knew that there were to be exactly 100 entrants, then I could use a FOR loop to control the number of times that the loop would be repeated. But we do not know exactly how many entrants will take part.

Although the statement of the problem says that each entrant will have a number in the range 1 to 100, there is nothing to say that there will be exactly 100 entrants. In fact, a sponsored run would involve someone in a lot of counting to determine how many turn out. It is easier to keep typing data until there is no more; then type in some preset value which will stand out from the normal data, so that the computer will stop looping. This special value is called a "terminating value" since it marks the end of the data.

In most practical situations, some value can be found which would never occur in the data for processing. For example, in the case of the sponsored walk, an entrant number of -1 would never occur — we could therefore use this as a "terminating value". As I will input pairs of values in the program, I will also provide a "dummy value" of 0 for the distance walked by "entrant number -1".

## THE GENERAL OUTLINE

I can now develop the general program outline as follows:

```
input entrant no., distance walked
if entrant no. = -1 then (end of program)
  print amount earned
  goto (input data)
```

end

How can I calculate the amount earned by an entrant? Assume that the entrant no. is N and the distance walked is D, then the amount earned by entrant N will be determined by:

$$d \times D = 15$$


then amount earned =  $D \times 0.25$

otherwise

amount earned =  $15 \times 0.25 + (D - 15) \times 0.5$

where the amount earned is in pounds.

## AND FINALLY — THE PROGRAM

Having developed the outline of my program, I am now in a position to write the program itself.

```
10 REM SPONSORED WALK
20 REM N IS THE ENTRANT NO.
30 REM D IS THE DISTANCE WALKED
40 REM
50 PRINT "WHAT IS ENTRANT NO. AND DISTANCE WALKED?"
60 INPUT N,D
70 IF N=-1 THEN 130
80 IF D<15 THEN 110
90 PRINT 15*0.25 + (D-15)*0.5, "POUNDS"
100 GOTO 30
110 PRINT D*0.25, "POUNDS"
120 GOTO 30
130 END
```

If your computer does not use END statements, then replace line 130 by 130 STOP

The STOP statement is similar to the END statement in that the program will stop running when it is encountered. However, unlike the END statement it does not have to be the last statement in a program — it can occur at any point in the program.

The above program could be improved in many ways. For example, the results would be a lot clearer if they were printed in a table rather than being mixed in with the input data.

## NEXT ISSUE MORE INPUT

In the program for the sponsored walk, the data for each entrant consisted of a number followed by the distance walked. It would be convenient in such a situation if the name of the entrant could also be input so that it could be printed next to the amount earned for easy identification. Next month, I will describe how this can be done using "string variables".

## NEXT ISSUE



# Brainware

## MIND ROUTINES No. 5

Using all the odd digits 1, 3, 5, 7, 9 how many 5 digit prime numbers can be made? What is the highest and the lowest prime? What is the total of all the primes that can be made?

• The winner of our January Mind Routines puzzle was Graham Taylor of Lawn Avenue, Peterborough and the first correct Modern Crossword entry out of the hat came from A. Still of Dorchester Chase, Bournemouth. Bottles of champagne are on their way to both winners.

The answers to our February last's puzzles are on page 16.

## NEVERA CROSSWORD

### ACROSS

1. Did David rules over computer storage device (4,4,5)
2. Move to give a higher case (5)
3. Encompass the video game (8)
4. School game (5)
5. Quite plain like the chess board (5,3,5)
6. Computer's words which contain adventure's equipment (5)
7. In which to send off the music program (5)
8. A hundred and six balls in cricket (10)
9. Soccer player with inborn ability to torment 2 (7,6)

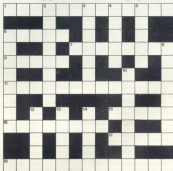
### DOWN

1. Soccer player stranded at the start (4,4)
2. Endlessly set up a single attack (5,4)
3. Opening Fortran for equivalent with alternatives (5)
4. Get data for the Basic program from this party (5)
5. Twisted British Rail cables makes board game (8)
6. It's irresistible (8) video game?
7. Display chess like this, the



Two bottles of champagne are up in grabs on this page every month. The first correct answers out of the hat for both the Mind Routines problem and the crossword on 14 March will have bottles of champagne rushed to

them. Ian Pedder's Mind Routines problem will test both your ability to think through a puzzle and set it out as a program. If you are more literary minded try Need's Crossword and see how you get on.



10. ganlight on the O.K. Corral for example (8)
11. Happening to be the first woman in the Old Testament on the New Testament (5)
12. Change a vital terminal piece (5)

14. For — Next structures put up for what one might do with printer output (5)

• For details of Computer and Video Games competition rules see Page 16.

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# Kit Korner

## CIRCUIT TRAINING

Over the next two issues I am going to move slightly away from actual kit building, to look at prototyping your own designs or those that you may find elsewhere.

It is helpful to know from the very beginning which is the best way of developing your ideas into a working circuit.

Depending on the complexity of the circuit and its function there is an ideal means of construction. There are, of course, other factors to consider, such as cost and availability and also how involved you want to get. I will try to cover all the methods but these will probably be one or two obscure types I will omit.

Many years ago I built a bridge rectifier with a dropper resistor on a group panel. It was very crude but as I had to dissipate a lot of heat it was an ideal way as I could hang the strip of high power diodes and resistors in a draught to cool it. The group panel, by the way, is simply a parallel line of solder tags formed onto a piece of insulating material.

The next stage up is probably the matrix board. This is just a piece of insulating board with an array of holes, of various dimensions, set 0.1in. apart, into which pins are inserted. By drawing your circuit out on paper you can arrange the pins at the point of each join of the components. For complicated circuits the components can be arranged on both sides of the board.

Please do not make the mistake of wrapping the component leads around the pins as it makes it extremely difficult to unsolder them later on, if you need to redesign the circuit or re-use the components. A simple lap joint will do. Also, take care not to push the pins in too far as you will fracture the board. If the board is to be well used, a drop of solder on the underside of it will prevent the pins from working loose.

If chips are included in the design you are strongly advised to use holders, which conveniently fit into the 0.1in. pitch holes. It should be possible to bend the legs of the holder outwards to be soldered to pins inserted along the side of the chip. This secures the holder onto the board.

When you come to making connections across the board, between pins, it is advisable to use insulated wire of different colours. It makes it much easier to follow the circuit if you can use particular colours for each line of the design, not only for power lines, but for data lines as well. This applies to all types of construction as a few circuits

went out the layout. A special track cutter is available but a drill bit will do just as well. If necessary, components can be laid along the tracks, as long as the track is cut between the leads. Yes, it has happened that all the components have been laid along the tracks without them being cut. For some reason the circuit did not work!

Make sure that the chip holders, if they are used, are laid across the tracks and that the tracks are cut between the pins. Again, the use of a drawing or diagram would be helpful.

Until you become proficient at designing board layout you will always use more board than you really need. This is unavoidable



will be impossible to trace unless they are colour-coded.

Up market from the matrix board, in some respects, is the stripboard. Like the matrix, the stripboard is just a variable array of holes, set at 0.1in. pitch in an insulating board, but with a very distinct difference. On one side of the board are bonded strips of copper conductor. The components can therefore be soldered onto the board without the use of pins, although these are useful as terminal and test points.

Care must be taken to cut the tracks in the right places. Drawing the circuit out on, preferably, 0.1in. graph paper will help you

to begin with and to overcome this problem slightly, try to redraw the circuit a few times on paper as you intend it to appear on the board. It will give you some experience in alternative design, if nothing else, and you may discover a more rational layout.

Next month I will endeavour to deal with wire-wrapping and the use of Eurocard type circuit boards. Unlike the two types of board mentioned here, which are discrete component orientated, the Eurocards are biased towards circuits with large numbers of chips. See you then.

**BY KEITH MOTT**



## REVIEWSWF

SNAPPING UP A MINOTAUR  
... AND SAVING BABIES!

## SNAPPER MINOTAUR, BABIES

This is the ninth and probably the best games pack from Acornsoft so far. All the games on this cassette use graphics and sound effects to the utmost showing just what can be achieved on the Atom through skilful programming.

The first game, Snapper, is a variation of the arcade game "Maxxman", mentioned in the November issue of Computer and Video Games. However, the game has been simplified to fit in on a standard Atom.

These simplifications include changing the "ghosts" and your man into circles (they are in fact in colour if you've got the colour encoder board fitted), and the simplification of the rules (you don't get fruit in this version).

If you haven't seen the arcade version of the game, then here's how to play. The basic object of the game is to eat as many ghosts as you can while your mouth is open (if your mouth is shut when you catch one, it eats you!).

To open your mouth you must go over one of the center crosses. Then you have a limited amount of time before it shuts again. The graphics are good and are backed up by excellent sound effects.

The second game, Minotaur, has impressive graphics too. The object of the game is to take all the gold bars from the boxes scattered around the maze, and to put them in the safe while trying to avoid meeting the minotaur who tries to catch and eat you. All this is done with 3-D pictures of the passages and the various objects in them. However, if you get completely lost, then you can call up a map of the labyrinth telling you where everything is.

You can also mark the floor with a big

cross so that you can remember where you've been. The game is very difficult to win and it ends either when you have put all five bars in the safe, or when you have been eaten by the minotaur. The scoring for this game is to put it mildly, odd, since you may often end up with a negative number of points.

This game also has sound effects telling you how far away the minotaur is — he growls when he gets close. When eaten, the minotaur just sits there in front of you smiling and winking. He doesn't actually look too convincing but that's only a small point which doesn't detract at all from the excellence of the game as a whole.

The third and last game, Babies, is an exact copy of the hand held game with the L.C.D. display in which babies jump out of a burning building. You must catch them on your stretcher and bounce them off the end of the screen before they fall to their deaths. There are allowed to die before the game ends.

This games pack is excellent value for money and I was very tempted to play the games rather than write the review!

These games should be available from Acornsoft at the price of £10.95 for the cassette.

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# HARD

## ROOM TO GROW

The Atom uses the 6800 microprocessor which is the same chip used in the Apple, Pet and the BBC microcomputer.

Memory capacity starts with a minimum of 16 KRAM which can be expanded to 128, by adding chips. Expansion to 256 is achieved by adding an extra busboard inside the Atom case and then you have to buy a 16K SACK which is expensive.

RAM starts at 8K and goes up to 192K on board, with extra expansion available on with the RAM chips.

The power supply needed to run an Atom is eight watts at 600 mA each for the minimum system. Users can supply the power unit which feeds the internal regulator. For the maximum system you need an external regulator supply.

A cassette interface port allows you to connect a cassette recorder for loading and storing information, and a printer output port for attaching a printer.

The Atom has sound capability via a loudspeaker which allows the generation of tones of any frequency.

## GAMES PEOPLE

Independent software suppliers have not been slow to support the Atom and a large range of games is available for the machine.

Acornsoft produces 12 games packs which contain three games on each cassette and costs £11.98 inclusive of VAT.

The company claims to be able to turn any arcade clone into an Atom game in a matter of months. One example is the game of Snapper, which recreates the popular Payman game — this shares a cassette with Minotaur and Rabies.

Also available are three Atom adventures and a chess playing program.

Among the other Atom games software suppliers are:

- Program Power (3 Wensley Road, Leeds LS1 2LR) has a range of about 28 games, from adventures to the arcade type. Bats, Bats, Invader Force and 3D Asteroids are its best sellers.
- Bug Byte (98-100 The Albany, 501 Hall Street, Liverpool L3 9EP) offers some 18 games, including the arcade and simulation types. 143 is a flight simulation program which along with Invaders and Galaxian, is its most popular cassette.
- Mamest (Hope Cottage, Wintbourne, Newton, Berkshire) is proud to have its games concentrating more on the adventure type. Of the arcade variety it offers an elementary Payman game called Chaser and Space Invaders. Atom Adventure is its best seller.
- A & F Software (10 Wilkshire Avenue, Longsight, Manchester M14 5PL) produces four games for the Atom of the

The Atom is made by Acorn Computer Ltd, and is available in kit form or ready built.

Based from Acorn it costs £774 for the 2K assembled or £740 for the kit. A "full" Atom has 128 memory and costs £289 from Acorn.

It is designed to plug into a television set and the Atom comes complete with Basic manual, UHF, television lead, A power supply (cost £16.29) and a cassette lead (£1.50) are important extras.

The machine, which was launched in mid-1982, has proved popular with games players because of its high resolution graphics but also has business and educational applications.

Hardware and software is available from Acorn Computers and its associated company Acornsoft, which shares its address at 40 Market Hill, Cambridge CB2 3RQ. The prices quoted above are RRP, but its large dealer network will cut the equipment much cheaper.

interactive type. A radar game, Early Warning, is its most successful.

- Team 4 Software (12 Leinster House, Redcar Road, Harlow HA, Harlow, Essex) offers Space Invaders and Shogakukan, an arch-slasher which enables you to draw and store your own graphics.
- Computer Concepts is at 18 Whynode, Chappelford, Huddersfield. It produces a small range of software for the Atom including Invaders, a sound effects program, an atom clock program and a program to increase the number of text lines and characters on the screen.

## GOOD GRAPHICS

The Atom manual contains plenty information necessary to produce your own graphics and sound for games playing.

Graphics capabilities depend on the memory available. A minimum Atom has 16 of 16,000 RAM, half of which is used for storing text. But this can be expanded up to 64K or 128K and 64K text space which is the maximum configuration on the board. The Atom has nine graphic modes dependent on memory.

| Mode | Resolution | X   | Y  | Memory |
|------|------------|-----|----|--------|
| 0    | 64         | 48  | 56 | 5K     |
| 1a   | 64         | 64  | 16 |        |
| 1b   | 128        | 64  | 16 |        |
| 2a   | 128        | 64  | 26 |        |
| 2b   | 128        | 64  | 16 | 1.5K   |
| 3a   | 128        | 96  | 36 |        |
| 3b   | 128        | 192 | 36 |        |
| 4a   | 128        | 192 | 66 |        |
| 4b   | 256        | 192 | 66 |        |

X is the horizontal axis and Y the vertical. The "m" modes refer to colour which requires the floating-point ROM and the

colour converter board — about £20 each.

The highest mode is more than adequate for reproducing arcade-type games and the more subtle displays required by strategy games. For example, Acornsoft has designed a version of Kensington which fits on the Atom screen.

Sound is available from a single bit on an output port and the user must write a machine code program to generate sounds very easy as the Atom has built-in assembler — the manual contains a machine code program to imitate a harpsichord.

Volume and quality from the internal speaker leaves a lot to be desired, however the sound output is available on one of the pins on the din socket which the cassette uses. A seven pin din plug will connect it to an amplifier.

## BASIC PROBLEM

One of the main criticisms levelled at the Atom by other computer users, is that its Basic is very different from the Microsoft Basic.

Among the peculiarities are the options to carry out print formatting, floating point arithmetic and string handling.

You can also use abbreviations for the most widely used command words. The string handling commands are also unusual — again to conserve memory space and speed up the string manipulation operations.

The Atom has an in-built assembler which enables you to produce machine code programs. Machine code can also be passed into memory and assembler statements be made part of a Basic program so that it returns control to Basic after the machine code has run.

Owners of the fully expanded Atom can take advantage of the Atom Forté implementation. The Forté language is a programming language which can be implemented on microcomputers and offers high-level ways of solving a wide range of problems.

It is a compiled language and programs run very quickly when you use it. The cassette contains a Forté dictionary and compiler, a tape interface/harmon editor, a graphics package and a high resolution graphics demonstration.

Forté can be used with the Atom but you need extra memory to link it in with either the System 2 or 3.

The Acorn Forté package includes a compiler, an editor and an interpreter and an in-line assembler for programming critical routines.

The List Processing Language (LISP) can be used on the Atom but this language is usually used when working on research programs rather than production programs.

# ALL YOU WANTED TO KNOW ABOUT THE



# CORE

## OPTIONAL EXTRAS

A variety of peripherals are available for the Atom, both from Acorn and other specialist firms.

The Atom was designed as a cassette-based system, not as a disc-based one, but in the near future Acorn is to bring out a single disc drive unit which should cost around the £200 mark.

Acorn claims any cassette recorder can be plugged into the Atom and used to save and load programmes but the more expensive the recorder the better the performance.

Acorn markets a printer which will produce hard copy from the Atom. It is called the GP-80A and sells for £332. The GP-80A is a dot matrix printer and provides characters printed in single and double widths, also graphics.

The 2K system needs the Atom printer-disc chips which fit inside the machine's casing. These retail for £71, having expanded the Atom you need a wire link from pin 17 of the 8255 chip to pin 17 of the printer connector.

There are no joysticks on sale for the Atom but Atari joysticks can be converted. A booklet on the subject can be obtained from Burgess, 37 Southview Road, Withers, Essex. The £2.95 12 page booklet also contains some Atom games programs.

Additional memory boards can be bought from Acorn or Revision-Based Timetables which specialises in the Atom.

You can get 16 Kbit RAM sets from Acorn for £11.22 each (sold around as three come a lot cheaper) and a 4K floating point ROM for £23.00. If you buy the 12K Atom it comes with the system. An 8K memory card is also available. It is connected inside the Atom and costs about £9.

Timetables supplies a 128 bit-on RAM for £99.50 and a 32K RAM board for £79.95.

A 64K dynamic RAM card can be connected inside the Atom. It is made by Audio Computers of Southampton and is available from the manufacturers at Technomate, 17 Burnley Road, London NW10.

Data memory is not usually required for playing games on the Atom but is usually needed if the user wants to build up a large database of information. According to Acornsoft all of the games software runs perfectly on a 12K Atom.

The user port on the Atom is similar to the Pet's (8 bit), so any peripheral advertised for the Pet user port can be connected to the Atom. You will need to make an adapter lead up and change the software — most manufacturers will make these alternatives available.

One interesting aspect is a voice synthesiser available from Little Bird Products of Royston, Herts. Its Speechwriter unit with power supply and speaker for £89 (plus VAT) will connect to the Atom.

The Atomsoft facility allows users to access massive mainframe databases via the information service Prestel. The Atomsoft ROM plugs into the Floating Point ROM socket (C30), you also need a modem and Isolating Unit (C31) and a PSU + a cable (C32).

A few of the Atomsoft facilities are Auto Dial, Auto log-on, full Prestel character set and provision for downloading software.

## A USER'S VIEW

I bought the minimum kit Atom for about £130 from one of the dealers.

Being a dab hand with a soldering iron it took me a long evening to construct but it's not hard for beginners because the construction manual which comes with the kit version only is quite comprehensive.

The keyboard is a problem to take care, but the grapevine says that a new keyboard will soon be used.

I had typed with a Pet previously so I was slightly perturbed by the reports of 'Atoms' peculiar Basic but within a week there was no problem.

The Acorn's 'idiosyncratic' approach to PREFIX, PREFIX-ing, print formatting and string handling is not only more compact than other methods, but more logical.

The floating point arithmetic is a bit complex because one has to prefix with 'F'. But you soon discover the speed advantages of integers and only use Floating Point when you need to.

The extra 2114s and 684 6802 come next and I had a fully expanded Atom and my wallet didn't notice. The beauty of the Atom is that you slowly build up and eventually you've got a hard disc-based system, with colour, Prestel, Atomsoft, BBC Rom set, Wordpack, Printer, Coozem and speech.

And finally, one tip for those who intend to get serious use out of the Atom. Buy, build, borrow or steal a 5 volt 2 amp regulated power supply the Atom PSU will support a maximum board, but if you are going to expand sooner or later you'll need it.

I things go wrong, Acorn has a service department but the company is notoriously difficult to reach by phone.

## BOOKING TIME

Several authors have been tempted into print to give others the benefit of their Atom experiences.

Acornsoft is in the throes of producing a book titled *Atomic Secrets*. This publication will consist of programming hints and techniques which Acornsoft's programming team has employed in producing software for the machine. It will give advice of how to get over many problems.



The *Acorn Atom Magic Book* is another publication on sale from Timetables. It is full of simple programs, mainly games, for the Atom and also programming tips for the amateur.

The *Magic Book* also covers converting programs from other machines' Basic into Atom Basic, together with useful sub-routine addresses contained in the ROM. The *Magic Book* costs £5.95.

A book which at the same time, called *Getting Acquainted With Your Atom*, it is an introduction to Basic using examples of games and educational programs, as well as a section on graphics. This book is slightly more expensive costing £7.95 and is published by Database Consultancy of Colver Park, Essex.

For the more advanced programmer who seriously wants to learn about the subject in more depth, a book titled *6802 Assembly Language Programming* by Lance Leverette is a good buy. It's a thick book packed with information detailing standard features of assembler language and also going into the complexities, but in a readable style. The publisher is Database Consultancy and the price is £25.95.

*Starting Forth* is useful for those who have bought Acornsoft's recently introduced Forth implementation package. Forth has generated a lot of enthusiasm amongst micro users because it is a high level language which is easily implemented on low memory systems. It was invented about 10 years ago but is just now becoming more widely accepted mainly due to the Forth Interest Group. *Starting Forth* is published by Forth Inc. which is owned by the language's author, Charles Moore.

Acorn supplies its own documentation with every computer it sells. For the Atom this includes the *Atom Manual* (£9.95), the *Basic Manual* — which can be used with Acorn's Systems 1, 2 and 3 and costs £7.50 — and a sheet of information on any integrated circuit for £1.00.

The manual which is written by David Johnson Davies of Acornsoft, also contains a section for the advanced user.

E ACORN ATOM... BUT WERE AFRAID TO ASK

TRS80 Models I+III  
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**ADVENTURE** A type of game in which the player takes over a character role and retrieves a number of treasures or objects by a trial and error process giving instructions to the computer. The "hero" (or player) encounters a variety of hazards often taking the form of dangerous monsters, wizards and animals. Some adventure games are so complex that they take weeks, or months, to solve.

**ALGORITHM** A process or set of rules to carry out a task or solve a mathematical problem.

**INDEX** A series of items (data or information) arranged to form a meaningful pattern.

**ARROW KEYS** The keys on a computer keyboard marked with arrows. Used for moving the cursor across, or up and down, the M/D II screen.

**ASSEMBLY LANGUAGE** A language built up with memory codes designed to make programming easier.

**NOOLEAN** An algebra developed by George Boole consisting of logical operations as opposed to arithmetic operations. A Noolean variable is a two-valued variable like true or false, yes or no.

**BRIDGE RECTIFIER** One of the components of a power supply whose function is to help smooth out AC voltage.

**BUG** A slang term given to a mistake in a computer program which prevents it from working. It can also refer to a mechanical, electrical or electronic defect in a computer.

**BYTE** A term to measure a number of bits (binary digits), usually eight bits or a byte.

**CMOS** A tiny piece of silicon which holds all the components that make up a microprocessor.

**CO-ORDINATES** These are used in drawing graphs. To plot a point on a graph you select the X (horizontal)

co-ordinate and the Y (vertical) co-ordinate. You plot the point where the two meet on the graph.

**COMMAND** In writing programs this word refers to an instruction word which specifies an operation which the computer must perform.

**COMPUTER LANGUAGE** Languages are used to make the computer perform operations. They consist of

instructions or commands. There are different types of language for carrying out different tasks.

1947.8.1948 A transmission line carrying computer information.

**DEDICATED CHIP** A chip (micro-processor) which has been specially programmed to perform a single or special group of applications, e.g. computer games. ROMs are usually the means by which dedicated chips are downloaded

**DIGITAL ANALOGUE CONVERTER** A device used to convert analogue voltages and currents to the digital representation used by computer systems. This is so computers can process data sensed directly from the commercial world.

**Hard** A magnetic storage device. It can be either a hard or floppy disc. Hard discs can usually store more information than floppy discs and are used with mainframe computers.

**DISC DRIVE A** unit which is connected to the computer, used for loading the information stored on discs into the computer.

**DISC STORAGE** The method of storing information on discs as opposed to tapefiles.

**DROPPER RESISTOR** This is a large resistor which is used in power supplies to bring the voltage rate down if necessary.

**EUROCARD** A type of printed circuit board suited to circuits with a large number of chips.

**FLOATING POINT** This is a notation used for the calculation of numbers in which the arithmetic point, binary or decimal, is movable but not necessarily the same for each number.

**FUNCTION** A special purpose or characteristic action.

**GOSUB** A Basic command instructing the computer to go to a subroutine in a computer program.

**GRAPHICS** The name given to pictorial representation of data.

**HARDWARE:** The general term given to all pieces of electronic and mechanical devices which make up a computer system, i.e. the actual machines.

### HIGH RESOLUTION GRAPHICS

A method of using Basic commands to move a drawing head to any position on the screen and drawing a line

# SOFTWARE GLOSSARY

A beginner's guide to plain jargon

between two specified points. This facility is available on several makes of microcomputer.

**INTEGER** A number which does not contain a decimal point, i.e. a whole number.

**INTERACTIVE** A word used to describe a system which is capable of real-time man-machine communications.

**K** Abbreviation for kilobyte.

**KILOBYTE** A measurement of memory capacity. 1024 bytes of memory. So 8K is equivalent to 8192 bytes.

**LANGUAGE** See "Computer Language".

**L.C.D. (Liquid Crystal Display)** A display containing liquid crystals which light up when electricity touches them. Used in calculators and watches. **L.E.D. (Light Emitting Diode)** Provides a simple display and consists of an electron tube which lights up when electricity is passed through it. Used as an alternative to liquid crystal.

**LINE NUMBER** Refers to the number assigned to a line or row of characters contained in a computer program.

**LOAD** Putting information from auxiliary storage into internal storage of a computer. It can be either a complete program or any data. When you load a program you put the contents of the program into the computer's memory from storage either on a disc or a cassette.

**LOOP** A Basic function referring to the repeated execution of a series of instructions for a fixed number of times.

**MACHINE CODE** The term used to refer to symbols or numbers assigned to parts of a machine.

**MAINFRAME COMPUTER** The jargon word used to describe a very large computer.

**MEMBER** A device which information — data — can be copied into, stored, and later obtained from.

**MICROCOMPUTER** A tiny computer (as the name suggests) consisting of hardware and software. The main processing blocks are made of semiconductor integrated circuits.

**MINIMAL ALGORITHM** An algorithm which defines the smallest and greatest possibilities in solving a task or mathematical problem.

**NUMBER CRUNCHING** The operation

in computing which carries out the arithmetic and logical processes which information has to go through.

**OPERATING SYSTEM** Firstly, this can be used to describe an organised collection of techniques and procedures for operating a computer. Secondly it refers to a part of a software package — the program or routine — defined to simplify procedures including input/output and data conversion routines.

**PEEK** A statement used in Basic which allows you to read the contents of a specified memory address.

**PERIPHERALS** Equipment which is used with a computer, e.g. printers, V.D.U.s and disc drives.

**POKE** An instruction used in most versions of Basic allowing you to store integers in a specific place in memory.

**RAM (Random Access Memory)** This is a memory chip which you can load programs and data to and from.

**RANDOM NUMBER** A number selected at random from an ordered set of numbers.

**REAL TIME** This is on-the-spot computing when the operation is performed during the time an event is taking place in time to influence the result.

**RND (RANDOMISE)** This is a Basic command referring to the procedure for making numbers, data, or events random.

**ROM (Read Only Memory)** A memory chip which can only be read from and not written into.

**ROUTINE** A set of coded computer instructions used for a particular function in a program.

**SOFTWARE** Another name for computer programs. It can also refer to computer documentation.

**STRING** A connected sequence of characters, words or other elements usually symbolised with the dollar sign.

**SUBROUTINE** A computer program routine that is translated separately.

**SYNTAX** The name used to refer to sentence structure rules of programming language.

**USER FRIENDLY** Software or hardware which is easy for computer users to operate and understand.

**USER PORT** The entry channel to which a data set (set of similar data) is attached.

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