

AUGUST 1982
75p

Your
chance to design
an electronic game
Details inside

COMPUTER & VIDEO GAMES

HAUNTED
HOUSE

ROBO-
RUN

Our first
game for the
Spectrum

Plus listings for the
ZX81, BBCmicro,
VIC, Tandy and
many more inside

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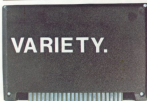
The VCR cartridge, fitted in a luxury case, can offer up to 20K RAM (Random Access Memory) and 16K of preprogrammed ROM (Read Only Memory). It is compatible with the various utility chips currently available. You can start with just 4K (VCR 4) for only £24, adding more memory later. Each 2K increment will cost £5, offering the finest quality CMOS RAM or low power NMOS RAM (£4).

The VCS is the little niche of software houses: in basic mode, it simply provides 64K of extra RAM with three slots for cartridges including those produced by CMM. In VCS mode, it can read cartridges into RAM and simulates them (once they are removed). This allows the programmer to use machine code tools (disassembler, monitor, editor, etc.) for analysing the cartridge. Available without RAM (VSC-0) for £24, or with 64K of RAM for £44.

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JUMBQ

[illegible][illegible]

The program was written by two authors who combined their good skills to produce a unique piece of software. The programmer got the last byte of the formatted data of the machine and the point the last day of automaticity out of the simulation. Other simulation programs...

[illegible]

A chart is supplied containing various items of data which you will need, including the spin-off data for a P&G with various interest positions. Some information about the various items and interest positions.

[illegible]

The controls are pretty well complete, apart to drive and wheel brakes. The flying gear may be completely finished by the time

degrees. Despite evidence to the contrary, the authors conclude that the use of the *depression* scale is not intended to be a test of the *depression* construct, but rather a test of the *depression* scale.

Activity	Attribute	Unit
Articulate instruction	Complexity	Stages per time
Articulate instructions	Typical outcome	Distance to learning
Articulate outcomes	Applicable outcome	Rate of growth
Power setting	Activities	

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© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 103–110

Results information and present conclusions are shown on the next page(s). It is very difficult to think of any factor that the authors have overlooked. Even the gale blowing at the top of the air with increasing height, which greatly affects the airspeed indicator in real life, is taken into consideration. Further than having a fixed starting speed, this continuously changes with the flight configuration. The weight

who uses the words that are published, good originality, accuracy, it is a combination with the author's own talent in writing is outstanding. It is available on tape or disk for \$99 or \$299. Authors: Victor, Victor Garcia, Dennis and David J. Hoffman.

Trade	1994-2000	1991-93	1994-2000
Price	1994-2000	1991-93	1994-2000

Table 1



1. BARNHAM HILL ROAD, TOWN HALL SQUARE, BISHILL, CHESH. MAN. S40 1JG

1991 - 1992: 1991-1992

1. *Journal of the American Medical Association*, 2000; 283: 2686-2692.

Free 90-day money-back guarantee. Software: \$24.95 (includes 1 year of updates) plus \$9 postage.



THE "STARWARS OF THE 80's"

NEXT
MONITOR

Tron lives inside a mainframe computer. He is referred to as a "Program" and he fights for the "users". He has also given his name to the Walt Disney film which is set inside a huge games computer. The film has just opened to rave reviews in the U.S. and will be in London's Odeon Leicester Square Cinema from October 11.

The film is unique in combining real actors, animation and some rapidly computer graphics and has been tipped as the "Star-Wars of the 80's" by those privileged enough to have seen it.

Our September issue gives two pages and the front cover over to this marvellously imaginative film, which is quite different from the usual Disney offerings.

We look behind the scenes at the graphics men behind the film, a review of the film itself and a run-down on the huge boost it is already giving to the video games and computer games industry, both here and in America.

WHAT'S THE ANTIMATTER?

NEXT
MONITOR

Our Science Fiction author, David Langford is back with another offering. He takes the concept of anti-matter and shows how it can be used in a computer game. And as usual comes up with a listing to illustrate his points.

Have you ever dreamt up your perfect computer game but felt that the programming skills necessary to convert it to your computer were beyond you?

Next month we are offering the perfect solution. In conjunction with Sinclair Research and Pison Computers, we are challenging readers to come up with an original idea for a computer game.

Sinclair are putting up five prizes for the best ideas, but more interesting for you aspiring games writers, is the chance to put your name to a game marketed through Sinclair. More details next issue.



DEFENDER IN ONE "K"

NEXT
MONITOR

On the games front, we have a Mini Defender in 1K for the unexpended Sinclair ZX81 owners. The ghosts of Pacman are ready to chase those of you with a VIC-20, plus Colditz, Star Wars, Bomber and many more listings for you to key-in to your machine.

And as an extra bonus for everyone who has an interest in the BBC Microcomputer, the Owl supplement makes a comeback with issue two. It includes some marvellous tips and programs and if you thought colour was impossible it made sense — then think again.

It's all wrapped up in a Tron cover, look out for it at your newsagents next month or fill in the form below to make sure of your copy.

I enclose payment for my subscription.
I enclose cheque for £10 for OAG (normal) for
first volume Computer & Video Games, Volume
1, Part 1, Number 1, published 1982.

Name
Address

Computer & Video Games.

The magazine that makes computers fun.

LAST CHANCE TO TAKE IN PARIS

This could be your very last chance to go to Paris at our expense. If you have a game for any machine which you think we ought to publish, then we want to hear from you.

Come October, Computer & Video Games will be a year old and the writer of the best game to be published in the magazine in that first year will be treated to an all-expenses-paid trip to Paris with any friend he (or she) may care to take along.

We already have some idea of the games we most enjoyed trying out in the office and those reviewers who have tested games have also given us some forthright opinions on their favourites.

For the perfect computer game still has to be written and the judges will wait until the last moment before pronouncing on the selection.

However, we would also like you readers to have a say in the result. So if there is a CAVG game which stands out in your mind as giving the most hours of fun, please write in and let us know.

We want to know the name of the game and why you gave it your vote. After all it's your magazine so it's important that your opinions influence the result.

Write to: the editor, Computer & Video Games, Current House, 8, Herby Hill, London EC1R 3JB.

WHO BEAT THE BUGS?

How did you fare in our June issue's Beat-the-Bugs competition? We've just finished sorting through the entries and, although this puzzle was thought to be more difficult than our first program a puzzle solution, the standard of entries seems just as high. The winner's name will be published in our September issue.

Did you choose the right three sides in our World Cup competition? If you rightly predicted the champions, runners-up and third-place play-off winners you are in the running to win an Atari TV games console. Watch our Competition pages next month.



"...the quality of the colour display is excellent". Popular Computing Weekly.

"The graphics facilities are great fun". Personal Computer World.

"...the Spectrum is way ahead of its competitors". Your Computer.

"The world's best personal computer for under £500."

Chris Smeaton

Sinclair ZX Spectrum

16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional's computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8-colours, sound generation, a full size moving-key keyboard and high-resolution graphics. Plus established Sinclair features such as 'one-touch' keyboard entry, syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours plus flashing and brightness-intensity control.

Sound – 8KHz command with variable pitch and duration.

Massive RAM – 16K or 48K.

Full size moving key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.

High resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.

ASCII character set – with upper- and lower-case characters.

High-speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and AUTOLOAD for programs and separate data files.

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

Printing speed is 50 characters per second, with 30 characters per line and 19 lines per vertical inch.

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes (on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second). And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're available later this year, for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEMPOST – use the coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard. CREDIT ADV – please allow up to 28 days for delivery. And there's a 14-day money back option, of course. We want you to be satisfied beyond dispute – and we have no doubt that you will be.

sinclair ZX Spectrum

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	Sinclair ZX Spectrum – 48K RAM version	100	175.00		☐ 16K Microdrive ☐ 48K Microdrive ☐ 128K Microdrive
	Sinclair ZX Printer	01	50.00		☐ Address ☐ Name ☐ Title ☐ Tel. ☐ Fax
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PUZZLED BY THE PYRAMID

Dear Sir,
While reading Keith Campbell's *Adventure* column in the February issue, I was most intrigued as to his comment on the availability of *Pyramid of Doom*, stating that it runs on TRS-80's, Video Games, Apples and Pans.

I happen to know that you also available for the Exidy Sorcerer, but never have I found any of the Scott Adams *Adventure* series for the Pet.

I have searched high and low for them, and have only found *Adventureland* and *Space Adventure* for the Pet, and they are in Basic. I would therefore be extremely grateful if you could tell me where I could get hold of the rest of the series, as I am an *Adventure* addict — well almost — having several for me on a friends Apple, but only two on the Pet, they being *Black Holes Guide* and a version of *Mozzrock*.
C. Armstrong,
Pans,
Middlesex

Keith Campbell replies: You are absolutely right! I was in error stating that *Pyramid of Doom* is available for a Pet. I based this statement on

too brief a glance at a Creative Computing catalogue which had separate pages for different machines. The Pet page did indeed list *Pirate Adventure* and *Adventureland*, whilst the other pages listed more than just these two. Unfortunately I did not look closely enough at the Pet page. However, your letter has made this all very clear now — my apologies!

Incidentally, I hope I won't be stalling my sack out by saying that the Scott Adams series is now available for the Atari computer.

SEARCH FOR HARDWARE

Dear Sir,
First I would like to congratulate you on a fine magazine. As a complete newcomer to computers, I have found it extremely interesting and helpful.

I recently purchased a second-hand Sinclair ZX81 and with the help of your magazine, have found that already I am beginning to understand how programs work, and have been able to modify some of the ZX81 program listings you have published. However, I have two problems you could perhaps help me on.

First, obviously the capabilities of the ZX81 are limited, and I am wondering whether it would be better to invest in ZX81 add-ons or to invest in a better machine.

Secondly, I have an Imagination games console and wonder whether anyone makes add-on hardware that could be used, i.e. keyboards, memory etc, that would turn the games console into a workable computer. I am aware that Imagination intend to make a keyboard unit, but this seems a long time coming. I have been waiting two years

for such a device already.

I am by trade an electrical engineer, and therefore would be able to construct anything that was available.

Considering that there are reputed to be more Imagination consoles about than ZX81's I'm surprised that I've seen nothing advertised in this vein. Perhaps there are technical difficulties.

G. Coleman.

Working,
Surrey.

Editor's reply: The peripherals and software market is advanced enough to turn your ZX81 into a pretty impressive machine Mr Coleman. They can certainly add a good keyboard, high resolution graphics, and colour.

Noted will be the only people searching an indivisibly keyboard in this country. It will be distributed by ACE and won't be out until the very end of 1982 and will be expensive in comparison to some of the new microcomputers which are crashing the market.

BLANK LOOKS FROM ZX81

Dear Sir,
Last Christmas I purchased a ZX81 computer. I had previously used a Pet belonging to my school.

Now I am greatly disappointed. To start with my computer would not load, and I found the computer would continuously "crash". Now it will not switch on and only shows a blank screen.

I am writing hoping that you could advise me on the best course to correct the fault.

Clay Smith,

January.

Chislehurst

Editor's reply: There are many reasons why the ZX81 has the problems you list.

First, it could be one of the duff machines, if so, send it back and get it replaced. You can see from the letter below the chance of tape recorder is rather sensitive, and probably accounts for loading problems.

AUTOMATIC AGGRAVATION

Dear Sir,
I am having trouble loading and saving my own programs on my ZX81. I use a Philips AR21 which has an automatic recording level. Does this affect the saving in any way?

P. E. Murphy,

Chesham,

London W4

Editor's reply: With the Philips tape recorder you have to use the 4-pin DIN socket for recording and playback. This, in conjunction with the AR21, is about the worst combination of circumstances for the ZX81. You really need a new tape recorder, where you can use the cassette and microphone sockets.

Heath have produced a long list of appropriate machines and it would be worth your while sending them an a.s.c. — to 4 Kings Parade, Cambridge — and asking for their technical data.

HOPES FOR ADVENTURE

Dear Sir,
I have recently bought an Atari 400 computer and I would like to find out more about it. I have heard that it has graphic facilities as yet unexplored and I hope that *Computer and Video Games* will spill the beans. I also hope to see an *Adventure* game soon.

Mr Peter Dingley

Chesham,

Middlesex





MAILBAG



FILLING IN THE HORIZON

Dear Sir,

I have the use of a North Star Horizon computer and when I asked a friend about the use of graphics he told me that instead of POKE, PEEK could be used.

I experimented with PEEK but could not get any results. Please could you tell me how graphics are used on the North Star Horizon, as the only games I can play are adventure games which don't involve graphics?

Stephen Evans,
Bodenham,
Haverhill

Editor's reply: I can't really answer this as it depends on the type of video board in your system. Most graphics boards do not allow memory mapped graphics — which is what POKE and PEEK are specifically for. As you are using a VIDE to display the video signals, the methods used depend on this, the graphics board and the hardware.

HELP! I'M BEWILDERED

Dear Sir,

I have only been involved in computers for about nine months and practical computing for about one month and am therefore totally bewildered by the whole thing.

I am saving up financially for a computer and I have a couple of questions to ask. Why is the ZX81 so much cheaper than its nearest rival? What's the difference?

In the April Mailbag someone asked what the cheapest price for a memory expanding pack was. Could you tell me if the same is true for the computer itself?
Ian G. Reed,
Bournemouth

Editor's reply: The ZX81 is mass produced. This combined with some clever design techniques allows it to be sold cheaply. It has a limited application and within these limits does things very well. Others, more expensive, computers can do more. If you only

want to do simple things then why pay for something you don't need?

New memory units are available for the ZX81 all the time. Now that Sinclair have enhanced the 1KB RAM to 32KB, this seems the best buy.

TEACHER FOR THE APPLE

Dear Sir,

My father owns an Apple II Plus, for which we bought a number of games.

As he is now thinking of buying the Wordstar word processing system he is about to buy the 2-86 Softcard for its CP/M language. What sorts of games will I be able to play on the Apple once the Softcard has been installed?

I am a very keen reader of your magazine and hope to buy some of the Apple games you print.

Angus Winchester,
Ellery,
Oxford

Editor's reply: There are many games running under CP/M. As this operating system is mainly designed for business use you will probably find that most are available on the Apple already. I don't hold much hope for any new ones, especially as the Apple has a rather idiosyncratic method of implementing CP/M.

SATISFIED READER

Dear Sir,

During the course of the present month I have discovered your fabulous magazine. I am very impressed with the amount of information you manage to supply. On reading the March issue, I have found a great number of ZX81 software suppliers,

previously I knew of none.
M. McEneaney

Garnock
South

TANTALISING PROGRAMS

Dear Sir,

As a relatively new user of computers and owning a Sinclair ZX81 my knowledge of the Basic used by other computers is very small. I would be grateful if you could inform me if there is a book that will change the Basic used in the tantalising

programs you write for other computers, to that of the ZX81's Basic.
Kevin Harris,
Lombardy,
Gloucestershire

Editor's reply: Quite honestly the most comprehensive booklet on Sinclair Basic is the ZX81 Instruction Book! Unfortunately the

information is not in any logical order! You have to read through it about ten times to find what you need. There is no book that will do the "translating" for you.

CHILDREN'S FAVOURITES

Dear Sir,

Although I enjoy reading your magazine very much and find the contents very good I think it could be bettered by the addition of a so-called children's page.

This could contain programs written for children and competitions. It would also contain letters and queries and some facts. After all, with the increasing number of mimes being used at school, a lot of your readers are children and if there was a children's page it would be easier for them to get their program printed.
John Hunter,
Middleham

Editor's reply: In our experience children are quite capable of taking the lead in the microcomputer gaming world. Certainly many of our games are sent in by young contributors and I would hate to patronise them by including their offerings on a children's page. One of the fastest and best machine code space

invader games I have come across was written by a 15-year-old. The point is that you youngsters can form your very own one page without us making any concessions.

VERY SORRY PEOPLE

Dear Sir,

We would like to apologise to all our customers for any delay or inconvenience caused on orders received by Anglo American Software.

This was due to an internal mail problem. Orders placed before May 15th have been mailed, and would anybody who has sent an order to us please contact us as soon as possible.

Mike Davies,
Anglo American Software
Birmingham



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WIN A BALLY PINTABLE

Bally's marvelous Electro pintable takes pinball just about as far as it can currently go.

Pinball fanatics will know it as the three-level pintable which adds a mini-playfield to the excitement of a two-level game. This pinball machine will go to the home of the lucky winner of our pinball competition.

And the winner could even find his ideas incorporated in a future Bally pinball design.

So how do you win an Electro pintable for your own living room, bedroom or hallway? Simply by being original. We want you to come up with an idea for a feature on a pintable — or any other arcade game — which you think would greatly enhance its playability. Or you could come up with a completely new machine.

You'll have to go some to match the current crop of pinball designers, who have introduced some pretty impressive features lately. The Electro itself is a good example of many of these and we have gone into some of these, below. But among the many innovations, currently pulling people into the arcades are: drop targets, playfields on more than one level, capture balls, pintables that talk back to you or the Vector's machine's flip-outs.

Pinballs have also found a new direction recently. The Williams Hyperball and Bally's Rapid Fire (reviewed on page 27) have given a new twist to the pintable by turning them away from the usual keep-the-ball-in-play strategy, to a firing game, shooting balls at lit targets.

It is this kind of completely fresh outlook on a game that Bally hope the winner of this competition will produce. It can be a single feature on a game or a whole new concept — but it has to be practical, so bear in mind the following criteria:

- Physical dimensions.
- That the game is capable of



being mass-produced.

- Cost.
- Weight.
- That it is safe to be used by the arcade player.
- The idea must not be stolen from any other arcade or pinball machine.
- And most important, it should be creative and original.

The Bally Pinball Division will present an Electro pinball machine to the grand prize winner. All entries will be judged by the Bally Pinball Division's new product board and announced in Computer & Video Games. All entries will be the property of the Bally Pinball Division and the entrants will assign

all rights, patents and privileges of their design to the Bally Pinball Division.

No employees of Bally or Computer & Video Games or their relatives may enter the competition. The judges' decision is final and no correspondence will be entered into.

Send your entries to The Pinball Competition, Computer & Video Games, Durrant House, 8 Hensall Hill, London EC1R 5JB before September 15th 1982.

More features than *Conquest*, in one way you could hit the Electro pintable. For pinball buffs, we'll just outline a few of these.

The first difference you will notice is the split-level playfield, which has two upper tiers and a central mini-playfield.

On the upper level you'll find stand-up targets, rollover buttons and a cannon arrow which will release another captured ball. Drop targets and a stationary target combine to produce a boot-a-ball multiplier.

Progress to the third, mini, playfield is achieved by collecting Electro time units on the upper levels. Each sequence of hit targets leads you into new possibilities. Now take a deep breath and you never again to refer to any arcade machine as: "Just another pintable".

BRAINWARE ANSWERS

The answers to our July Mind Routine problem is: Billy Backus 50 pts. vs. Roger Keene 52 pts.

35 reds, 5 yellows, 1 green, 2 browns, 5 blues, 4 pinks and 5 blacks (giving a total of 111 pts.).

The correction solution to last month's *Nevera Crossword* is printed right and the winning names will be published in next month's issue.

For more puzzles turn to page 80 for Mind Routine and *Nevera Crossword*.

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O X E K
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M O O E D I F Y
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H R H A E
U P D A T E L A N D E R
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WORLD CUP SHOCK

There was really only one way to put our June issue's World Cup Manager game to the test. And that was to get a national squad manager to play it.

So we invited England's manager Ron Greenwood to test out his soccer skills against the computer.

Ron graciously accepted the challenge and just before the England squad flew out to Spain, Sharp sent three computers (complete with the game) down to the squad's football headquarters at a Northfordshire hotel.

Several other members of the squad also tried their hand at the game with Steve Coppell and Emery Benson being the notable successes.

Between them they guided a rather strange England line-up through the first round and with Emery in charge the team narrowly failed to qualify for the semi-finals on goal difference.

Ron fared rather less well. With a team that consisted of Corrigan, Mills, Foster, Sansom, Wilkins,



McDermott, Coppell, Keegan, Martinez, Woodcock and Rio, Ron took on Hungary in the first game of his tournament.

CW/C's editorial assistant, Susan Cameron, helped Ron to keep in the opposition tactics and choose his tactics. And the result?

England lost 3-0! Well we never said the game was easy...

But he ran into a few tactical problems, like being forced to bring on substitute Peter Shilton, in the attack after a disappointing first half showing, in which the Hungarians claimed most of the midfield and stamped their authority on the game early.



Confessions of a Bug

Machine code! What on earth got the editor the impression he could break that past us?

The Bug hasn't been born, who can't put a spanner in the works of a machine-code listing. Snag factor got to grips in line 1 which has a real question mark over it.

Unfortunately author Pat Morris, once spotted the problem and came up with a subroutine which makes data entry into that first line much easier. First of all replace line 1 with 45 fullstops.

1 REM (45 full stops)

Next type in the following short routine:

```
3000 FOR A=10004 TO 10005
3010 INPUT B
3020 POKE A,B
3030 NEXT A
3040 STOP
```

After this short program has been typed, type in GOTO 3000. The cursor will appear, awaiting input. Put in the following data: 32,218,84,12,43,117,35,128,147,294,118,25,1,25,35,38,35,35,34,242,294,33,32,1,200,214,28,155,155,155,35,134,224,33,18,15,35,34,282.

After the data has been entered, delete lines 3000 to 3040.

One other point is that the entries in line 65 are two multiplica-

tion signs and NOT a power sign.

Also a piece of rogue paper obliterated a part of Pantom during the printing process—ably alerted by T. Hinch. Line 133 suffered as a result: 133 IF V=3 AND A=11 THEN PRINT "YOU HAVE BLACK-JACK"

is the correct version. Moonshuttle was left to Screaming Foul-up but he couldn't do much with it (he's not been well recently). But the printed version was for use with the keyboard rather than a joystick. The [in line should be changed to 31137 if you wish to use joysticks to play the game. Bye for now.

yours Mal

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS GAMES NEWS

WIN YOUR FORTUNE ON THE HIGH SEAS

BARGAIN BYTES TWO

Aboard landlubbers! There's your chance to take to the high seas in search of fame and fortune.

It's up to you to work your way up the ship's hierarchy, from cabin boy to admiral of the fleet, in a story similar to that of the fictional Captain Jack Sparrow.

Once aboard the good ship ZARI you must use your life-saving talents to win promotion by fearless performance in battle. Skillful use of resources is vital while sailing the seven seas. Supplies, men, and ammunition must be carefully calculated and finely balanced.

The journey is hazardous and the battles fierce but a determined player can battle his way up the ranks to become First Sea Lord.

Sea Adventure is one of eight games featured on Bargain Bytes Two. Other major games on the cassette are Stock Market, in which the player must make instant buying decisions to market information flashes up on the screen.

Naughts and crosses, with three skill levels, a fruit machine game, complete with random



balls, nudes and a winnings counter and a moving graphics Ski Run game are also on the tape.

The rest of the cassette includes educational games, a general knowledge quiz, an alphabetical Simon game and a memory calculation puzzle.

Bargain Bytes Two is available from Richard Shepherd, of Maidenhead, Berkshire. It needs a 16K RAM pack and costs £5.99 including postage and packing.

WIPE OUT THE NASTIES

WE PANIC



The only way to deal with some monsters is to trap them in a pot and hit them on the head with a shovel!

That's the aim of the 16K character who inhabits the WE PANIC maze.

You are in control of this little chap who, armed with a spade, rushes around the maze digging pits and trapping monsters. The aim is to wipe out all the nasties and collect a high score.

The game is similar to the arcade Space Panic machines and runs on the unexpended MSX 2.

The cassette is available from Liverpool-based Bug Byte and costs £7.99 including postage, packing and VAT.

THE MAZE MASTER AGAIN!

ATTACK-MAN

No computer is complete without a version of that master of the maze, Pacman.

The latest to sport a copy of this busy little creature and his antagonistic cohorts, is Texas Instruments' under-rated T1 9944.

As usual the player must guide this hungry alter-ego through a maze-eating points and avoiding the monsters.

The cassette costs £6 and is available from Stephen Shaw of Stockport. Coming soon, from the same source, are more T1 programs which are being brought over from the Canadian Norton Software catalogue.

TO WORK ON AN EGG

SPACE PIRATES

Yo Ho Ho and a basket of eggs!

What's this — have all these tough tough pirates gone soft in the head? No, they are still hard boiled characters, but you could say that this latest addition to games tapes for the BBC Micro-computer is a real cracker!

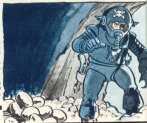
In Space Pirates you really go to work on an egg. On screen is an asteroids type spacecraft which you control to defend a clutch of space eggs under threat from some thieving aliens.

Once an egg has been snatched however your only defence is to shoot it. Then it turns into your

next spacecraft. If you miss all the snatched eggs then you'll end up minus your study ship and nothing for breakfast.

Space Pirates runs on the model A machine in 16K, and the tape comes from Bug Byte of Liverpool and will cost around £9.00.

Bug Byte are working on other games for the BBC machines, including a chess tape with 1,000 — yes 1,000! — skill levels, and Palato — a submarine warfare game for the model B using high resolution graphics.



EW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS

ARMED, FUELLED AND ON THE MOVE

SCRAMBLE

Scramble aptly describes the player's desperate antics, as he attempts to score points above a world on which he is barely escaped to exist.

Already a big arcade success, the game puts you in charge of a plane, armed, fuelled and on the move to rock a mountainous landscape.

Scorpio is the company responsible and it is quickly making a name for itself for adapting arcade games onto the limited graphics facilities of the ZX81. This version costs £4.95 (including post and packaging) and shows up to five ships in action on the screen at any time and has the fuel gauge, ground defence and changing terrain of its video predecessor.

ROBOTIC GENOCIDE

REPSEK

Genocide takes the strange name given to the game of robot genocide which frequented arcades last year.

It drops us again on one of the games cartridges which can be bought for the new Dragon 32 microcomputer. The Dragon is being manufactured in Swansea and is a division of toy company Mattel.

Genocide challenges you to escape from a room full of robots without running into the walls, the robots, or their bullets.

The game comes in cartridge form to slot into the computer and costs £19.95. Other games cartridges currently available are: Cosmic Invaders, Meteoroids and Ghost Attack.

Bank, dive and climb as the Earth travels past beneath your feet — or actually it's on your TV screen which has been transformed into a cockpit window.

Flight Simulation is the name of the game which is one of a series of five being produced for Sinclair by software house, Pagan.

The simulation places you in a cockpit of an aircraft.

The sky and the ground move through this window, and although it hardly bears comparison with the multi-million pound

FROM THE COCKPIT

FLIGHT SIMULATOR

flight simulators which real pilots train on, it does offer some of the excitement and a very real challenge.

The tapes are marketed under the Sinclair label and will be available from the company in your local W. H. Smith for ZX81s with a 16K Rampack. Flight Simulation costs £5.95 and the other programs are

Fantasy Games which retails at £4.75 and offers two adventures in a Perilous Swamp and on the Sorcerer's Island.

Cheese costs £5.95 and has six levels of play with a chess clock on which to time yourself.

Barfagames, the gentlers' favourite dice game has a graphics board, rolling dice, and doubling dice for £5.95.

The space invasion look-alike, Space Raiders shares a cassette with the familiar City Blaster type game, Bomber and retails at £3.95.

DEATH LURKS IN SPACE

INVADERS AND ASTEROIDS

Take your ZX81 where no Sinclair has gone before. But in the distant reaches of space lurk the Invaders and deadly fields of fast moving asteroids all out to do you terminal damage.

Both games include most of the features of the arcade favourites and are written entirely in machine code for fast and furious action. Invaders has 10 skill levels, a high score table, flying saucers, a bonus feature and realistic invader movement.

Asteroids has 10 skill levels, a wrap-around screen, five attack waves and those flying rocks come in three sizes. There is also a high score table and bonus feature.

Invaders and Asteroids will run in 4K of RAM and are available from Silvercraft, Bader Park, Moleham, Wiltshire, or the London based Small Enterprises. Invaders costs £4.95 and Asteroids will set you back £5.95.



NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS GAMES NEWS

THAT LITTLE YELLOW FELLOW

SNAPPER

For Miles, that cheerful glutton of the arcade will soon be establishing the revenues of the BBC Microcomputer thanks to Acornsoft.

Their version of the well known video game is called Snapper — named after the yellow creature which chomps its way around a maze.

The game — a faithful reproduction of the original — is easy to play using four well placed keys on the BBC keyboard which guide the hungry Snapper around the maze.

Snapper has even chomped his way into the respected pages of the Financial Times. Bizarre hatred city games were told that Snapper is "a little yellow figure" and he "moves about a sort of maze and scores points by gobbling up little wafers, power pills and ghosts. The longer you keep him alive the more points you score. If he eats all the video wafers he gets another life. But he can be destroyed by the



ghosts and can only eat them if he has first eaten a power pill." So now you know.

The maze appears in eight colours — using the BBC microcomputer mode 2. There are also sound effects — including gurgling noises as the Snapper eats his way around the maze and an audible learning when the little creature has eaten a power pill

and is able to chase and devour the ghosts.

Snapper includes a high score table. To qualify for a place you have to score at least 1000. The average beginner should score about 4000 points. The highest so far is 180,560 according to Acornsoft.

Acornsoft Snapper is available from Small Enterprises.

FOR THE CUNNING AND DEVIOUS

PHILOSOPHER'S QUEST

Do you have a cunning and devious mind? You'll need one to solve the new adventure game, *Philosopher's Quest*.

This text based adventure runs on the BBC Microcomputer Model B and takes the player through a whole series of strange settings.

The usual adventure format of command words is used to help the budding philosopher along on his search for the ultimate truth. During his search he has to overcome several what the devious programmers of Acornsoft refer to as "wining puzzles" on the way.

Part of the action takes place in an underwater scenario but there are puzzles to be solved on dry land in popular spots as well as out in the open. But I promised not to give too much away so I'll stop here. If you want to know more...

The game is available from Cambridge-based Acornsoft and costs £39.95 plus VAT.

MEET THE SUPER BIKES

TT RACER

Rev up on a high-power racing machine for the thrill of a minute experience of a TT competition.

A realistic motor cycle ride and his bike are in your hands on the difficult game in which bikes smash into trees, barriers and oil slicks.

You must complete as many laps as possible in the 30 second race. Manoeuvre your bike with the sensitive joystick and see him lean to the right or left from gravitational pull going round the bends.

Absolute control of the bike rests with the joystick. By pushing it hard forward the speed increases quite drastically and usually makes the later bend straight for the nearest tree or other obstacle.

It's best to try slow laps at first to learn the best technique for handling sharp bends. Once you are more experienced you can

speed things up and complete more laps.

If you feel you are travelling too fast put the joystick towards you and you'll slow down. The game is for one player only, but that's just as well because additional bike riders would only clutter up the track and make your life more difficult.

Each time your rider crashes the time on the clock ticks away, giving you less chance to catch up completed laps. It is difficult to master the controls of the game but once done you will find it challenging and competitive to tackle.

It runs on an Atari 800 with 128 memory and is available from Curry's stores, Calisto Computers and Maplin Electronics for £19.95. North London based Centrosoft is the producer.



AN ALIEN VETERAN

Spectra's new baby, the Spectra-1, is fast getting a library of software all for itself.

The latest addition is the *Spectral Invaders* cassette — a faithful copy of the new western phenomenon of the video game boom.

It is written in machine code and makes full use of the Spectra-1's graphics capability.

SPECTRAL INVADERS

The game is controlled by joystick and has a high score feature, as well as the usual invader antics.

It runs on the standard Spectra-1 and comes from Day Byte of Liverpool priced at £5.95 including postage, packing and VAT.

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS

DRAGONS AND GOLD DIGGERS

Deep underground is a mysterious land that lies a board of underground golden treasures which are talked of in whispers in inns and taverns by groups of strangely garbed travellers.

The treasure is guarded by several demons of the caverns which the would-be treasure hunter must subdue or defeat if he wishes to snatch some of the glistening prizes.

Colossal Adventure is named after the central feature of the

COLOSSAL ADVENTURE

game, the Colossal Caverns — a mass of caves and underground passages containing fabulous treasures. The player must deal with a dragon, a snake, spiders, orcs and a troll in order to grab the loot.

Commands are entered as English phrases so the game is simple to play — but difficult to complete. It should be possible for the player to finish the game

— but the makers, Level 9 Computing, are offering a special service to their Adventurers.

Each copy of the cassette comes with a stamped address envelope and Level 9 has undertaken to answer one question from a player who finds himself stuck in the caverns and provide the odd hint.

Colossal Adventure has a twist in its tail. Just when the player

thinks it's all over it enters a new phase. The cave is flooding and you must rescue the elves.

The program is written in a super-compact language developed by Level 9 called "a-code". This is specially tailored for the production of Adventure games and includes a compiler and a small "a-code" interpreter which runs the compiled code.

Colossal Adventure is the first of a range of Adventure games from Level 9 Computing of High Wycombe, Buckinghamshire. It runs on the Moscom 1 and 2 in 12K, and costs £9.95.



IT'S SNOW JOKE ON THE SLOPES

SKIING

Sliding against the clock may not seem to matter but controlling the athletic skier is really a true test.

There are two different races to attempt, a straightforward downhill course and a more taxing slalom race.

You have as many skiers as you need to complete the course within the set time limit, and the boundaries of each course remain the same although the features alter.

The slalom is the more difficult of the races because you have to make your skier twist and turn with agility between the flagged posts.

Hazards abound on the course in the shape of ice patches and

log piles. If you ski over an ice patch, which are denoted on screen by randomly placed blue pools, the impact speeds up the skier. That has a tendency to land you in trouble as it takes time to adjust to the new speed.

If you find your skier hurtling headlong into a pile of black logs press the action button and he

will leap over the heap.

An amusing game element occurs when a skier crashes. The game stops and two skid-cap bearers run through the trees onto the slope and cart off the injured skier.

Sliding was written by Centaursoft and runs on an Atari 800 and costs £19.95 from branches of Curry, Maplin Electronics and Cable Computers.



A CHALLENGE FOR SPACE CAPTAINS EARTH ATTACK

Can you pilot a spacecraft on a mission of destruction and return safely to base?

Microscopic Software have issued this challenge to all you space captains out there in the form of their new cassette Earth Attack.

You have to fly your fighter over a rugged terrain of mountains — dodging missiles fired from bases on the ground and bombing fuel dumps to ensure your supply is replenished during the mission. If the game sounds familiar that's because it's based on the arcade favourite Scramble.

It comes complete with sound effects and good graphics and runs on the Microtan 16 in 16K or 128K. It is available from Microscopic Software of Dulwich, London and costs £9.95.

Microscopic also have versions of Defender and a Pac-Man type game called Gobbles.

TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN

WHEN EAST AND WEST KEEP QUIET

BRIDGE

The most animated aspect of the card game bridge, is the post-mortem which follows a defeated contract.

But when the Atari TV games console becomes your partner the "How on Earth could you bid four spades with that hand" banter becomes a little one-sided.

Bridge has so far defeated the programmers' efforts to turn computers into club-level players, despite some imaginative attempts. The fact that the game is divided into the two distinct areas of bidding and playing, added to the problem that good bridge players usually combine educated guesswork with a fair amount of psychology, makes bridge a hard game to program.

Beginners and those who wish to rehearse bridge skills will find the cartridge useful. It plays seven levels of bridge. The first three are all bidded and played, the other four are just played. It uses the common, Alice bidding



system and deals out a hand of cards which is displayed on the screen for you, as seen by the South position player.

Your partner North and you are the only two players involved in the bidding — so a rather false picture of bidding systems is built up. East and West cannot double unlikely contracts or nullify you. All of which makes the playing of

the finesse (the winning out of a key card by devious means) very difficult to judge as there are few hints as to who holds the card.

At £24.95, the Activision cartridge only hints at the resources of this king of card games but it will teach beginners and help fair players sharpen their skills. It is marketed over here by Computer Games.

NOW DODGE THE GUIDED MISSILES

LASER ATTACK

You are in command of a space smelter flying on a suicide mission to a planet in the outer galaxy.

Your mission is to lead a squadron of jet fighters in an attack on the planet's surface. Enemy fire comes from laser cannons placed strategically on the planet. These fire radar-guided missiles which home in on your spacecraft.

There are only two enemy cannons to contend with in the first round of Laser Attack. There are only worth one point each.

You have an air fleet of four super-speedships and can change planes if one is shot down.

After the first two laser bases have been destroyed more appear on the screen. These are worth more points the further you progress through the game.

When the eighth cannon has been wiped out each one thereafter awards you 10 points.

To avoid the missiles you must fly your ship swiftly and accurately to confuse the projectile's computer-guided system. Your ships are controlled with the handsticks by moving the joystick to the left or right, and up and down.

To activate your own weapons push the red button on the hand-

set, but take care to aim and fire at the right moment.

Several variations are included in the game with varying degrees of difficulty. Game four only gives you one chance to blast a laser cannon. If you miss a missile will automatically lock on to your craft's position and destroy it.

Laser Attack runs on the Activision MPU2000 and costs £14.95 from stockists.

STAY OFF THE COMPUTER CAR'S TRACK

HEAD ON

Driving a high-powered Formula One racing car can be as heart-stopping as your television screen as it is in real life.

In Head On the screen is filled with the lanes of a race track which spread outwards from a central rectangle. The car under your control can quickly swerve to avoid a head-on crash with the computer-controlled opposition.

Your driver is luckier than his real-life counterpart. For in this drive with death he has three lives to play with, only the third collision is terminal.

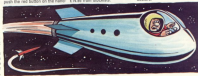
Using the handsticks you can regulate the speed of your car. By pushing the joystick to the right you increase the speed. To slow down move the joystick to the left.

The game comes complete with small cards which fit on top of the keyboard. These are used for directional control of the racing car.

On the bottom of the screen is a clock which keeps track of the number of miles your car has covered.

There are nine different variations including games for one or two players, a role reversal game in which you have to attempt to collide with the computer-controlled car, and a version when two cars are computer-controlled.

This game runs on the Activision MPU2000 and is available for £14.95 from all the usual ACE dealers.



S CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES VIDEO SCREEN



FIRST SEVEN SPELLS OF NEW ATARI MAGIC

Atari Leisure Group has tied up a deal to bring American cart-ridges to UK Atari WGS owners.

Video games designed and produced in the US Atari spin-off Imagic are available now. The firm was set up in America at the beginning of the year offering a range of seven games compatible with the Atari home games centre.

Each one has high quality graphics and some of the games are new in concept and very addictive.

Comic Arc is a space destruction game. The pilots of the Arc are entombed with the job of

bringing back creatures from distant planets in the galaxy. But the ship is under constant attack from numerous alien beasts.

As the Arc hovers above the surface of a planet, lighting off the attackers you must send a satellite ship with which to capture the creatures.

The planet is protected by a laser beam which will destroy the satellite craft if it flies into the path of the beam. Keep dodging the laser to catch the aliens.

The Arc weapon hits are in four positions, firing to left and right, up and down. With alien bombardment coming from all

sides you need to be digitally devious to escape and survive the onslaught.

Riddle of the Sphinx is an original scrolling game and a hard one to get the hang of. On the screen appear numerous palm trees interspersed with camels, pyramids and the occasional oasis.

You control a small man whose quest in life is to discover the middle of the Sphinx. He does this by picking up clues as he walks through the desert, and these are displayed along the bottom of the screen once he has collected them.

Your intrepid explorer needs water for his energy source. Having just quenched his thirst at an oasis he can bounce through the sands with a strong stride.

Gradually the heat of the desert overtakes him and his pace slows down, making him extremely vulnerable to hazards like scorpions which have a deadly sting in their tail.

An enemy force constantly harras the day traveller firing shots at him. The man is armed with a gun and you score points by helping him shoot any enemies that get in his way.

Other games in the Atari compatible range include space games like Games Attack, and Star Voyager, a Pin Fighter game in which you have to evacuate a rescue from a burning building.

There's a version of billiards called Trick Shot, and a sea battle adventure called Atlantis. The submerged city is battling a relentless enemy. Waves of flying boats batter the city's defences. You command three mobile installations and must track and destroy enemy ships.

Cartridges are expected to retail at two basic prices, £19.95 or £24.95. They will be available from electrical dealers, big stores and some toy shops.

Imagic also has a range of games packs which are compatible with the Matel Impulsion games centre.

As yet there are only available in America but in the future these cartridges will begin to filter through to UK retail outlets providing a high degree of competition for Matel and a wider variety of games for television games centre owners.

ALIENS OVER THE CITY SKYLINE

DEFENDER

Defender was the dedicated arcade player's game when the novelty of space invaders wore off and Asteroids had been conquered.

Both space invaders and asteroids converted well to the Atari T.R. Games Centre screen, although both lost some of the challenge of the arcade original.

Defender is the new game to make the transition with Atari continuing its successful policy of buying up the licence to produce the arcade money-spinners under their correct title.

Graphically, Defender is not as impressive as the original but it does capture a good deal more of the playability.

The controls are much more approachable with only a joystick and one fire button, compared to the twin buttons on the arcade machine.

The planet surface is replaced with a city skyline, behind which your craft can disconcertingly sink, making it difficult to judge your position on the screen.

The radar screen is still there, so are all the adversaries you will remember from the arcade, although they do look very different.

The humans are still to be found on the surface of the world and must be returned there if the aliens' landers capture them. And the ultimate weapon is still your smart bomb, which destroys every alien creature on the screen.

The attacks still come in waves and every attempt has been made to copy the original as closely as possible. What makes it more challenging than space invaders and asteroids is sheer difficulty. The aliens are very accurate with their bombs and quick to home in on you. They also rush in at you from off-screen positions making it hard to line up your shots.

Atari should have another winner on their hands at £29.95.

CHESS



I have talked about human world champions beating chess-playing programs. Now I would like to introduce the strongest chess program of all, BELLE which has beaten several top players.

BELLE is a special-purpose chess machine built by Ken Thompson of Bell Laboratories.

Its processing speed is so great that it can generate a candidate move in one two-millionth of a second and can examine 100,000 positions per second.

BELLE has a stored opening book of 200,000 positions which it scans in just one and a half seconds! It was built out of 1,700 chips in the Spring of 1986, won the World Computer Chess Championship a few months later and has since won a number of impressive games against players of up to senior master standard.

The human opponent for the game that follows was Hans Berliner, a strong U.S. master, who is also a former world champion for the correspondence chess.

Berliner has himself spent considerable time writing chess-playing programs and

was the originator of the phrase "the horizon effect" to describe the blindness experienced by any program at the limits of its analysis.

He is also the author of a celebrated Backgammon program which won a match against the reigning human world champion a few years ago.

Berliner's motivation for arranging a challenge game against BELLE was, in his own words, that: "I felt it may be getting to the time when I would have my last chance to beat the world's best mechanical chess entity, so I thought I'd better try to do it now."

"It would be foolish to play a normal game against BELLE. It was clearly better than I tactically, so I had to take advantage of its lack of knowledge in some way, while intending to avoid tactical complications if at all possible.

"My idea was to get it into an opening system in which I had private (unpublished) analysis, and hope to get an advantage that could hopefully be converted into a win at some future time."

restricts the Knights even further.

20. ... P-KN4; 21. P-B3, E-K2; 22. E-K1, P-K4. A temporary Pawn sacrifice aimed at getting his King into play. However, the King and Rook now become vulnerable to Knight forks.

Berliner comments: "I had done my calculations and everything seemed to be in order. But against a program that was by now probably looking at least nine ply deep, one mistake could prove fatal."

23. PaP, E-K3; 24. N-K5, E-K7, (1) 22 ... K-K7; 23. N-K4ch wins the Rook; 24. N-K3, KxP; 24. E-K1, E-K5, retreating, but also placing the King in a dangerously exposed position. 25. N-QB4, P-KN4; 26. E-Q3.

26. ... KxN (25) 27. PaP, E-Q6. More bold play by Berliner. He is now a Pawn for a Knight behind in material, but has a passed Pawn on the Queen side... a potential one-on-



Fig. 1. Position after Black's 15th move



Fig. 2. Position after White's 22nd move



Fig. 3. Position after White's 25th move



Fig. 4. Position after Black's 27th move

Berliner's obvious respect for his electronic opponent may seem excessive but it is justified by the game that follows.

BELLE (White) v R. Berliner (Black) — Alekhine's Defense?

1. P-B3, N-KB3; 2. P-K3, N-Q4; 3. P-Q4, P-Q3; 4. N-KB3, P-KB3; 5. P-Q4, N-K3; 6. PaP, BPxP; 7. B-K2, B-N2; 8. Q-Q, Q-Q; 9. B-K3, N-QB3; 10. N-QB3.

Up to here BELLE was "in the book" 15 ... P-Q4 (1), P-B3, N-K3; 12. BxN, PaP; 13. Q-K2, B-KB3; Threatening to take the Queen Pawn. 14. Q-B4, PaP; 15. BxN, BxP;

16. KxP Berliner considers this a subtle mistake. Apparently White wins two Knights for only Rook and Pawn. However, the variation favors Black who obtains much

better-placed pieces in the following end game. 16. ... QxP; 17. KxQ, BxQ; 18. N-Q4 x 3, Kx-Q11 Threatening to penetrate to the seventh rank. BELLE now defends well. 19. for example, 19. E-Q1, BxN; 20. N-K, E-QB1; wins a Pawn; 21. P-QB3, PaP; 22. PaP, B-Q; 23. P-KB4.

A good move which prevents Black chasing away White's Knight with a Pawn when it reaches the good defensive square of Q4.

21. ... N-QB7; 22. N-Q4, B-Q; 23. N-B3, B-Q; 24. N-QB3, P-QB3; 25. N-K3, B-QB7; 26. B-Q1, B-K1-Q2; 27. BxP, BxP; 28. P-KB3.

White is badly restricted. It was necessary to defend the King's Bishop's Pawns to avoid threats such as B-Q3 and B-QB3. Berliner now

the King side and a strong King position.

No comments. "Black has excellent winning chances." Of course, this largely depends on the player's ability. Against a lesser opponent than Berliner, BELLE might well go on to draw or even win.

28. N-KN1, P-KB3; 29. P-B3, E-K5; 30. B-K2, E-K7; 31. E-Q4, P-QB4.

Only now does a Black victory begin to seem likely to the untrained eye. Even so there are many difficult variations to consider, which space prevents me from including here. White's best chance now was probably 42. N-Q4. However, BELLE continued 42. E-Q3, P-K5; 43. N-Q4, P-B3; 44. E-K2, P-K7; 45. E-N2, P-KB3; 46. N-B3, PaP; 47. BxN.

BY MAX BRAMER

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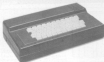
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The Wife's Tale

BY SUE GARDEN

"Disaster! I have been faulty plain by a wicked warlock!"

"You tormented the sixth Klingon. Now I must find a Starship. Heading 68 degrees warp factor eight."

Such are the remarks that flutter through our house, as husband, children, husband's friends, children's friends cluster around the 1980s equivalent of the old jukebox.

No more do the finishing verses herald a burst of "Love's Old Sweet Song", nor even a lusty chorus of "Roll Out the Barrel". These days the keys are pressed to cries of "Puke the Rom", (the modern version of "Pin the Tail on the Donkey"), "Get It String" (nothing to do with strip poker) or, more enigmatically, F2 QD 8C.

The computer, it seems, is the latest in man's compulsion of hobbies to lure him from the real world. "At last," declared my galling widow friend, "your husband does not disappear for hours on end every weekend. You know where he is."

Physically, I cannot deny, there is a figure hunched instantly in a corner of the room. The cups of coffee, carefully positioned, are retrieved, empty, after a lapse of time. At mealtimes, the figure is there — well, eventually — and gives every appearance of eating according to convention.

Con conversationally, it is another question. Casual remarks are met with a dreamy, vacant look and blazes of repelment.

"More mised, dear?" I ask. "I saved 500 bytes." comes the reply. At what cost to the digestion, one wonders?

"The sink is still blocked," "... then it might crash" Surely it cannot be that serious?

"I see the grass has grown



I see the grass has grown, I said. "Maybe I could eat an it," he replied. With a phaser operated lawn mower, I suppose.

again. "I could test Del it." With a phaser-operated lawn-mower, I presume.

How insignificant the minutes of everyday life must appear, to one who has just been riding the world before that, he saved the known universe from extinction by an alien force, then traded intergalactically in medical supplies and machinery. Why is this magic not the same in a trip to the chemist for soda, or to the hardware shop for a spare part for the lawn-mower?

I was engaged in conversation recently with a plumber who had come to mend a leak in the water-tank. ("A drip? Good grief, woman, I'm sure he's just wiped out two-thirds of the population.") Spying on the computer, he expounded on its mysterious allure. The aggregation of most games appears to man's violent nature. He can sublimate, electrotonically, instead of beating the wife. They don't make plumbers like they used to.

Had I realized that my husband could be run by computer, he required. It would put an end to the heating, the oven, the electric blanket. Do the shopping, cook the meal, wash the shirts, scrub the

floors? My interest was roused. Well, no, not yet, they were working on it.

As the programmers tend to be men, obviously they go first for the fireman jobs around the house (i.e. putting on switches), leaving the smaller tasks to a later stage of development.

In the States, there is a recognized breed of computer widows. A computer can be cruel for divorce. Neglect? Desertion? Adultery? I have had my doubts about that BASIC tape.

The bookcase groans with a new range of reading matter. *Software Secrets*, *murders and more*, beguilingly, 1001 things to do with your *Personal Computer* volunteers another. Odd that it does not mention the half a dozen which spring instantly to mind.

"If you can't beat them, join them", says the old piece of advice. Imagine the scenes of violence if we were both jaxing for the eight-hour slot on a Saturday.

Anyways, dinner is ready. "Won't be a moment, I'll just program it to play itself at chess while we eat." Well, that's fun for it! Imagine the surge of triumph in its steely breast when it wins.

Come to think of it, I wonder whether the cunning beast is gradually eliminating the human element altogether. It settled out the world, all by itself, for four hours the other evening. End of human life in 2030. It was fed with more information. We watched, helplessly, for another four hours. End of human life in 2030.

My football widow neighbor knocks on the door. "Fancy a trip into town?"

"Well I would, but I shall have to make tea in a minute." The spotless tones of "So long, it's been good to know you" came clanging into the kitchen. "That means the SS Enterprise has collided with a star. I must put the kettle on quickly, before he boldly goes anywhere else."

She looks baffled. What a simple life she leads! She knows her husband is running round a muddy field, in bitter cold and shorts, chasing a piece of leather.

Mine, on the other hand, he's tapped five alien spacehips and failed, on a slight navigational error, to repel a galactic invasion.

It makes you sort of proud doesn't it?

ILLUSTRATION BY TERRY DOUGLAS

ARCADE

The 3-D space fortress

ZAXXON

The deep blue fortress of Zaxxon floats in space at the frontier of a third dimension in arcade games.

It is heavily armed with missiles, cannons and forcefields and your mission is to fly through its defenses to destroy the deadly robot and its homing missile.

Over the wall and the enemy fortress is mapped out in marvelous detail before you. One hand on the joystick and the other on the fire button you can set the ranks of missiles, the green cannons and red fuel tanks. Planes are waiting on the runways for extra points while blown-up fuel tanks provide extra fuel as you fly deeper into the fortress.

The control stick allows you to bank left and right and change altitude. You can judge your height by the size of the player ship, which appears larger or smaller, depending on altitude. And there is also a shadow which follows its every move.

Altitude is critical when you fly through the tiny gaps between the walls and the electronic barrier. If you survive the enemy barrage in the fortress, you next have to take on the enemy fleet.



It's made more realistic as you have to be at the correct altitude to score a hit on the enemy planes. Once through the daylight, you are involved in a new battle at the enemy headquarters. This is a better defended fortress with tighter passages and increasingly heavy firepower.

The climax of Zaxxon is the battle with the Jansquard robot and its homing missile. Here six hits are needed before the missile and robot are vanquished.

THE GAME WITH MORE ZIP

For a game with a little more 'zip' to it, try the new Pepper II (Pepper).

The main character in Pepper II is an angel but he is occasionally prone to complete a Dr. Jekyll and Mr. Hyde transformation into a devil.

Pepper is his name and he spends his time exploring four

NOT TO BE MISSED

TIPS ON MISSILE COMMAND

Missile Command was the first arcade game to introduce a combination of realism to video warfare.

Based around an anti-ballistic missile (A.B.M.) conflict over a number of cities, which have to be protected from bombardment, it recreates some of the horrors of a nuclear war.

It also offers such a rush of action that it can be confusing for the casual watcher. The first thing the beginner must learn is not to aim his missile sight to cross on the screen which guides the warheads directly on the descending missiles. This is because missiles have to be fired from ground to air and in the split second that takes, the enemy warhead will have already penetrated through the area of explosion.

Instead, fire just below the incoming missiles and they will

be detonated by entering the area of explosion. Also remember that missiles from your centre base travel faster — than those from the right and left bases.

The most important tactic is the scatter. Done right at the beginning of the screen when missiles are first coming down, a good scatter will halt the deadly rain of missiles, hold-up the 'smart' bombs and destroy the first satellites. Use the right or left base to scatter a chain of cross marks two-thirds of the way up the screen.

This will produce a curtain of explosions which takes the initial sting out of the enemy attack.

Leave one or two missiles in the base used to scatter, as these must be saved for the satellites which come out from either edge of the screen.

Scatterers must be hit before they reach the middle of the screen or they will unleash a further deadly rain of missiles.

Save the centre base's missiles for warheads which have penetrated your first lines of defence. These are also useful when you have reached a score over a million. Then 14 or more smart bombs can appear on the screen. Smart bombs will follow over explosions and then continue their descent when they feel it is safe. These can only be destroyed by a direct hit, usually from the faster centre base.

On most machines, bonus ideas are awarded every 10,000 points and a maximum of three can be destroyed on any one screen. If one city is left, a good strategy is to finish the screen and under your next bonus score, say 40,000. This means that in the next screen you will only need to score a 1,000 to earn your next bonus city.

Queen Lane from Nottingham, who provided us with these tips and has a high score of over 12 million in eight hours, also pointed out a common bug on the Missile Command game. When a score of 808,080 points is reached, many machines award over 80 bonus cities — this is the time to go to the loo.

PEPPER II

sections of the screen, searching for secret areas. As he travels he leaves a zipper-like track behind him. As in the game On, once a complete area has been surrounded by these tracks, it is filled by a brightly coloured pattern and points are awarded.

As he roams around the screen, Pepper must take care to avoid the two villains of the piece, the roaming eyes and the deadly whippennapper.

The whippennapper is a bright crimson enemy who will strip any of Pepper's tracks which do not fully enclose an area. When Pepper manages to surround an area which contains a pitfall, he turns into a devil for a few seconds (reminiscent of Pinman).

While in his Mr. Hyde form he can capture the roaming eyes for extra points but still cannot bring the whippennapper to heel.

As in Pinman, Pepper II just has the one control, a joystick, which adds to the playability but does not detract from the excitement.



ACTION

NO SITTING ON THE DOCK OF THIS BAY

PORTMAN

There's no time to sit back and take a tea-break in the dockyards of the game Portman.

In this visual game, you take the part of an overworked dockster charged with the task of loading a ship which is just about to leave dock.

But you can't expect life to be too easy in arcade games and the Portman docks are played by a team of saboteurs who are out to disrupt the work as much as possible.

The ship's captain is also determined to make things difficult and he keeps his ship chugging backwards and forwards at the dock. The cargo is stored at the top of the screen and drops randomly downwards. Your dockster must chase after descending cargo and catch it — some pieces of cargo can only be caught on the first bounce.

A CUTE AQUATIC FAIRY TALE

DEVIL FISH

An aquatic maze made up of gemstones seaweed and coral reef is the setting for Devil Fish.

The story behind the game reads like the wildest fairy tale:

Deep in the sea garden there was once a happy group of aquatic creatures. But one day a school of ferocious Devil Fish broke up their peace and occupied the sea garden.

The angry King of the Sea spotted the brown Sea Dog to conquer the Devil Fish and make the sea garden a happy place again where honest aquatic creatures could swim in safety....

This scenario places Devil Fish firmly in arcade games "cute" category but it still offers a good twist to the familiar Pacman theme.

The strange sea mazes are made up of regular width passages but with obstacles on their

tracks also travel the quayside and if an item of cargo hits the truck it will cause it to flip in the same position for a few seconds obstructing your freedom of movement on the dock.

Once all the cargo is successfully loaded onto the boat between four pillars, the game moves into its second phase. In this, conveyor belts travel across the screen loaded with boxes of dynamite. The saboteurs use the conveyor belts to try and kick the boxes down onto the quayside before you are ready to catch them.

You are armed with stones which you can hurl at the saboteurs and throw up to demolish boxes of dynamite when you feel ready to catch them. If you miss a box, it will blow away a section of the floor and soon make the dockyard disintegrate.

Once through this section of the game, you are returned to the first phase, except that it becomes increasingly difficult as the game goes on.

Three lives to play with but the action really ought to do something about the working conditions.



water which restrict the size of creatures which can pass through them.

The Sea Dog of the saga is represented on the screen by a fishy face and the Devil Fish are small blue octopus-like creatures. These grow progressively larger as the Sea Dog feeds them up with bait. Eventually they get too large to pass by certain of the passage mazes, and when they are stuck, Sea Dog goes back and attacks them.

When he successfully disposes of the first batch of Devil Fish, a more complicated maze features on the screen as the game gets progressively harder.

IS IT A PINTABLE?



Look, up there in the arcade. Is it a pinball or is it a video machine? No... it's a mixture of both!

Bally's latest mechanical fantasy includes features seen on both the screens and playfields of your local arcade.

Like pinball it features drop targets and bonus scores. Like video games it employs laser starters, alien creatures and touchy force field.

Rapid Fire — that's the name Bally have given to this hybrid creation — comes in a pinball style cabinet and has a pinball style 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 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997, 998, 999, 1000.

The first thing the player will notice when he steps up to the machine are the two pistol-like grips — which control the action — at the front of the machine. With these you fire the projectiles and defend yourself with the force field buttons.

The grips direct the angle of fire from the four inch "gun" barrel at the base of the machine. Out of this barrel bursts the small metal balls which the player has to aim at targets at the back of the playfield.

The playfield itself is a flat surface covered with spear-warding alien figures in the centre which light up as the game progresses. Down each side are ramped space lanes — ready to blast the unwary player!

The aim of the game is to hit the drop targets so that letters spelling out the word R-A-P-I-D-F-I-R-E are lit up. This puts the machine into rapid fire mode — and you can blast away at the space lanes and alien at a rate of 480 balls per minute!

The alien, send out blasts of fire which you have to fend off using your force field.

Also featured on the machine are a laser Master button which you can use to help boost your score — and in real moments of stress when everything seems to be firing at you all once you can hit the panic button which brings about your salvation. But you can only use it a limited number of times.

Rapid Fire may not be a favourite with serious pinball players but it certainly offers a new challenge to all arcade addicts everywhere.



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Statements 10-600 set up the arrays describing the rooms and their contents. 600-700 ties the subroutines together. 1000 handles the keyboard entry. 2000 lists what you are carrying. 3000 decodes verbs and generates the associated messages.

The author reckons the strength of his program lies in its flexibility. Any room names, object names and room contents can be changed simply by altering the statements assigning the string contents. The vocabulary will alter accordingly. The interaction between the room contents can similarly be altered and does not depend on the names contained in the arrays. Thus the body of the program can handle any number of rooms, with any interconnection, without alteration.



RUNS ON AN ACORN ATOM IN 12K

BY ALEC PEARSON

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5300 Goto 5311
5310 UNTIL C71=471 OR 5311
5320 IF 5311 P, "THE '88' IS NOT IN HERE!" P,
5330 IF C71=108 P, "YOU MUST BE LUCKY!" P,
5340 IF C71=5 C72=C71+5, 5370
5370 IF C71=5 C72=C71+5, 5375
5380 IF C71=5 C73=C71+5, 5375
5390 P, "YOU HAVE THREE ITEMS ALREADY!" P,
5395 A71=ADD(SEE C71)=84 P, "YOU'RE OUT IT!" P,
5400 IF 70=5 G, 5500
5410 108, 809 LEAVE
5420 Goto 5311
5430 UNTIL C71=44 OR 5411
5440 IF 5411 P, "THERE'S NO SPACE IN HERE TO LEAVE THAT!" P,
5450 IF C71=C72 C73=5, 5470
5460 IF C71=C72 C73=5, 5470
5470 IF C71=C72 C73=5, 5470
5480 P, "YOU DON'T HAVE THE '88'!" P,
5490 IF 70=5 A71=C71+SEE C71=44 P, "NO!" P,
5500 G,
5510 IF 70=4 G, 5500
5520 IF C71=C72 OR C71=C73 OR C71=C74 G, 5530
5530 P, "YOU DON'T HAVE THAT!" P,
5540 IF C71=6 P, "THERE'S NOTHING HERE, DON'T WASTE IT!" P,
5550 G=SEE C71
5560 IF C71=108 AND C71=44 P, "THAT'S SATISFIED THE GOD!" G, 5400
5565 IF C71=108 AND C71=44 P, "THE GODS HAVE PLEDGED!" G, 5400
5570 IF C71=111 AND C71=112 P, "THE GODS UNLOCKED THE!" G, 5400
5575 IF C71=110 P, "NO '88' DON'T SCARE A GOD!" P,
5580 P, "THE '88' HAS NO EFFECT, I SHOULD KEEP IT!" P,
5590 G,
5600 Goto 5311
5610 UNTIL C71=44 OR 5611
5620 IF C71=110 A71=C71
5630 A71=ADD(SEE C71)=44 G, 5670
5640 IF 70=5 AND C71=110 P, "YOU CAN'T EXERCISE A '88' IT!" P,
5650 IF C71=110 P, "THERE'S THE GOD!" P,
5660 IF C71=108 OR C71=109 OR C71=100 G, 5680
5670 G, 5680
5680 IF C71=108 OR C71=109 OR C71=100 G, 5680
5690 G, 5680
5700 IF C71=108 OR C71=109 OR C71=100 G=SEE C71 P, 5670
5710 G, 5680
5720 P, "YOU DID IT, IT'S SATISFIED!" A71=44, SEE C71=44 G,
5730 P, "YOU DON'T HAVE THE NECESSARY ITEMS!" P,
5740 A71=ADD(SEE C71)=108 GOTO 5311
5750 G,
5760 Goto 5311
5770 UNTIL C71=44 OR 5711
5780 IF 5711 G,
5790 P, "IN HERE THERE'S "
5800 IF A71=5 P, "88" A71=5+1
5810 IF A71=6 P, "88" A71=6+1
5820 IF A71=7 P, "88" A71=7+1
5830 IF A71=8 P, "88" A71=8+1
5840 IF A71=9 P, "88" A71=9+1
5850 IF A71=10 P, "88" A71=10+1
5860 G,

```

BREAKOUT

Here's a knock-out game for all you BBC micro owners. There's a pretty red and yellow wall at the top of the screen which Mr Ward invites you to lay waste in the traditional time honoured fashion. Using a bat moved from side to side by the X and Y keys. There's a supply of three balls served by the space bar.

The ball speeds up when it hits a red brick and leaves the bat at a somewhat random angle, defying the laws of physics in a careless manner. Once a complete wall has been demolished a new one appears — allowing seasoned veterans of the game to build up impressive totals on the high score display.

You can make a couple of alterations to the program if you wish. The sound effects can be improved by changing the final parameter on each SOUND call to 5. For more advanced BBC owners a further improvement could be made by using the FX commands to change the responsiveness of the keyboard.

RINGS ON A BBC IN 12K

BY NICK WARD

```
500 IFY=640 RND YC751 Y=645 T=10
510 IFY=650 RND YC751 Y=704 T=20 WWH=1
520 IFY=749 Y=Y52 T=30 WWH=1
530 MOVE Y:MOVE (Y+51):PLOT87,(E+60),(Y+51)
540 IFZ=1 Y=Y+52 G=641
550 REM INCREASE SCORE AND INCREASE SPEED OF BALL IF BALL HITS RED BRICKS
560 G=641 WWH=1:IFZ=1 R=F*1.3 G=641.3
570 PROCSCORE
575 ENDPROC
579 REM PLOT WALL (BY COLOURING IN FOUR TRIANGLES) :
580 GCOL:1:MOVE:600 MOVE:1270:600 PLOT85:5:700 PLOT85:1270:700 GCOL:2:PLOT85:
580 PLOT85:1270:600 RETURN
```



```

10 REM *** BREAKOUT *** WPA ***
20 H=0:Z=1
30 MODE=PRINT:TRAB(143)="BREAKOUT":TRAB(143)=TRAB(143):TRAB(143)="CONTROLS"
LEFT",Z":TRAB(143)=TRAB(143):TRAB(143)=TRAB(143):TRAB(143)="HIGH SCORE":TRAB(143)=
40 PRINT TRAB(43):PRESS SPACE BAR TO CONTINUE"
50 REM GETS [PROMPT] "GOTO20 ELSE B=3"
60 REM SET UP SCREENS
70 REM MODES-COLOUR:1-F=1:G=1:G=2:G=3:G=4:G=5:G=6:G=7:G=8:G=9:G=10:G=11:G=12:G=13:G=14:G=15:G=16:G=17:G=18:G=19:G=20:G=21:G=22:G=23:G=24:G=25:G=26:G=27:G=28:G=29:G=30:G=31:G=32:G=33:G=34:G=35:G=36:G=37:G=38:G=39:G=40:G=41:G=42:G=43:G=44:G=45:G=46:G=47:G=48:G=49:G=50:G=51:G=52:G=53:G=54:G=55:G=56:G=57:G=58:G=59:G=60:G=61:G=62:G=63:G=64:G=65:G=66:G=67:G=68:G=69:G=70:G=71:G=72:G=73:G=74:G=75:G=76:G=77:G=78:G=79:G=80:G=81:G=82:G=83:G=84:G=85:G=86:G=87:G=88:G=89:G=90:G=91:G=92:G=93:G=94:G=95:G=96:G=97:G=98:G=99:G=100:G=101:G=102:G=103:G=104:G=105:G=106:G=107:G=108:G=109:G=110:G=111:G=112:G=113:G=114:G=115:G=116:G=117:G=118:G=119:G=120:G=121:G=122:G=123:G=124:G=125:G=126:G=127:G=128:G=129:G=130:G=131:G=132:G=133:G=134:G=135:G=136:G=137:G=138:G=139:G=140:G=141:G=142:G=143:G=144:G=145:G=146:G=147:G=148:G=149:G=150:G=151:G=152:G=153:G=154:G=155:G=156:G=157:G=158:G=159:G=160:G=161:G=162:G=163:G=164:G=165:G=166:G=167:G=168:G=169:G=170:G=171:G=172:G=173:G=174:G=175:G=176:G=177:G=178:G=179:G=180:G=181:G=182:G=183:G=184:G=185:G=186:G=187:G=188:G=189:G=190:G=191:G=192:G=193:G=194:G=195:G=196:G=197:G=198:G=199:G=200:G=201:G=202:G=203:G=204:G=205:G=206:G=207:G=208:G=209:G=210:G=211:G=212:G=213:G=214:G=215:G=216:G=217:G=218:G=219:G=220:G=221:G=222:G=223:G=224:G=225:G=226:G=227:G=228:G=229:G=230:G=231:G=232:G=233:G=234:G=235:G=236:G=237:G=238:G=239:G=240:G=241:G=242:G=243:G=244:G=245:G=246:G=247:G=248:G=249:G=250:G=251:G=252:G=253:G=254:G=255:G=256:G=257:G=258:G=259:G=260:G=261:G=262:G=263:G=264:G=265:G=266:G=267:G=268:G=269:G=270:G=271:G=272:G=273:G=274:G=275:G=276:G=277:G=278:G=279:G=280:G=281:G=282:G=283:G=284:G=285:G=286:G=287:G=288:G=289:G=290:G=291:G=292:G=293:G=294:G=295:G=296:G=297:G=298:G=299:G=300:G=301:G=302:G=303:G=304:G=305:G=306:G=307:G=308:G=309:G=310:G=311:G=312:G=313:G=314:G=315:G=316:G=317:G=318:G=319:G=320:G=321:G=322:G=323:G=324:G=325:G=326:G=327:G=328:G=329:G=330:G=331:G=332:G=333:G=334:G=335:G=336:G=337:G=338:G=339:G=340:G=341:G=342:G=343:G=344:G=345:G=346:G=347:G=348:G=349:G=350:G=351:G=352:G=353:G=354:G=355:G=356:G=357:G=358:G=359:G=360:G=361:G=362:G=363:G=364:G=365:G=366:G=367:G=368:G=369:G=370:G=371:G=372:G=373:G=374:G=375:G=376:G=377:G=378:G=379:G=380:G=381:G=382:G=383:G=384:G=385:G=386:G=387:G=388:G=389:G=390:G=391:G=392:G=393:G=394:G=395:G=396:G=397:G=398:G=399:G=400:G=401:G=402:G=403:G=404:G=405:G=406:G=407:G=408:G=409:G=410:G=411:G=412:G=413:G=414:G=415:G=416:G=417:G=418:G=419:G=420:G=421:G=422:G=423:G=424:G=425:G=426:G=427:G=428:G=429:G=430:G=431:G=432:G=433:G=434:G=435:G=436:G=437:G=438:G=439:G=440:G=441:G=442:G=443:G=444:G=445:G=446:G=447:G=448:G=449:G=450:G=451:G=452:G=453:G=454:G=455:G=456:G=457:G=458:G=459:G=460:G=461:G=462:G=463:G=464:G=465:G=466:G=467:G=468:G=469:G=470:G=471:G=472:G=473:G=474:G=475:G=476:G=477:G=478:G=479:G=480:G=481:G=482:G=483:G=484:G=485:G=486:G=487:G=488:G=489:G=490:G=491:G=492:G=493:G=494:G=495:G=496:G=497:G=498:G=499:G=500:G=501:G=502:G=503:G=504:G=505:G=506:G=507:G=508:G=509:G=510:G=511:G=512:G=513:G=514:G=515:G=516:G=517:G=518:G=519:G=520:G=521:G=522:G=523:G=524:G=525:G=526:G=527:G=528:G=529:G=530:G=531:G=532:G=533:G=534:G=535:G=536:G=537:G=538:G=539:G=540:G=541:G=542:G=543:G=544:G=545:G=546:G=547:G=548:G=549:G=550:G=551:G=552:G=553:G=554:G=555:G=556:G=557:G=558:G=559:G=560:G=561:G=562:G=563:G=564:G=565:G=566:G=567:G=568:G=569:G=570:G=571:G=572:G=573:G=574:G=575:G=576:G=577:G=578:G=579:G=580:G=581:G=582:G=583:G=584:G=585:G=586:G=587:G=588:G=589:G=590:G=591:G=592:G=593:G=594:G=595:G=596:G=597:G=598:G=599:G=600:G=601:G=602:G=603:G=604:G=605:G=606:G=607:G=608:G=609:G=610:G=611:G=612:G=613:G=614:G=615:G=616:G=617:G=618:G=619:G=620:G=621:G=622:G=623:G=624:G=625:G=626:G=627:G=628:G=629:G=630:G=631:G=632:G=633:G=634:G=635:G=636:G=637:G=638:G=639:G=640:G=641:G=642:G=643:G=644:G=645:G=646:G=647:G=648:G=649:G=650:G=651:G=652:G=653:G=654:G=655:G=656:G=657:G=658:G=659:G=660:G=661:G=662:G=663:G=664:G=665:G=666:G=667:G=668:G=669:G=670:G=671:G=67
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High quality, compact, fully integrated circuit board, wider range and full integrated computer (including 6502 microprocessor, 16K RAM, and a 6502 timer). It is ideal for your program. It has a 6502 timer and a 6502 timer. It is ideal for your program. It has a 6502 timer and a 6502 timer.

Kit costs £19.95 - plus £2.00 p.p. and £1.00

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FUR TRADER

A lot of you young whippersnappers have been asking me just what it was like chasing little furry animals around for their valuable skins. Well now you can relive those bygone days from the comfortable surroundings of your C300.

Among the many strange creatures you'll come across out in that desolate wasteland, are coyotes, rabbits and coppers. There is also the little known haggis, a wondrous beastie, whose fur commands some of the best rates — it was the best the trader up in price, that is!

You have to collect as many furs as you can and get them to the trading post. But you must take into account your supplies of food and water — and if you are getting enough sleep. Otherwise you could get into big trouble! The instructions are included in the program. Good luck and good hunting!

REFERENCES

[illegible][illegible]

```

400 PRINT
410 PRINT " (1) LOOK FOR TRADING
420 PRINT
430 PRINT " (2) GO TO BED "
440 PRINT " (3) EAT/DRINK FOOD A
450 PRINT " (4) FOOD/HUNGER/REST
460 PRINT
470 PRINT " (5) SEE GOING EXCHAN
480 PRINT " (6) MAKE A DEAL "
490 PRINT " (7) WHAT IS YOUR
500 PRINT " COMMAND "
510 INPUT A
520 IF INT A/10 OR A/1 OR A/5 T
530 GOTO 1000
540 IF NOT A AND A/10 THEN GOTO
550
560 IF A=5 AND ERU=5 THEN GOTO
570
580 CLS
590 GOTO A/1000
600 IF INT (1000+10)+1/10 THEN
610 GOTO 1000
620 PRINT " (8) CONGRATULATED
630 YOU HAVE FOUND A TRE
640 PRINT
650 LET A=INT (500+50+1
660 PRINT " (9)
670 IF A=1 THEN LET F=F+1
680 IF A=2 THEN PRINT "YOU ALSO
690 WISHED TO RECALL YOUR
700 PRINT " FORTUNE "
710 PRINT " (10)
720 PRINT " (11) SEE LUCK.YO
730 PRINT " (12) NOT MANAGE TO FIND A TRE
740 PRINT " (13)

```


COUNTRYSIDE PACKMAN

You are a Rabbit in one of 7 million underground mazes. You must collect your carrots from the farmer's field before the pole cats collect you. Superb, high-resolution graphics. Machine code and basic. £7.00 incl.

MISSILE COMMANDER

New York is about to be obliterated by incoming ICBM's. You must direct your Nuclear anti-missile missiles to destroy them before they wipe out the city. Classic arcade game. Colour & Sound effects are brilliant. £7.00 incl.

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Your roving tank moves around the battlefield destroying enemy mines and installations. This game needs the quickest reflexes of all BBC games available so far. Uses machine code. £5.00 incl.

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PLEASE SEND ME:

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They said it couldn't be done!

Galactic FIREBIRD

Those ever circling, swooping, diving Firebirds of the famous arcade machines, brought to the micro in Mike Chalk's ultimate achievement—Galactic Firebird.

Yes, it's the latest in the Kansas Arcade series, but plus, his best. For Mike has been pulling these right back from the original Arcade boards, and feels he wants a rest.

The reason being that he has always bothered his preceding program, and feels that with Firebird he has reached a pinnacle.

Many programmers of many machines have tried to emulate the arcade game, Firebird, but nobody, the Americans included, have managed to get the circling, swooping Firebirds on a computer. Until now!

It is incredible how the Firebirds just seem to circle around in numerous positions on the screen, then suddenly swoop in to attack, all the while raising down their bodies.

Even if you manage to dodge all their bombs whilst shooting them down, it is as though they realise they will not get you this way, for without warning they'll take Kansas's action and come straight for you!

Then come the Astro Blasters, shooting down a solid orange ball, to try you completely, in addition to their own brand of super bombs. Oh, you can fire at them, but a solitary hit will have no effect whatsoever on these monsters.

As though Firebirds and Astro Blasters are not enough, as the game progresses, come the Mega Bombs. With no time then does this needed to destroy! And you can't dodge them easily either, as their explosion spread.

Stores are kept of course, and there is the now expected realistic sound effects. And—wait for it—it progresses to FOURTEEN levels of difficulty! Mike's last words: "Nobody will ever get there!"

It's ONLY available direct from Kansas but at a sensible £9.50 Vet and post paid

Kansas

Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, S44 5XJ, Tel. 0346 850057



For TANDY TRS-80 & VIDEO GENIE


```

5100 PRINT AT 0.25/H;" -
5110 LET CP=CP/2
5120 PRINT AT 15.5;HF;" -
5130 LET T=0
5140 LET FOO=0
5150 GOTO 17
5160 CLR
5170 LET D=D-1
5180 LET H=H-1
5190 IF H=0 THEN GOTO 5200
5200 IF D=0 THEN GOTO 5200
5210 IF INT (HND*100)/10 THEN GOT
5220 T=T+1
5230 LET HF=HF-INT (HND*HF/20)
5240 LET CP=CP-INT (HND*CP/20)
5250 LET DP=DP-INT (HND*DP/20)
5260 LET FOO=FOO-INT (HND*FOO/20)
5270 PRINT AT 0.5;" SOME BODDED
5280 HAVE JUST BOGGED YOUR PACK FOR
5290 50% OF SOME OF YOUR
5295 FURS
5300 PAUSE 300
5310 CLR
5320 IF INT (HND*100)/10 THEN GOT
5330 T=T+1
5340 LET H=H-INT (HND*H/20)
5350 PRINT AT 0.5;" SOME BODDED
5360 HAVE JUST BOGGED YOUR PACK FOR
5370 50% OF SOME OF YOUR
5375 FURS
5380 PAUSE 300
5390 CLR
5400 PRINT "YOU DIED DUE TO A LA
5410 CK OF REST."
5420 GOTO 5000
5430 PRINT "BAD LUCK.YOU STARVED
5440 TO DEATH."
5450 GOTO 5000
5460 PRINT "YOU HAD ".F." BACK-H
5470 ORSES OF FOOD AND WATER LEFT
5480 PRINT "T.O YOU COULD HAVE SURVIV
5490 ED ".D." DAYS WITHOUT REST."
5500 PRINT "YOU COULD HAVE SURVIV
5510 ED ".H." DAYS WITHOUT FOOD/WATER
5520 PRINT "IN YOUR WILL,YOU LEF
5530 T."
5540 LET H=H-INT(HF*HF)
5550 LET H=H-INT(CP*CP)
5560 LET H=H-INT(DP*DP)
5570 LET H=H-INT(FOO*FOO)
5580 PRINT "A TOTAL OF E".H;" HE
5590 T."
5600 PRINT " ".HF;" HAGGIS FURS
5610 PRINT " ".CP;" COYOTE FURS
5620 PRINT " ".DP;" OCELOT FURS
5630 PRINT " ".FOO;" RABBIT FURS
5640 PRINT "A TOTAL OF E".H;" HE
5650 T."
5660 PAUSE 3000
5670 GOTO 7
5680 PRINT AT 17.5;" YOU HAVE
5690 A TOTAL OF E".H;" HE
5700 T."
5710 PAUSE 300
5720 GOTO 5
5730 PRINT AT 17.5;" YOU HAVE
5740 A TOTAL OF E".H;" HE
5750 T."
5760 PAUSE 300
5770 GOTO 5
5780 PRINT AT 17.5;" YOU HAVE
5790 A TOTAL OF E".H;" HE
5800 T."
5810 GOTO 5

```

YOUR COMMANDS ARE :

- (1) LOOK FOR TRADING POST.
- (2) GO TO BED.
- (3) GET SOME FOOD AND WATER.
- (4) FOO,HUNGER/REST/STORES CH.

COMMANDS AT TRADING POST ONLY.

- (5) SEE GOING EXCHANGE RATE.
- (6) MAKE A DEAL.

WHAT IS YOUR COMMAND ?

FOOD / HUNGER / REST / STORES CH.

YOU HAVE 5 HAGGIS FURS.

YOU HAVE 50 COYOTE FURS.

YOU HAVE 100 OCELOT FURS.

YOU HAVE 300 RABBIT FURS.

YOU CAN SURVIVE 5 COMMANDS WITH
OUT ANY FOOD.

YOU HAVE 5 BACK-HORSES OF FOOD A
ND WATER.

YOU CAN SURVIVE 5 COMMANDS WITH
OUT ANY REST.

YOU NOW HAVE 5100

EXCHANGE RATE.

HAGGIS FUR = 0.04

COYOTE FUR = 0.10

OCELOT FUR = 0.15

RABBIT FUR = 0.7

YOU NOW HAVE A TOTAL OF 5100

YOU HAVE 5 HAGGIS FURS

YOU HAVE 50 COYOTE FURS

YOU HAVE 100 OCELOT FURS

YOU HAVE 300 RABBIT FURS

HOW MANY HAGGIS FURS WOULD YOU
LIKE TO SELL ?

YOU DIED DUE TO A LACK OF REST.

YOU HAD 5 BACK-HORSES OF FOOD AN
D WATER LEFT

YOU COULD HAVE SURVIVED -1 DAYS
WITHOUT REST

YOU COULD HAVE SURVIVED 5 DAYS W
ITHOUT FOOD/WATER

IN YOUR WILL,YOU LEFT :

A TOTAL OF 5007 NET.

(5 HAGGIS FURS)

(50 COYOTE FURS)

(100 OCELOT FURS)

(300 RABBIT FURS)



MARTIAN EXPLORER

Here's your chance to boldly go where no game player has gone before — deep into the mysterious ravens of the red planet Mars.

By your spacecraft through the network of weird and wonderful underground caves and tunnels — but remember you could run out of fuel, luckily for you previous Martian explorers have left fuel dumps which you can use — if you can land safely among the rocks (aren't they).

The landing pad is colored light green and is located on the right hand side of your screen. Once down safely your ship will be refueled and the next cavern will appear. Points are awarded for a safe landing — based on the difficulty level and the amount of fuel you have left.

You have a display which tells you your speed and fuel the amount of fuel in your ship's tanks. If you come into land at a speed greater than 10 units you will crash. And of course you have to avoid contact with the cavern walls during your flight. You get five ships per game.

To get the action underway all you have to do is press the red button on your joystick. This ignites your ship's engines. Gravity is simulated in this program so when you release the button your craft slows down — and will gradually start to fall downwards at a gradually increasing speed.

No error loops have been included to cover the accidental flight of a spaceship off the corner and off the screen and if this happens an error message will arise. So you should take care not to send your craft off the screen in this way.

It is important that lines 4038 and 4140 are fed in exactly as indicated otherwise the fuel and speed indicators will appear in the wrong position relative to the data.

Variables

- V2: Cavern level.
- CM: Number of spaceship in action.
- V: vertical speed of ship.
- H1, H2: in combination determine the horizontal speed of the ship.
- L: Flag indicating collision of ship with cavern walls.
- DIR, YMS: Horizontal and vertical position of fuel indicator.
- DIR, VMS: Horizontal and vertical position of speed indicator.
- H3, V3: Horizontal and vertical position of spaceship.
- SC: score.
- F3: Rate of fuel consumption.

```

10 OPEN "814.0:"R1"
20 PRINT#0:54275:PRINT#0:5403:SETCOLOR=555
30 HITCLR=53274:HPFR=53252:HPHCLR=53277
40 HPDPR=53244:HPFR=53252:HPDPR=5324
50 HPDPR=53252
50 PCOLR0=164:PCOLR1=785
70 DATA 164,164,164,133,285,164,164,133,
285,164,1,164,8,133,284,133,284,177,284,
136,145,284,288,288,288,247,164
73 DATA 1,177,288,136,145,288,288,288,
247,288,288,164,133,285,164,164,133,
285,164,247,164
74 DATA 8,133,284,133,288,177,288,288,14
5,284,136,136,288,247,164,247,177,288,288
8,145,288,136,136,288,247,164
75 DATA 164,164,164,133,285,164,164,25
5,164,8,133,284,164,8,145,284,136,288
76 DATA 248,232,136,24,168,8,161,285,13
3,285,164,285,284,14,288,247,164
77 RESTORE (76)
80 FOR I=0 TO 110
85 READ A
90 POKE 1536+I,A
95 NEXT I
95 GOSUB 3688
100 GOSUB 4688
110 GOSUB 5688
120 L3=1
130 L3=1
140 S=0
150 SETCOLOR 2,0,0:SETCOLOR 4,0,0
160 POKE PCOLR0,88:POKE PCOLR1,38
170 POKE HITCLR,0
180 HL=0
190 H2=0
200 FOR K=0 TO HL
205 S=S+0,05:POKE HPDPR1,2845+140
210 L3=500:HPFR=1:IF L3=0 THEN GOTO 1688

```

RUNS IN 32K ON AN

ATARI 400/800

WITH JOYSTICKS

BY MARTIN CRAWLEY

```

525 IF STR$(X)=0 THEN X1=50POKE HPDP1,515
526 GOTO 515,515SOUND 1,5,5,50GOTO 240
527 POKE HPDP0,00
528 IF STR$(X)=0 THEN X1=50POKE HPDP1
529 SOUND 5,200,5,51SOUND 1,125,5,51X=
530 50POKE HPDP0,X=5-5,1
531 IF STR$(X)=1 THEN X1=51POKE HPDP1,
532 SOUND 5,200,5,51SOUND 1,5,5,5
533 IF 5=0 THEN GOTO 240
534 IF 5=0 THEN GOTO 400
535 GOTO 240
536 FOR J=0 TO 5:RES=USR1574,PO,PI:Y=
537 NEXT J
538 GOTO 240
539 FOR J=5 TO 5:RES=USR1536,PO,PI:Y=
540 NEXT J
541 GOTO 240
542 RES=0
543 HL=554850H5
544 IF STR$(X)=15 AND 5=0 THEN H5=5+5
545 SOUND 2,5,5,50GOTO 525
546 IF STR$(X)=15 AND 5=0 THEN H5=5-5

```

```

547 THEN GOTO 1620
548 IF 5=153 AND X=171 AND Y=140 AND
549 THEN GOTO 1120
550 GOTO 2000
551 SC=50POKE INT(X/50)-110
552 GOTO 4115
553 FOR J=1 TO 500:NEXT J
554 POKE PCOL0,50POKE PCOL1,5
555 50=50X1=50Y=140Y1=150Y=150Y
556 50=50Y=140
557 POKE HPDP0,55POKE HPDP1,5POKE H
558 50GOTO 1120
559 HL=5
560 COLOR 1
561 GOTO 4200
562 POKE 752,1
563 GOTO 4115
564 GOTO 5040
565 GOTO 150
566 IF 5=55 AND X=73 AND Y=130 AND 5
567 THEN GOTO 1620
568 IF 5=150 AND X=175 AND Y=150 AND

```

```

569 SOUND 2,5,5,50GOTO 525
570 IF STR$(X)=0 AND STR$(X)=0 THEN H5
571 5+5SOUND 2,10,5,5IF 5=1,5 THEN H
572 5-1
573 IF STR$(X)=0 AND STR$(X)=12 THEN H
574 5+5SOUND 2,10,5,5IF 5=1 THEN H
575 5-1
576 50=50+50H5
577 GOTO 240
578 POKE HPDP1,5
579 POKE HPDP1,5SOUND 5,5,5,5SOUND 1
580 5,5,5
581 50 LO GOTO 1100,1200,1300
582 IF STR$(X)=0 THEN GOTO 1040
583 GOTO 1620
584 FOR J=0 TO 1
585 RES=USR1536,PO,PI
586 NEXT J
587 GOTO 150
588 IF 5=170 AND X=73 AND Y=130 AND 5

```

```

589 THEN GOTO 1220
590 GOTO 2000
591 SC=50POKE INT(X/50)-110
592 GOTO 4115
593 FOR J=1 TO 500:NEXT J
594 POKE PCOL0,50POKE PCOL1,5
595 50=50X1=50Y=140Y1=150Y=150Y
596 50=50Y=140
597 POKE HPDP0,55POKE HPDP1,5POKE H
598 50GOTO 1120
599 HL=5
600 GRAPHICS 7:SETCOLOR 2,5,5,COLOR 1
601 GOTO 4200
602 POKE 752,1
603 GOTO 4115
604 GOTO 5040
605 GOTO 150
606 IF 5=55 AND X=66 AND Y=150 AND 5
607 THEN GOTO 1620
608 IF 5=170 AND X=150 AND Y=150 AND

```




```

501 THEN GOTO 1329
1315 GOTO 2666
1320 SC=SC+1:GOSUB F1:INT RND=110+5640F1*5
1331 GOTO 2346
2666 LF=LF+1
2667 GRAPHICS 6
2668 POKE HPDP9,5:POKE HPDP1,5:POKE HP
2669 ,5:POKE HPDP10,5
2670 FOR I=0 TO 16
2675 FOR J=0 TO 16
2680 SETCOLOR 4,1:G0
2685 SETCOLOR 2,1:G0:SOUND 9,16,1,0,16,15
2690 ,1,5:1,6,16
2695 NEXT J:GOTO 1
2698 SOUND 9,9,4,0,9:SOUND 1,6,0,0,9:SOUND 2
2700 ,4,0,0
2705 IF LF=5 THEN GOTO 2166
2710 GRAPHICS 7
2715 SETCOLOR 2,6,0:SETCOLOR 4,6,0
2720 ON LF GOTO 2676,2666,2666
2725 GOSUB 4066:GOSUB 2666:GOTO 136
2730 GOTO 1135
2735 GOTO 1335
2740 GRAPHICS 16
2745 POSITION 2,2:IF #5:"KEEP TRYING!"
2750 POSITION 2,4:IF #5:"FINAL SCORE "+SC
2755 POSITION 2,6:IF #5:"PRESS ANY KEY"
2760 POSITION 2,11:IF #5:"TO TRY AGAIN"
2765 GET #1,4
2770 GOTO 66
2775 POKE HPDP9,5:POKE HPDP1,5:POKE HP
2776 ,5:POKE HPDP10,5
2780 GOSUB 16
2785 POSITION 2,2:IF #5:"CONGRATULATIONS!"
2790 POSITION 2,4:IF #5:"SUCCESSFUL"
2795 POSITION 2,6:IF #5:"MISSION"
2800 POSITION 2,8:IF #5:"FINAL SCORE "+SC
2805 POSITION 2,10:IF #5:"PRESS ANY KEY"
2810 POSITION 2,11:IF #5:"TO TRY AGAIN"
2815 GET #1,4
2820 GOTO 66
2825 GRAPHICS 16

```

```

2830 POSITION 5,1:IF #5:"READY?"
2835 POSITION 5,3:IF #5:"EXPLODER"
2840 POSITION 5,5:IF #5:"Y"
2845 POSITION 2,7:IF #5:"Wait'n J. Conley"
2850 POSITION 2,10:IF #5:"PRESS ANY KEY"
2855 POSITION 2,11:IF #5:"TO START GAME"
2860 GET #1,4
2865 GRAPHICS 16
2870 POSITION 4,1:IF #5:"INPUT NUMBER "
2875 POSITION 4,3:IF #5:"1,2 OR 3"
2880 POSITION 4,5:IF #5:"FOR REQUIRED"
2885 POSITION 2,4:IF #5:"DIFFICULTY LEVEL"
2890 POSITION 4,7:IF #5:"1-NOVICE"
2900 POSITION 4,9:IF #5:"2-MIDPLANNER"
2905 POSITION 4,11:IF #5:"3-CHALLENGER"
2910 GET #1,4
2915 IF 4=3 THEN GOTO 3,4:GOTO 4,4:RETURN
2920 IF 4=2 THEN GOTO 2,4:GOTO 4,4:RETURN
2925 IF 4=1 THEN GOTO 3,4:GOTO 4,4:RETURN
2930 GOTO 3,5
2935 GRAPHICS 7:SETCOLOR 2,6,0:COLOR 1
2940 PLOT 6,56:DRAWTO 2,55:DRAWTO 5,74
2945 PLOT 36,74:DRAWTO 36,76:DRAWTO 48,6
2950 :DRAWTO 43,63:DRAWTO 48,53:DRAWTO 56,56
2955 :DRAWTO 63,55:DRAWTO 63,36
2960 PLOT 63,36:DRAWTO 76,36:DRAWTO 86,4
2965 :DRAWTO 97,36:DRAWTO 96,43:DRAWTO 105,5
2970 :DRAWTO 107,61
2975 PLOT 107,61:DRAWTO 135,55:DRAWTO 13
2980 :DRAWTO 142,42:DRAWTO 147,46:DRAWTO
2985 :153,66
2990 PLOT 9,6:DRAWTO 6,3:DRAWTO 6,9:DRAW
2995 TO 15,3:DRAWTO 23,26:DRAWTO 25,12:DRAWTO
3000 :17,6:DRAWTO 45,3:DRAWTO 63,6
3005 PLOT 63,6:DRAWTO 73,7
3010 PLOT 73,7:DRAWTO 76,3:DRAWTO 76,26
3015 :DRAWTO 84,24:DRAWTO 126,7:DRAW
3020 TO 126,4
3025 PLOT 126,4:DRAWTO 134,9:DRAWTO 142,
3030 :DRAWTO 148,14:DRAWTO 153,5
3035 COLOR 2
3040 PLOT 5,74:DRAWTO 36,74
3045 PLOT 147,42:DRAWTO 136,61

```

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machine code:
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Repeat your Starship before Invasion enters. Starship is a simple exploration, collection, conquest, biological 104000 and planning into a 20 persons.

STARTER This version of the well known space adventure game features various Klingon models, and provides also for a tracking.

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8 games for 16

25-CHARACTER (machine code)



Send and shoot your way through the turbulent events.

CONQUEST

machine code



INVASION

machine code



Hypercube (machine code)

GALAXY INVASION (machine code)
Lots of invading and doing alien stuff.

SHARKBITE (machine code)
Let the ocean follow it into you. Variable speed from 1 to 1000.

WRE (machine code)
A ZX81 version of the well known game.

30-70-100-100 (Basic)
Played on a 6x4x4 board, this is a game for the brain. It is very hard to beat the computer at it.

1 of the 8 games are in machine code. 800000 is a multi-tasker from Basic. Some of these games were previously available from J. Stoddart.

Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
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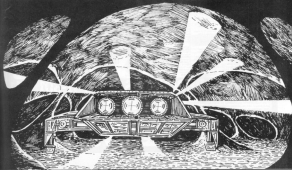
4180 PLOT 752.1
4185 SCLR
4190 T "F"
4195 T "SPEED" ASC
4200 T "FUEL"      0
4205
4210 T "SPEED" -50
4215
4220 PORE 752.1
4225 RETURN
4230 GRAPHICS 7:SETCOLOR 2,0,0:COLOR 1
4235 PLOT 0,4:ORRANTO 20,7:ORRANTO 20,4:ORR
ANTO 34,4:ORRANTO 42,0:ORRANTO 40,4:ORRANTO
0,42:ORRANTO 77,17:ORRANTO 86,30
4240 PLOT 96,30:ORRANTO 89,40:ORRANTO 80,3
0:ORRANTO 104,24:ORRANTO 114,14:ORRANTO 119
,11:ORRANTO 123,7
4245 PLOT 129,7:ORRANTO 139,0:ORRANTO 147
,0:ORRANTO 152,30:ORRANTO 156,40:ORRANTO 15
6,42
4250 PLOT 16,41:ORRANTO 34,35:ORRANTO 37,4
0:ORRANTO 43,42:ORRANTO 46,40:ORRANTO 47,30
:ORRANTO 57,50:ORRANTO 58,50
4255 PLOT 59,40:ORRANTO 64,40:ORRANTO 66,4
0:ORRANTO 69,40:ORRANTO 75,70:ORRANTO 87,70
:ORRANTO 96,64:ORRANTO 113,42:ORRANTO 119,2
0
4260 PLOT 119,30:ORRANTO 122,37:ORRANTO 12
,37:ORRANTO 112,60:ORRANTO 114,70
4265 PLOT 134,70:ORRANTO 136,60:ORRANTO 14
6,61:ORRANTO 153,60:ORRANTO 159,63
4270 PLOT 0,40:ORRANTO 5,33:ORRANTO 7,61
4275 COLOR 2:PLOT 7,63:ORRANTO 30,64:PLOT
114,70:ORRANTO 114,70
4280 RETURN
4285 GRAPHICS 7:SETCOLOR 2,0,0:COLOR 1
4290 PLOT 24,70:ORRANTO 26,72:ORRANTO 33,6
0:ORRANTO 41,61:ORRANTO 40,63:ORRANTO 50,73
:ORRANTO 64,70:ORRANTO 65,70
4295 PLOT 69,70:ORRANTO 77,74:ORRANTO 82,6
0:ORRANTO 87,70:ORRANTO 94,70:ORRANTO 124,7
0:ORRANTO 131,60:ORRANTO 133,55
4300 PLOT 133,55:ORRANTO 139,42:ORRANTO 13
,7,0:ORRANTO 144,20:ORRANTO 122,22:ORRANTO
109,10:ORRANTO 92,20:ORRANTO 69,23
4305 PLOT 6,10:ORRANTO 4,14:ORRANTO 0,0:OR

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RANTO 15,30:ORRANTO 27,0:ORRANTO 37,10:ORRANTO
0,44:ORRANTO 40,42
4310 PLOT 45,42:ORRANTO 50,40:ORRANTO 72,0
:ORRANTO 81,34:ORRANTO 97,40:ORRANTO 104,2
0
4315 PLOT 37,0:ORRANTO 38,0:ORRANTO 33,30
:ORRANTO 40,10:ORRANTO 50,40:ORRANTO 50,0:ORRANTO
0,10:ORRANTO 114,30:ORRANTO 120,0
4320 PLOT 12,0:ORRANTO 10,0:ORRANTO 144,
12:ORRANTO 137,10:ORRANTO 150,30
4325 PLOT 144,30:ORRANTO 150,50:ORRANTO 15
,50:ORRANTO 150,57
4330 PLOT 0,47:ORRANTO 0,30:ORRANTO 12,30:
ORRANTO 14,30:ORRANTO 3,60:ORRANTO 4,70
4335 COLOR 2
4340 PLOT 4,70:ORRANTO 24,70:PLOT 131,60:
ORRANTO 140,60
4345 RETURN
4350 ORRANTO 1:ORRANTO 171:YR=171:YR=170
4355 YR=150:YR=150:YR=150
4360 PORE HPORP6,62:PORE HPORP1,5:PORE H
PORE,100
50-0 0-PORE:ORRANTO 1-24
5050 PORE MYRSE,0:MYRSE=250:0
5055 PORE ORRCTL,0:PORE ORRCTL,62
5060 PORE PCOLR,0:PORE PCOLR,0
5065
5070 PORE 1:YR=170
5075 PORE 1:YR=170
5080 PORE 1:YR=170
5085 PORE 1:YR=170
5090 PORE 1:YR=170
5095 PORE 1:YR=170
5100 PORE 1:YR=170
5105 PORE 1:YR=170
5110 PORE 1:YR=170
5115 PORE 1:YR=170
5120 PORE 1:YR=170
5125 PORE 1:YR=170
5130 PORE 1:YR=170
5135 PORE 1:YR=170
5140 PORE 1:YR=170
5145 PORE 1:YR=170
5150 PORE 1:YR=170
5155 PORE 1:YR=170
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5990 PORE 1:YR=170
5995 PORE 1:YR=170
6000 PORE 1:YR=170

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Back and forth among the planets in this intergalactic adaptation of an old arcade game.

Rocks is similar to that classic turn-of-the-century Asteroids. You control a spaceship threatened by a variety of deadly meteors. You score points — and stay alive — by blasting the rocks. When you have scored 300 or more points, streaks across the screen and attempt to run you. You can avoid or shoot it down.

To control your ship use key 1 and 2 to turn, 5 and 6 to move left and right, 8 to fire. You can also use the operator to supercharge your way out of trouble — but this will cost you 100 points each time you use it.

The main variables are: 50 scores, 32 shapes of space ship, 8, 1, one rock variable, 2, input from keyboard, 1 direction of fire.

```

1 DATA 191.2,191.2,191.2,207.8,223.8,8.4,219.2,217.2,215.2,231.8,229.8
2 DATA 8.4,219.2,217.2,215.2,231.8,229.8,215.2,217.2,219.2,213.12,8.4
3 DATA 16.16,16.16,16.16,16.16,16.16,8.8,8.8,255.8,8.8,8.8
4 DATA 64.8,1,16.8,64.1,128.8,8.8,8.8,8.8,8.8,8.8,8.8,8.8
5 DATA 68,168,124,48,56,16,16,8.8,12,14,28,252,122,38,1
6 DATA 8,324,128,46,128,324,8,8,1,38,122,252,38,14,12,8
7 DATA 8,16,16,56,48,124,188,68,128,188,95,63,56,112,48,16
8 DATA 8,7,38,116,38,7,8,8,16,48,112,56,63,95,188,128
9 DATA 1.2,4,8,16,32,64,128,128,64,32,16,8,4,2,1
10 DATA 68,68,128,65,255,255,68,68,12,28,38,127,255,255,252,56
11 DATA 8,8,34,56,48,32,8,8,8,56,252,255,255,127
12 POKE32,28:POKE56,28:CLR:POKE36878,15
13 POKE36879,25:PRINT"3688888888888888"
14 PRINT"***** << CONTROLS >>*"
15 PRINT"1: 1 AND 2: TURNS SHIP":PRINT"8: 8 AND 9: MOVES SHIP":PRINT"5: 5 FIRES A BEA
16 M"
17 PRINT"500 TO JUMP HYPERSPACE USE THE SPACE BAR"
18 FORZ=17022:READA:POKE36876,A:POKE36875,A
19 REPOS:FORA=1708#100:NEXT:POKE36876,A:POKE36875,A:HEXTZ
20 PRINT"MPRESS ANY KEY TO START"
21 GETA:IF#A=""THENG4
22 FORA=32270382:REPOS:POKE128#A,8:HEXT
23 FORA=38270478:POKE128#A,PEEK(32768#A):HEXT
24 POKE36869,253:POKE36866,PEEK(36866)OR128
25 SC=8:X2=34
26 X=7981:X1=5
27 POKE8,32
28 PRINT"7":POKE36879,8
29 FORA=7638707679:POKEA,33:HEXT:FORA=8164708186:POKEA,33:HEXT
30 FORA=768870916457022:POKEA,33:HEXT

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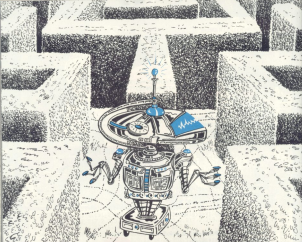
100 FORA=1T04
110 IF PEEK(RA)>32THEN140
120 IF=1THENK1=INT(2000000(1)+7783):T(1)=INT(2000000(1)+45):K1=INT(2000000(1)+21
)
130 IF A=1ANDSC=30000DINT(500000(1))=2THENT(1)=44:K(1)=7783+K1:K(1)=22
140 IF=2THEN=INT(2000000(1)):R(2)=7783+K(22):T(2)=INT(2000000(1)+45):K(2)=INT(20000
00(1))
150 IF A=30000DINT(500000(1))=2THENT(2)=44:R(2)=K(22)+1
160 IF A=3THEN=INT(2000000(1)):R(2)=7723+K(22):T(2)=INT(2000000(1)+45):K(2)=INT(20000
00(1))
170 IF A=3THENK(2)=21
180 IF A=30000DINT(500000(1))=2THENK(2)=21
190 IF=30000DINT(500000(1))=2THENK(2)=21
200 IF A=30000DINT(500000(1))=2THENK(2)=44:R(2)=K(22)+20:K(2)=1
210 IF A=3THENK(4)=INT(2000000(1)):R(2)=7723+K(22):T(2)=INT(2000000(1)+45):K(2)=INT(20000
00(1))
220 IF A=40000DINT(500000(1))=2THENK(4)=44:R(4)=8143+K(1):K(4)=22
230 POKER(3):32:R(4)=R(4)+K(4)
240 IF T(4)=4THENPOKE36876,200
250 IF R(4)=K(1)THEN600
260 POKE36876,0
270 IF PEEK(RA)>32THEN100
280 POKE R(4),T(4):POKE(RA)+30720,A+2
290 J=PEEK(197)
300 IF J=2THENK(2)=K(2)+1:IFK(2)=42THENK(2)=34
310 IF J=56THENK(2)=K(2)+1:IFK(2)=33THENK(2)=41
320 IF J=40000DINT(500000(1))=2THENPOKEK(1):32:K(1)=K(1)+1
330 IF J=32THENPOKEK(1):32:K(1)=K(1)+20000DINT(500000(1)+20):K(1)=INT(2000000(1))
340 IF J=32THENK(2)=K(2)+100:IFK(2)=32THENK(2)=0
350 IF J=32THEN400
360 PRINT"*****"SC
370 IF J=50000DINT(500000(1))=2THENPOKEK(1):32:K(1)=K(1)+1
380 POKEK(1):K(2):POKEK(1)+30720,7
390 NEXT:GOTO100
400 IF K(2)=34THENF=22:F(1)=29
410 IF K(2)=35THENF=23:F(1)=43
420 IF K(2)=36THENF=1:F(1)=30
430 IF K(2)=37THENF=21:F(1)=42
440 IF K(2)=38THENF=22:F(1)=43
450 IF K(2)=39THENF=23:F(1)=43
460 IF K(2)=40THENF=1:F(1)=30
470 IF K(2)=41THENF=21:F(1)=42
480 F(2)=K(1):J=230
490 F(2)=F(2)+1:IFPEEK(F(2))>32THEN450
500 POKEF(2):F(1):POKE36877,J:J=J+2:POKEF(2)+30720,2
510 GOTO420
520 U=PEEK(F(2))
530 IF PEEK(F(2))>3400PEEK(F(2))+47THEN510
540 POKEF(2):31
550 POKE36875,150:POKE36877,150
560 IFU=44THEN=SC=SC+50:U=32:GOTO450
570 SC=SC+10:U=32
580 PRINT"*****"SC
590 FOR=K(1)+1TOD1000:NEXT:POKEK(2):NEXT
600 POKE36877,0:POKE36875,0:POKEF(2):U
610 GOTO300
620 FOR=1TOD1000:NEXT:POKE36863,240:POKE36866,150:POKE36873,25:PRINT"*****":POKE368
70,0:END

```

RUNS ON A VIC-20 IN 4K

BY ANDREW STANFORD

ROCKS



ROBORUN

Here I am brain the size of a planet and they stick me inside a maze and tell me to get out. "Is that all," I said. "Yes," they said. Depressing isn't it.

So here I am in the maze trying to get out. I must admit it's turned out to be a bit harder than I thought. But don't tell them that. It appears this maze has three levels getting progressively harder each time.

They are controlling me by using keys J for left, K for down, I for up and R for right. There's some alterations that should be made to the program. But I'll let them tell you all about those.

When typing in the program from the listing a capital A should be used in the graphics mode place of the capital A's in the listing. A graphic mode B should replace the capital B and in place

of the capital C a graphics mode C. When the program is run these capital letters will be replaced by the proper graphics. To alter the speed of the game the variable "V" in line 33 may be altered.

```

1 REM ROBORUN 8124
2 BORDER 1: PAPER 1: INK 7: C
3
4
5 FOR V=144 TO 240
6 FOR J=0 TO
7 READ A: POKE LAN CHR$ (A)
8
9 NEXT J
10 NEXT V
11 DATA B1H 00000000,B1H 00010
000,B1H 00000000,B1H 01010100,B1
12 01011000,B1H 01010100,B1H 0001
13 0000,B1H 00010000
14 DATA 0,B1H 01000100,B1H 000
15 000,B1H 01111111,B1H 00010000,
B1H 01010100,0
16 DATA 01011000,B1H 01010
17 1000,B1H 00101000,B1H 01111000,B1
18 01111010,B1H 10111010,B1H 0010
19 0000,B1H 00101000,000

```

BY PAT MORRIS

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REVERSI

BY JOHN BALL

SUBTLE USE OF THUMBS

The family Reversi champions probably tell you the "do's and don'ts" of the game.

These are the "rules of thumbs" which most know Reversi — also known as Othello — players will stick with, even though he may not have categorized them as such.

But the expert Reversi player/programmer will also know when to break those same rules.

In the last article on computerized Reversi (C&WD May) I outlined these rules. They were:

• **Board Values**, so that the nearer the corners the worse the move, but capturing corners being best. The whole game is really about capturing the corners to help you capture pieces permanently. I have included the value diagram below.

8	-9	29	5	4	4	5	29	-9
7	29	22	3	2	2	3	22	29
6	5	3	1	1	1	1	3	5
5	4	2	1	0	0	1	2	4
4	4	2	1	0	0	1	2	4
3	5	3	1	1	1	1	3	5
2	29	22	3	2	2	3	22	29
1	-9	29	5	4	4	5	29	-9
a b c d e f g h								

• **Face capturing**, where ironically it pays to take as few as possible to reduce your opponent's choice of moves.

• **Side taking**, which helps shorten "option-burden" but is best in the end-game, so generally avoid them.

I said that a computer program based on those three points, if carefully balanced would result in a reasonable standard of play. But of course that is not the whole story. In my book *Key To Othello*, only half a dozen of the 30 pages deal with what I now call the three thumbs. The rest deals with other four points that are really exceptions — in other words telling you when to give the "thumbs down".

The standard board values would strongly persuade you to avoid playing next to a corner, but look at diagram one. There is one square next to a corner that is safe — due to white holding the side. So a White play at A would be far preferable to B.





ALTERNATIVE DIMENSIONS

Any video game or simulation that deals with real events and scenes has to face the problem of how it can successfully represent the real three-dimensional world on a flat two-dimensional video screen.

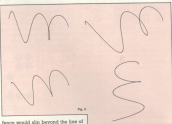
The eyes and brain of every person have to cope with a similar problem because we see the world only via a flat image of it produced on the retina of the eye.

The secret of representing three-dimensional images in a realistic way on a flat surface was discovered by the artists of the Renaissance in the fifteenth century.

One of the set-pieces used for teaching perspective at that time was to draw a church, and there is a famous drawing of a church by Uccello in the Uffizi Gallery in Florence, which bears a startling resemblance to the most modern computer-generated images.

The idea of perspective is that the cone of rays of light reflected from an object into the eye becomes narrower the further the object is from the eye. This explains why an object appears to be smaller when it is further away from one's eye.

Students of art are usually taught to deal with perspective on any a street or a straight fence, by drawing a "disappearing point" on the horizon, this is where the houses or



fence would slip beyond the line of sight if they were to continue far over. It works well on straight boulevards but more thought is needed on winding or hilly terraces.

This idea naturally leads us to a way of representing solid objects on a flat surface. We can specify the position from which an object is being observed and the position of the flat surface on which it is to be represented as shown in Figure 1.

The eye is at the origin of the coordinate system. The picture plane is parallel to the $x-y$ plane at a distance d from the eye with its origin on the x -axis. A three-dimensional point with coordinates (x, y, z) can then be seen to correspond to the point (X, Y) in the picture plane, where

$$X = x + (dx/z)$$

$$\text{and } Y = y + (dy/z)$$

Using this perspective transformation, three-dimensional surfaces and curves can be represented by transforming points in the picture plane and joining them as appropriate.

A three-dimensional surface can be represented mathematically by an equation such as:

$$z = x^2 - y^2$$

or, more generally, by any equation giving z in terms of x and y . If the $x-y$ plane is taken as horizontal, then for every point (x, y) in this plane, the height, z , of the surface above the plane is given by such an equation.

A surface can be represented by a "wire-frame" model obtained by taking a rectangular grid in the $x-y$ plane, calculating the height of the surface above each cross-point of the grid and then joining these surface points. A part of the surface $z = x^2 - y^2$ drawn in this way is shown in figure 2.

A three-dimensional curve can be defined by the intersection of the



two surfaces, and so it can be given mathematically by the equations for a pair of surfaces. Any point lying on two surfaces at the same time must lie on the curve in which they intersect each other. Part of the helix given by:

$$x = \cos(x/2)$$

$$\text{and } y = \sin(x/2)$$

is shown in figure 3 from several points of view.





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GAMES SAY

Many game of chance players — generals, admirals, investors and habitués of gambling casinos — believe in luck. Good luck to them, but bad luck to those they command or whose money they invest.

Games, love and war can only be understood in terms of human behavior (subjectively), machine behavior (relatively objectively) or mathematically (with total objectivity).

The latter method can provide an understanding of all three, thanks to newly discovered mathematical techniques which merely confirm what some people have felt all along — although they usually get into terrible pith arguments.

The new mathematics of games ends such arguments because you can't argue with the facts.

For one thing the new mathematics demonstrates that luck and chance are human superstitions believed by those who want to evade responsibility for their own actions.

Let's start by pinching pennies — by hand or by computer. No luck is ever involved there. It all depends on whether or not you know what you and your game partner — human or computer — are doing.

If neither knows what he is doing, first one and then the other may win for a while. If both pinch pennies in a random, mindless manner for long enough, that game will end in a draw.

But if both players are perfect calculators and know how to manipulate the coin with precision, each will get what he wants every time.

That's also a draw. The only genuine victory that can be achieved is when one player knows how to manipulate the coin perfectly and the other doesn't, and doesn't believe that this can be done.

The same principle holds true for war games and for actual warfare. All wars are based on dirty tricks. They coordinate the only winning strategies — just as in pinching pennies. The idea in war is to create maximum confusion for the opponent so that he makes mistakes. Then you move in for the kill.

To try winning by brute force is stupid, expensive and eventually lost. No one can keep that up forever, whether it's Alexander the

Great. You are in the hands of chance only if you believe in luck, according to ARNOLD ANGLUS. In this article he examines "so-called" games of chance — whether they are played on computers, on game boards or on the stock market.

Great, Genghis Khan, Napoleon or Adolf Hitler.

But the available variety of dirty tricks is sufficiently great so that they will wear out and defeat any aggressor, no matter what he does, provided he can't wipe you out with the first blow.

Unless that occurs — and it is rare or impossible, except in nuclear war — he who strikes the first blow, or makes the first move in any game, suffers a severe numerical disadvantage. That disadvantage is precisely equal to the number of turns he enjoys, unless he knows how to play perfectly. This is a mathematically based



statement. Anyone can verify it by comparing the sum of choices available to the first moving player in Monopoly and Crosses.

The disadvantage declines towards the end of the game, but then it doesn't matter any more. The game ends in a draw when the first moving player's numerical disadvantage declines to zero.

These facts are even true for games that are traditionally known as games of chance and luck. As every poker player knows, the player who makes the first bet is said to be under the gun. That is a very big disadvantage.

Given the new mathematics of games and a little self-discipline, anyone can win steadily and consistently at roulette, or any other so-called game of chance, unless the table is fixed, the croupier knows how to manipulate ball and table with relative precision, or the betting rules are rigged.

Except for random programming — that is, sometimes limited — or deliberate exclusion of certain combinations, computers can't be made to cheat. The limits of systematic machine randomization can now be defined mathematically.

That poses a threat for many who write game programs and for gambling casinos, but only for knowledgeable players who are first rate mathematicians. The possibilities for human cheating may seem endless.

But even such cheating has its limits. Once all cheating methods are known, no-one can ever take advantage of anyone else.

One of the so-called winning plays in what were believed to be games of chance consists of temporary alliances that are dissolved as soon as convenient. Then you turn on your former ally when he least expects it. That is virtually the only way to succeed at Monopoly, Risk and in other games in which such strategies are not expressly forbidden by the rules. But these realistic policies are difficult to apply in computer games, unless specifically allowed for in the program.

As in the previous article which dealt with Space Invaders, the difference between defensive and attack strategies becomes clear. As far as any attacker is concerned anything goes.

Defenders are best off with those they can count on to remain loyal, come what may. None of this involves any moral judgments. These are mathematically verifiable facts which are confirmed by experience.

The trouble with war games is that one wonders to what they lead?

What is won when the opposition is wiped out? In real life there is then no one with (or against) whom to play. In games, one war game can only lead to another. No chance, luck or fate is ever involved in either case.

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Kit Korner

THE KEYBOARD QUESTION

For the unadventurous, replacing the keyboard on the Sinclair machine can seem a daunting task.

There is a large selection of possible keyboards now available, for the Z8801 in particular, and it can be confusing to decide exactly what you need, from the keyboards and how much hardware you wish to fit inside the case.

Most of the models currently on the market have been produced in the same form for some time. They are usually about three-quarters of the size of a normal QWERTY keyboard which makes them especially attractive to users of the Z8801 who wish to keep their system as compact as possible. The case provided with many of the keyboards are even large enough to house the Z801 itself.

Unfortunately, for those who regularly use a full size keyboard, and are familiar with its 'feel' there is, as far as I know, no alternative. That is, unless you are prepared to do a little modifying with knife and soldering iron. These are available, I know, several versions of unencoded matrix keyboard but as Sinclair uses a non-standard matrix, any

tions will be effected by wire links. This will make your job all the easier, as all you will have to do on this side is to rearrange the links. The trouble will come when the tracks on the bottom of the board have to be changed.

Fortunately, here, the most frequently used means of key connection is by soldering a fine wire in a very large plated-through hole. This will, as a consequence, mean that there will be plenty of room for the new connecting wires when you come to reassemble the board. After unsoldering the keys the next and most important step to take is to make a sketch of the board and all the suitable connections.

It is no good rewiring the board and then finding out that you have made a wrong connection somewhere. It will invariably be in the most inconvenient place, according to Murphy's Law, chapter two.

Once you have convinced yourself that you have the matrix right, and you can refer to the diagram in last month's edition, the offending matrix must be cut and replaced by wire links. Do not remove the track at all, but cut through it with a very sharp knife. This will allow you, if you wish, to modify the board later to a different matrix without much trouble. I prefer to use single-stranded wire for this type of job but multi-stranded will do. Try to make the links as short as possible



you use the same sort of socket. These, fortunately, are generally available from 'most good stores', as is the connecting strip.

The modification above can, of course, be made on almost any type of keyboard, even the encoded type, which normally has an 8255 output. This would become redundant if the matrix is changed, though. These keyboard are, however very expensive for a straight modification and it is possible to alter them for both forms of operation. This is a very tricky job as the matrix must work in both systems and should only be undertaken by those who know how the UART (look it up) functions.

Of course, second hand keyboards are available in junk shops and at computer bring-and-buy sales and many other places. These are ideal to practice on as they are cheap (as little as £5) for the associated electronics are often defect.

You can make the most of the board by fitting extra sockets to take joysticks and other associated add-ons. Also, the boxes for these keyboards are large enough to take the machine, the power supply and the memory pack if you wish.

You would then be left with only the printer and any other controls you yourself had added, to carry separately.



shown last month, these are not suitable in their original form.

If you contemplate buying a full size keyboard for your Z8801/Spectrum try to get one in kit form. This will save you the job of having to unsolder all or most of the keys when you come to modify the matrix, as the connecting tracks are often on both sides of the board. If you are very lucky the top connec-

and as close to the board as you can — this will ensure the machine is robust.

On the board there should be a connector of some sort that would have taken the signal from the original matrix. You may decide to use this one or one of your choice. Whichever it is you will find it difficult to attach the same type of connector as is used by Sinclair unless

PRACTICAL PROGRAMMING

DO YOU TALK TO YOUR USERS?

Even some professional software tapes fall down in the vital area of communicating with the person who will end up using them.

Communicating instructions or other help in deciding what the computer next aspects of its player is an important part of the games program and should be built into the program at an early stage.

There are two types of input routine in the first type the program looks to see if an input is ready and continues if there is one, in the second the program stops until an input is ready.

The two forms are implemented in BASIC by GET or INKEY\$ for the first and INPUT for the second, although there are other differences.

GET and INKEY\$ are extensively used in interactive action games, where the display and the state of the game must be continuously up-

```
1000 GET AS
1010 IF AS = "L" THEN GOTO 2000
1020 IF AS = "R" THEN GOTO 2100
1030 IF AS = "U" THEN GOTO 2200
1040 IF AS = "D" THEN GOTO 2300
1050 IF AS = "T" THEN GOTO 2400
1060 ...
```

According to the key pressed the program will branch to a routine to perform the appropriate action; if no key is pressed or if the key pressed has no defined function the program will continue.

WHICH KEY DOES THAT?

As important consideration in the type of program is the actual specification of which key does what. The keys and their functions should be easy for the player to remember; the above example satisfies this criterion if L, R, U, D, T stand for "move left", "move right", "move up", "move down", "fire". It is less satisfactory to use, say, the digits 1, 2, 3, 4, 5 as there is no immediate connection between the digit and

left, right, up, down, and are easily remembered by their positions relative to 5. The keys T, U, I, 3 can also be used for movement in the appropriate direction.

Another possibility is to use cursor control keys, if they are available, to implement directional movement.

IMMEDIATE RESPONSE

In the action games, considered above, the program responds to one key at a time and the response is immediate. The player is given no chance to correct an error, but since such games are mainly a test of speed and dexterity pressing the wrong key is one of the hazards of the game. However, in strategy games and data processing applications we need a different approach to errors.

As an example, consider the problem of checking the player's move in a game of chess. A standard format for specifying the squares on the board and the moves is to label the columns, from left to right, with the letters a to h, and the rows, from bottom to top, with the digits 1 to 8.

A square is specified by the column letter and row digit, and a move is specified by giving the starting square and finishing square of the move.

For example, e4 is the square at the fifth column and second row, e4 is the square at the fifth column and fourth row; and e4e4 means move the piece on square e4 to square e4 as an opening move this would be, in another standard chess notation, P-K4, pawn to king four.

THE CHECKING PROCESS

The checking process can be divided into two parts: first, checking that the input string has a valid form for the specification of a move, and second, checking that a valid form specifies a legal move accord-



dated whether or not the player has done anything, while INPUT is more often used in games whose turns alternate or in applications where the program processes data that is typed in.

In an interactive action game there is usually little difficulty in processing the results from a GET or INKEY\$ instruction. It is often possible to have a single routine to handle the player's responses, which will work something like the following:

the corresponding action and the player will have to learn arbitrary key values before he can really get into the game.

On machines with a numeric keypad separate from the main keyboard the keypad is often used to define direction of movement. With the standard layout:

```
300
400
500
600
700
```

The keys 4, 5, 6, 7 can be used for

BY TED BALL

PRACTICAL PROGRAMMING

ing to the rules of the game.

To use some jargon, the first part of the checking process is a "syntactic" problem, while the second part is a "semantic" problem. The distinction is that syntax refers to form while semantics refers to meaning.

In general, syntactic problems are much simpler than semantic problems, and this is certainly the case in checking a chess move. The syntax for a move can be defined precisely as requiring exactly four characters of which the first and third are letters from a to h and the second and fourth are digits from 1 to 8. This can easily be checked by a simple routine, for example:

```
1000 IF LEN (ME) < > 4 THEN
GO TO 1004
1010 IF MID$(ME, 1, 1) < "a" OR
MID$(ME, 3, 1) < "a"
THEN GO TO 1000
1020 IF MID$(ME, 2, 1) < "1" OR
MID$(ME, 4, 1) > "8"
THEN GO TO 1000
```

where line 1000 is the start of the error report routine.

ARE YOU SURE THAT'S LEGAL?

The semantic problem of deciding if a syntactically correct move is legal is much more complicated, too complicated to deal with fully here.

A little thought will reveal some of the things that must be checked: does the player have a piece on the first square specified; is the second square vacant; if the second square is occupied is it occupied by one of the player's pieces or one of the computer's pieces; does the move expose the player's king to check.

If a chess program is to be effective the routine that checks a move for legality must be thorough and efficient as the main use made of such a routine will not be checking that the player's moves are legal but in generating possible moves for the program. When the program is turning many lines of play for several moves ahead the move generator may be used thousands of times and must be very fast to avoid



Android Nim: "Get a move on, we haven't got all day!"

unacceptably long times for deciding on moves.

In game programs where the rules and the format of the input are precisely defined it is always possible to make a complete check on the input for validity and legality, and this should always be done. A program should never accept an invalid move and all invalid inputs should be trapped by checking routines written into the program and not left to the programming language or operating system.

For example, in a gambling program if you try to bet 100 when you only have 50 the program should detect this and give a message like "You don't have that much, try again". If the program accepts the 100 it may later try to use the -50 left after subtracting 100 from 50 in an expression where negative numbers are inadmissible.

In that case you would get a system error message, "Paradox: all error is 1294," or something similar. The program would then terminate and the machine would go back to basic command mode, which could be confusing to someone who does not write programs and only uses his computer to run pre-recorded programs, and would be annoying to someone who had typed in 100 when he meant 10 and has been given no chance to correct his mistake.

In game programs, failing to trap an invalid input is at most annoying to the user, but in serious business

and scientific applications it could be disastrous.

Although a games magazine is not the place to discuss such applications every programmer should appreciate the importance of data validation.

THE POLITE COMPUTER

As a necessary to the trapping of errors we should also give some thought to the form of the error messages given after an error has been detected. All messages from a program should be informative and polite.

In some cases it may be sufficient to say simply "Error" or "Invalid command", in other cases it may be necessary to be more specific, for example in chess suitable error messages may be "That move would put you in check" or "You already have a piece on E4".

Regarding politeness in error messages you often find messages like:

"You can't go there, you rotten cheat" or, in real examples) in Android Nim, if you are slow in making a move you will be told: "Get a move on, we haven't got all day".

Such things may be amusing the first few times you see them but by the 100th time they are just annoying.

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Main Features — • Interfaces ZX81 and parallel printers of the Centronics type • Enables use of a range of dot matrix and daisy wheel printers with ZX81 • Compatible with ZX81 Basic, prints from LIST, LOAD and COM • Contains firmware to convert ZX81 characters to ASCII code • Gives best-case characters from ZX81 inverse character set

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A complete range of ZX81 plug-in peripherals

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Adventure

Flags are objects seldom found in Adventure games, but they often play a useful part hidden in the program. We will arrange for an array C(1) to provide a flag for each object, and its value to be negative if the object must not be taken.

Consider a location numbered (say) 4, a garden. Lying around innocently at other locations will be found a SPADE (object No. 5), a BEAN (No. 6), a BUCKET (No. 12) and a pond. Figure 1 will remind you of the relevant variable names.

The objectives will be to dig a hole, plant the bean, and grow a beanstalk. Before it can grow to its full height it must be watered.

The command DIG will return a value of 1 if water decoded and via an ON 11 GOTO (line 50) statement, control will pass to line (say) 500: 500 REM DIG ROUTINE
501 IF P15<=>0 THEN LET Q15="NOTHING TO DIG WITH: GOTO 100"

511 REM THE FOOL FORGOT THE SPADE
521 IF L1<=>0 THEN LET Q15="NOT HERE: GOTO 100"
531 REM MUST BE IN GARDEN
541 IF C15<=>0 THEN LET Q15="NOT AGAIN: GOTO 100"
551 REM ONLY ONE HOLE PERMITTED

VARIABLE	DESCRIPTION
L1	Current location no. of player
E1	Decoded number of verb input
E2	Decoded number of noun input
Q15 & Q16	Computer's current reply
R15	2nd word of player's input
O15 (n)	Object description array
P(n)	Object location no. array (1) P15-Q15 is held by player)
C(n)	Object flag
E1(n)	Exit code string for location n
O15(n)	Destination code string for loc'n n

FIGURE ONE

5610 LET Q15="OK" LET C15=1 LET L1=4 LET E1="WITH A SMALL HOLE" GOTO 100
5611 REM C15=1 - HOLE IS DIG
By having increased C(5) by 1 we can control a PLANT routine:
5600 REM PLANT ROUTINE
5610 IF E2<=>0 THEN LET Q15="I CAN'T PLANT A " + E1 GOTO 100
5611 REM E1 - DECODE NO. FOR BEAN & ONLY BEAN CAN BE PLANTED
5621 IF P15<=>0 THEN LET Q15="THE NOT GOT ONE" GOTO 100
5631 IF L1<=>0 THEN LET Q15="NOT HERE" GOTO 100
5641 REM ONLY IN GARDEN
5651 IF C15<=>0 THEN LET Q15="NO HOLE IN GROUND" GOTO 100
5661 REM MAKE SURE DIGGING IS DONE
5670 LET Q15="OK" LET

C15=1 LET L1=4 "GARDEN" LET P15=UNSET C15=1 LET O15="BEAN SHOOT" GOTO 100
5681 REM (1) C15 NOW SAYS BEAN IS PLANTED
(2) HOLE REMOVED FROM LOCATION DESCRIPTION
(3) LOCATION OF BEAN FROM PLAYER TO GARDEN
(4) BEAN MADE UNTAKEABLE
(5) E1="YES"
(6) BEAN DESCRIPTION CHANGED TO BEAN SHOOT

Now the plant must be watered. Note that C(12)=2 for an empty bucket and 3 if bucket contains water.

700 REM "WATER ROUTINE"
710 IF P12=>0 OR C12=>0 THEN LET Q15="NO WATER" GOTO 100
721 REM NO BUCKET, OR NO WATER IN IT

731 IF E2<=>0 OR L1<=>0 THEN LET Q15="FLASH!" LET C15=2 GOTO 100

741 REM IF NOT BEAN OR GARDEN WATER GOES TO WASTE
751 IF C15<=>0 THEN LET Q15="I DON'T UNDERSTAND" GOTO 100
761 REM IF BEAN NOT PLANTED
771 IF C15<=>0 THEN LET Q15="OK" LET C15=1 LET L1=4 LET E1="BEANSTALK" LET E2=4
781 IF E2<=>0 THEN LET E1="IT'S A TREE" LET C15=1 GOTO 100
791 REM GIVES NEW EXIT UP AND NEW DESTINATION 31
801 LET Q15="OK" GOTO 100
811 REM DEFAULT IF STALE HAS ALREADY GROWN

If he took the right steps the player has now grown a beanstalk. We have prevented him from making any mistakes, and forced him to grow it exactly as we wanted ... Ray Prater

DEALING WITH THE WIZARD . . .

I typed "RUN" and "ARE YOU A WIZARD?" flashed on the screen. "YES," I lied.

"ENTER THE PASSWORD" commanded the computer. A wrong guess caused the Atom to call me a charlatan and terminate the game.

Next time round I admitted that I wasn't really a wizard, and found myself on a twisty road through a dense forest.

A handy Adventurer will rarely venture anywhere exciting without a lamp, keys, and an axe. As I had now collected these essentials I guessed it must be time to enter the caverns up the road. But how to get in? The entrance was closed, and no amount of violence to rocks and doors helped. An extensive search for an alternative way in proved fruitless.

The computer suddenly an-

nounced "YOUR NEXT MOVE IS SO OBVIOUS I SHALL NOT MENTION IT" — as I cried "HELP". The Wizard was obviously still talking from my earlier deceit, and relaxed.

I promptly typed in a short sharp phrase suggesting what should be done to the wizard, and to my dismay I read "THE DENIZERS OF THE ADVENTURE HAVE DELICATE EARS. GAME ENDED BY ORDER OF THE PROGRAMMER, J. SPILSBURY".

Eventually, of course, I got in to the caverns. The method was so obvious I shall not bother to tell you!

After Adventuring from Program Power in to Basin and requires 128 of memory. The game's speed of execution was disappointing but this was more than compensated for by the game's chatty manner and novel turn of phrase.

by KEITH CAMPBELL

New ZX81 Software from Sinclair.

A whole new range of software for the Sinclair ZX81 Personal Computer is now available - direct from Sinclair. Produced by ICL and Paces, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 equipped by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offers full alphanumeric and highly sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole 19 screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required - ZX81.
Price - £4.95.

Programs - Invasion from Jupiter, Skiffles, Magic Square, Doodle, Kix, Liquid Capacity.
Description - Five games programs plus easy conversion between pints, gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required - ZX81.
Price - £4.95.

Programs - Rings around Saturn, Secret Code, Mindboggling, Showette, Memory Test, Metric conversion.
Description - Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required - ZX81.
Price - £4.95.

Programs - Train Race, Challenge, Secret Message, Mind that Meteor, Character Doodle, Currency Conversion.
Description - Five games plus easy conversion at will - for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required - ZX81.
Price - £4.95.

Programs - Cowen Under, Submarines, Doodling with Graphics, The Invisible Invader, Reaction, Petrol.
Description - Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £4.95.

Programs - Martin Knock Out, Graffiti, Find the Male, Labyrinth, Drop a Brick, Continental.

Description - Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £4.95.

Programs - Galactic Invasion, Journey into Danger, Create, Nine Hole Golf, Solitaire, Daylight Robbery.
Description - Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required - ZX81.

Price - £4.95.
Programs - Race-track, Chess, NIM, Tower of Hanoi, Cooking the Spacepot, Golf.

Description - Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required - ZX81 + 16K RAM.

Price - £4.95.
Programs - Star Trail (plus blank tape on side 3).

Description - Can you, as Captain Church of the UK spaceship Endeavour, find the galaxy of the Klingon message?

Cassette G9: Biorhythms (ICL)
Hardware required - ZX81 + 16K RAM.

Price - £6.95.
Programs - What are Biorhythms? Your Biorhythms.

Description - When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Paces)
Hardware required - ZX81 + 16K RAM.

Price - £5.95.
Programs - Backgammon, Dice.
Description - A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Paces)
Hardware required - ZX81 + 16K RAM.

Price - £6.95.
Programs - Chess, Chess Clock.
Description - Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best Chess programs available. The Chess Clock program can be used at any time.



Cassette G12:

Fantasy Games (Paces)

Hardware required - ZX81 or ZX80 with 16K RAM.

Price - £4.75.
Programs - Perilous Swamp, Sorcerer's Island.

Description - Perilous Swamp: rescue a beautiful princess from the evil wizard Sorcerer's Island; you're guaranteed. To escape, you'll probably need the help of the Grand Sorcerer.

Cassette G13:

Space Raiders and Bomber (Paces)

Hardware required - ZX81 + 16K RAM.
Price - £3.95.

Programs - Space Raiders, Bomber.
Description - Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Paces)
Hardware required - ZX81 + 16K RAM.

Price - £5.95.
Program - Flight Simulation (plus blank tape on side 2).

Description - Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1: Fun to Learn series - English Literature 1 (ICL)

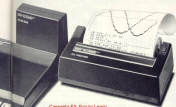
Hardware required - ZX81 + 16K RAM.
Price - £5.95.

Programs - Novelists, Authors.
Description - Who wrote Robinson Crusoe? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series - English Literature 2 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £5.95.

Programs - Poets, Playwrights, Modern Authors.
Description - Who wrote Song of the Shire? Which playwright also played cricket for England?



Cassette E3: Fun to Learn series - Geography 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Towns in England and Wales, Countries and Capitals of Europe.
Description - The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4: Fun to Learn series - History 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Events in British History, British Monarchs.
Description - From 1066 to 1801, find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5: Fun to Learn series - Mathematics 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Addition/Subtraction, Multiplication/Division.
Description - Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6: Fun to Learn series - Music 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Composers/Musicians.
Description - Which instrument does James Galway play? Who composed Peter Grimes?

Cassette E7: Fun to Learn series - Inventions 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Inventions before 1665, Inventions since 1665.
Description - Who invented television? What was the 'dangerous Lucifer'?

Cassette E8: Fun to Learn series - Spelling 1 (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £6.95.

Programs - Series A1-A15, Series B1-B15.
Description - Listen to the word spoken on your tape recorder, then spell it out as your ZX81, 360 words in total suitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Park (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £8.95.

Program - Collector's Park, plus blank tape on side 2 for program/data storage.
Description - This comprehensive program should allow collectors of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)

Hardware required - ZX81 + 16K RAM.
Price - £8.95.

Program - Club Record Controller plus blank tape on side 2 for program/data storage.
Description - Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, phone numbers plus five lots of additional information - eg type of membership.

Cassette B3: YU-CALC (Paine)

Hardware required - ZX81 + 16K RAM.
Price - £7.95.

Program - YU-CALC

Description - Turns your ZX81 into an immensely powerful analysis chart. YU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: YU-FILE (Paine)

Hardware required - ZX81 + 16K RAM.
Price - £7.95.

Programs - YU-FILE Examples

Description - A general purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records of club memberships, keep track of your accounts, or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone - simply call Camberley (0376) 68104 or 21262 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

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REVIEWS REVIEWS REVIEWS REVIEWS

WARTIME FLIGHTS OF FANCY

London's safety rests on your tactical ability as commander of crash fighter squadrons as you fight the Battle of Britain.

Nine fighter squadrons and all your disposal to fend off attacks from nine German bomber squadrons. Each bomber follows a different route towards its destination. If 100 or more German planes reach London the battle is lost.

The computer allows you to send instructions to individual squadrons and it controls the movement of British and German forces. But there are no graphics. To follow this wargame simulation you must use a map.

I am sure this will deter many potential buyers of the game and it certainly detracts from its realism. A sketch map showing the starting positions of the British forces is provided along with the cassette — which loaded first time — and the fairly comprehensive instruction leaflet.

The controls are easy to use, but you can't spend very long deciding what to do next. The program continuously updates the squadron positions and status.

BATTLE OF BRITAIN

This, coupled with the fact that you are meant to use counters or a marker pen to follow the movements of the squadrons on the map, does not make the game very easy to play.

Commands you can send to your squadrons are: scramble, patrol, report, return to base and change course. You must follow each command with a squadron number.

If a British fighter comes within five kilometres of a German

bomber an aerial battle occurs.

One minor criticism is that the computer simply displays the word "retaking" when squadrons are locked in combat and all contact is lost.

British fighters have to return to base for refuelling. A problem which does not plague the enemy forces as they are equipped with long range fuel tanks.

Battle of Britain may appeal to the keen wargamer but it will be of little interest to the average IBM user, due mainly to the lack of graphics and the fact that the

game must be followed on a map. It is difficult to develop a good strategy, and the game generally lacks realism.

The program is also poorly written but with considerable re-writing it could be made into a stimulating simulation.

Battle of Britain runs on a IBM Z801 and is available from Cambridge based Microgame Simulations for £19.95.



WHAT'S ALL THIS THEN?

MURDER AT AWESOME HALL

If you have ever had the inclination to be a detective, Murder at Awesome Hall will give you the opportunity to test your powers of deduction.

Written for the Atari 400/800 computers, Murder at Awesome Hall is very similar to the board game Cluedo.

Your job is to discover who murdered Colonel Awesome, which of the 26 rooms the murder was committed in and which weapon was used.

To assist in solving the mystery, you are provided with an on screen floor plan of both the ground floor and the first floor.

After entering a room, pressing Q allows you to discover who or what is in the room. If the room entered contains one of the Colonel's associates, you can question that person.

You can also consult your detective notes which list the contents of the rooms you have visited and the answers to your

questions. By pressing L, a list of suspects and weapons will appear.

The computer will occasionally give you extra clues.

When you think you have the case solved press C on the

keyboard. This allows you to type in your answer, but be careful — if your answer is wrong 5 points will be deducted.

You then have the option of having another try at solving the murder or giving up.

The game is not visually exciting and rapidly becomes boring. Murder at Awesome Hall costs £14.95 from Calista Software and requires 16K.



I WANT CANDY!

CANDY FLOSS

When the sun is shining on Blackpool beach and Mum has only enough money for just one selfishly sugary delight six-year-olds dream of becoming candy floss magistrates.

Candy Floss will either make that dream come true or turn it into a nightmare of bad weather, miserably clonked and disruptive donkeys.

Candy Floss sets certain parameters for you to discover a recipe by trial and error, for success on the beach. You are given the cost of basic raw materials (sugars), the cost of advertising posters, and an accurate weather report. You have to decide how much candy to make, how many advertising posters to set up and at what price to offer your wares.

It comes, for the BBC model A or B, with a professional Star Trek program on the same cassette. All for £5.95 from Blackpool based L.J.K. Software.

JOURNEYS IN TIME AND SPACE

ADVENTURE!

Four dingy dungeons to inter stellar space. Acornsoft tempt you to travel these expanses with their Adventure package for the ICR Atom.

Attractively packaged within a hard book type cover it stimulates the imagination with visions of wondrous worlds and fantastic deeds. All instructions for loading, running and playing and a brief outline of the three scenarios (capable of being set up as included).

The program is loaded in three stages, the first being a file index read down to screen, allowing time for correct playback volume. Next, Advent is "LOADED". Taking about five minutes this gives you ample time



to decide which game to play. For the next stage a tape counter is a definite asset. As you "think the bits of your choice the Atom reads it from tape, thus to load and play intergalactic — the last game — takes about 21 minutes.

What do you get once loaded. Well, not a lot really. On the reviewed tape intergalactic failed to RUM. An audible test revealed considerable deterioration in recording quality on the last few program blocks.

MOUSEKATZ

WHERE THE RODENTS RUN RIOT

Larry Bain is a plumber with the Rodent Rooster Plumbing Service who installs pipes throughout the levels of Rat Alley.

This is a maze game and as in other games of this type, there is always a catch. In Mousekatz it is giant rats.

They meet the most causing considerable hindrance to your plumbing activities. As protection against the rats, head office has issued you with two cats and two traps.

The trouble is the traps only hold the rats for a few seconds.

The cats are so scared that they will not even move, but then do scare the majority of the rats. Unfortunately there are super rats in the maze and these simply eat the cats.

Periodically replacement cats and traps are dropped in the centre of the maze, but if they are not claimed quickly, they are removed by head office.

Once you have planked one maze completely, another maze commences with snarker rats. For every two screens cleared, you receive a bonus plumber. The movement of your plumber is controlled by a joystick.

This game is very difficult as well as addictive making each game a constant challenge.

Mousekatz is available on disc for a £25 Atom from Games Electronics and costs £22.95.

ALIENS WILL GIVE YOU THE SHAKES

SHOCKWAVE

A huge mother ship, lights flashing, slowly approaches. Suddenly it drops a smaller saucer, which crashes down into the atmosphere with a tremendous boom.

No, it's not a scene from the latest space movie but all part of Shockwave, written for the Tangerine Microstar (Micro) system. It's a game which, although interesting and tricky, is totally different from any other space game I have yet seen.

You load the program at CUTE speed, then, type Q400 to start the game.

The mother ship comes on and once in the middle of the screen starts to drop its alien offspring into stacks down each side of the screen.

Each stack holds five aliens, when the sixth alien enters a stack one drops from the bottom. To make things really hard, you can only shoot the aliens whilst in the stack.

The aliens do not shoot at you, they adopt a hunkered action. When they drop from a stack, they plummet to the bottom line, where a small shockwave

spreads out a little way either side, destroying your boss if it's within range. Hence the name of the game. The mother ship also drops small saucers at random.

It is important to shoot down these saucers before they reach the bottom line as the shockwaves they generate spread out over the entire base of the screen.

A good strategy is to concentrate on keeping the stacks as empty as possible. Aliens only fall when the stack is full. It is possible to fire a salvo of five shots by keeping the fire button depressed until five or more chunky blasts are above your ship. This means that you can be in the middle of the screen to shoot the saucers while your shots are still destroying the aliens in the far right or left stacks.

It is impossible to move and shoot at the same time, but this is not too much of a disadvantage because you can fire five shots in quick succession and dash back into hiding.

One criticism is that the controls are not explained anywhere in the program or on the sheet which comes with the program — otherwise very addictive.

Shockwave is available from the Tangerine Users Group, at a members price of £5.62 (non-members pay 25 per cent more) and requires 3K on Tunes.



DOWN TO BASIC

PRESENTATION IS VITAL

In all uses of computers, the presentation of the output is vital. This not only applies to games with a visual emphasis like Space Invaders, but also to business applications such as payroll systems.

In many cases, a lot of the time spent in designing and developing a program will be spent on the presentation of the output. The importance of this aspect of programming cannot be to denote this month's article to the extra facilities provided in many versions of Basic to help programmers improve their display of information.

These extra facilities can be divided into two main categories: the extra forms of the PRINT statement provided to allow the programmer to specify precisely where results are to be displayed, and the special graphics statements sometimes available — such as the PLOT statement — which are particularly useful for pictorial displays.

EXTRA PRINT FACILITIES

If the number of characters that can be printed on one line of the screen/paper is N , then you can think of each character position on a line as being numbered from 1 to N (N will vary from one system to another). The TAB function specifies a move to a particular character position on the line. The general form of the TAB function is

TAB(X)

where X may be a constant, a variable or an arithmetic expression. If the function

TAB(N)

were encountered in a PRINT statement, then a move to position N on the line would take place. If X is a variable or an arithmetic expression that takes a non-integer value e.g. $X = 14.5$, then the integer part of X will be taken as the required position (in this case 14).



The effect of using the TAB function is that printing will continue from the specified position. The statement

```
30 PRINT TAB(10);TRED;TAN;Y
would produce the following output, assuming that Y had the value 1.25.
```

position	1	2	3	4	5	6	7	8	
				T	R	E	D		
			9	10	11	12	13	14	15 ...
				1	.	2	5		

The cursor will move to position 3 then print 'TRED' in positions 4 onwards; it then moves to position 10 and prints the value of Y in positions 10 onwards.

The reason that the digit '1' appears in column 11 is that whenever a number is printed it is preceded by a minus sign, if it is negative, or a space, if it is positive.

Therefore, position 10 will contain either a space or a minus sign depending upon the value of Y. It is important to remember the space that precedes a positive number as it causes the value to be printed one position further to the right than might be expected!

It is also important to separate the items in the PRINT statement with semi-colons rather than commas when using the TAB function — otherwise you will be mixing up the precise specification of positions in the output line with the ideas of 'skipping to the next row' caused by the appearance of a comma. In many systems, it is in fact possible to omit the semi-colons and obtain the same effect:

```
30 PRINT TAB(10);TRED;TAN;Y;Y
```

The TAB function is particularly useful when printing a table — it allows you to specify the position of

each column. The section of program

```
30 PRINT
TAB(10);NAME;TAB(10);HEIGHT
35 PRINT
40 FOR I=1 TO 3
50 PRINT TAB(10);M(I);TAB(10);H(I)
60 NEXT I
```

could be used to output a table with the following format:

NAME	HEIGHT
FRED	1.04
MARY	1.52
CECIL	1.97

I have described the effect of TAB(X) as being the printing of the next item in positions X onwards.

It should be pointed out that in some versions the effect would be to print the next item in positions $(X+1)$ onwards — the result being that everything is shifted one position further to the right than in the version I have described.

Some systems also have the statements HTAB and VTAB. These can also be used to specify the required position for printing — however, these appear not as part of a PRINT statement, but as statements in their own right before the appropriate PRINT statement.

HORIZONTAL HELLOS

HTAB (horizontal TAB) is similar to the TAB function in that it specifies the required position of the cursor on the output line. VTAB (vertical TAB) can be used to select a particular line on the screen as the next output line. The statements

```
65 VTAB 10
70 HTAB 10
80 PRINT "HELLO"
```

would cause the word HELLO to be printed on line 10 of the screen in positions 10 onwards.

A number of the microcomputers offer special graphics facilities. These can include such things as special graphics symbols, statements for plotting points and drawing lines and things like selection of colours.

The range of facilities varies greatly and I will, therefore, only cover one of the more common

BY MOIRA NORRIS

statements — the PLOT statement in this article.

Before using the special graphics statements, such as PLOT, it is often necessary to indicate that you wish to enter "graphics mode". For example, on the APPLE II, you can use the statement:

30 GR

to set the computer ready for graphical display — the screen will be set up with 40 rows and 40 columns which can be referenced by graphics statements, and 4 lines at the bottom of the screen reserved for text.

It is then possible to select a position on the screen to be "shaded" by use of the PLOT statement:

40 PLOT 30, 30

will cause the small area in column 30, row 30 to be shaded. The APPLE II has colour facilities and it is therefore possible to select a particular colour for shading by using the COLOR statement.

The number of different positions that can be selected will determine the amount of detail that can be produced in a picture produced in this way. The APPLE II system offers two levels of detail — low resolution and high resolution. If the statement

30 HGR

is given, then the high resolution option will be selected. In this case, the area of the screen used for graphics is divided into 520 columns and 160 rows.

Positions on the screen can then be selected for shading by use of the HPLOT statement, which is similar to use of the PLOT statement. The penalty paid for the increase in the level of detail is the reduction in the range of colours available.

NEXT MONTH

Many inexperienced programmers are baffled by talk of the POKE and PEEK operations. Next month, I will explain the use of these in detail.

In addition, the features of the version of Basic available on the BBC Microcomputer will be outlined.

THE CORE OF THE APPLE SYSTEM

The peculiarities of the Apple II Basic feature in this month's machine-by-machine breakdown of the language.

VARIABLES:

Variables names can be of any length but only the first two characters are distinguished.

If a variable name is followed by %, it is an integer numeric variable.

ARRAYS:

Can have multi-dimensional arrays.

STATEMENTS:

Can have more than one statement per line using a ":" as a separator.

The form of the IF statement is <line no.> IF <condition> THEN <statement(s)>

Either a STOP or an END statement can be used at any point in a program to terminate the execution.

The GOTO statement can be used to transfer to one of a list of line nos, depending upon the value of a given expression

<line no.> ON <expression>

GOSUB <list of line nos.>

<line no.> ON <expression>

GOTO <list of line nos.>

The ONERR statement can be used to transfer to a line no. if an error is encountered

<line no.> ONERR GOTO <line no.>

CLEAR

clears all variables.

DEF FN

declares user defined one-line functions.

GET

reads a character from the keyboard without displaying it.

POKE

writes specified value at specified memory address.

POP

restores the most recent subroutines return address to be deleted.

RECALL

retrieves an array from cassette tape.

STORE

records in array on cassette tape.

WAIT

used to suspend program execution.

FUNCTIONS:

ASC

returns the ASCII code of the first character in the specified string.

CHR\$

converts code number to character.

FREE

returns the amount of free memory space.

LEFT\$

returns the specified number of leftmost characters from a string.

MID\$

returns a specified sub-string.

POS

returns current value of specified games paddle.

PEEK

value of byte in specified memory address.

POS

returns the cursor position.

RIGHT\$

returns the specified number of rightmost characters from a string.

SPC

used in a PRINT statement to supply spaces.

STR\$

converts number to character string of digits.

USR

calls the user's machine language subroutines.

VAL

breaks the specified string at a number.

Plus ABS, ATN, COS, EXP, INT, LEN, LOG, MOD, SIN, SM, SQRT, TAN, HTAB (horizontal TAB), VTAB (vertical TAB).

GRAPHICS:

Colour graphics facility statements

COLOR and HCOLOR.

PLOT C, R plots a "point" in column C, row R

similarly for HPLOT C, R in high resolution graphics

draws shape definitions set up in shape tables.

draws horizontal lines in low resolution graphics.

draws vertical lines in low resolution graphics.

sets angular relation for shape drawn by DRAW.

sets scale size for shape drawn by DRAW.

returns colour code of specified point on screen.

loads a shape table.

similar to DRAW but each point drawn in the complement of the colour already existing at that point on the screen.

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Brainwave

MIND ROUTINES

Starting at any of the above 16 numbers and by moving along the grid lines the object is to visit every one of the 16 numbers once and once only and keep a running total. The highest total wins. Send in your total and the path which obtains it.

For example: moving along the top row:

3+3-7+3

◆ Winners of our June issue Brainwave problems were D. Bell of Willesden Green, London NW1 and A. Leigh of Redruth in Cornwall. Bottles of champagne are on their way to both. Two more bottles can



be won for the first people out of the hat with this month's answers correct.

Answers to the July problems are on page 11.

NEBULA

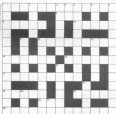
CROSSWORD

ACROSS

1. Distasteful management of channel changing (8, 7)
2. Zero-ten Deck game (3)
3. Good man, not a dick? (5)
4. Colourful puzzle innovator (5)
5. Putting together the SH 575 (5)
6. Average statistical distribution (8)
7. Such hand and nerve are required by arcade games players (6)
8. Program language collector (8)
9. Adventure game nobleman finds nothing in the barn (5)
10. Horror one might get from static (5)
11. Adventure game Humanaid from Goli Forest (3)
12. Best form refer relating for video adventure game (5, 2, 8)

DOWN

1. Early sacrifice from the top chess nation (7, 6)
2. Creative from Adventure Game noting in Gringo Green? (4)



3. Programming fish in force (9)
4. Animal back in the multiplexor (2)
5. Computer direction celebrity (5, 4)
6. Erase key without out (3)
7. Pedestrian Ending to Saint above at — a star in the West (4, 5)
8. Play these close to your chest (5)
9. Apple game for explosive animal people like you (6)
10. Cutting computer (5)
11. What a Galician does when he leaves formation (3, 3)
12. God painful with LISP (4)
13. It does nothing but is basically helpful (3)
14. Behold a function without force (2)

SOFTWARE GLOSSARY

A beginner's guide to plain jargon

ADVENTURE: A type of game in which the player has to take a character role and retrieve a number of treasures or objects by a trial and error process giving instructions to the computer. The player encounters a variety of hazards often taking the form of dangerous monsters, wizards and priests.

ARRAY: A series of items arranged to form a meaningful pattern.

BASIC: The most widespread computer language which is one of the easiest to learn and is used for programming all microcomputers.

BASIC COMMAND MODE: When you break into a running program it reverts to basic command mode (i.e. it will wait for new command instructions from the keyboard).

BUG: A slang term given to a mistake in a computer program which prevents it from working. It can refer to a mechanical, electrical, or electronic fault.

BYTE: A term to measure a number of bits (binary digit/5), usually there are eight bits to a byte.

COLOR: American spelling used to call colour out of several U.S. computers, e.g. the Apple.

CURSOR: A position indicator used by most computers to show where the next character should be entered.

DROP TARGETS: Targets on a portable which retract upon being hit by the ball.

SEE: A basic command which tells the computer to scan the keyboard and return with either a numeric or string value.

GRAPHICS MODE: A mode in which the computer can produce graphical characters and displays.

HARDWARE: The general term given to all pieces of electronic and mechanical devices which make up a computer system, i.e. the actual machines.

INPUT: A basic command which checks the keyboard for input and places it in a string.

INPUT: Data or information which is fed into the computer.

E: See kilobyte.

KIBYTES: A measurement of memory capacity. 1K is equal to 1024 or 8K is equivalent to 8192 bytes.

LED: (Light Emitting Diode) Provides a simple display and consists of an electron tube which lights up when electricity is passed through it.

LOAD: Instruction which is used in conjunction with a cassette recorder to transfer programs from tape to the computer's memory.

MATRIX: A rectangular array of numbers subject to mathematical operations.

PACMAN: The first ghost in the maze arcade game which has since been recreated in many forms and on many computers. Player takes control of a gobbling creature and eats dots in the maze while avoiding pursuing ghosts.

POINT: To map or draw points on the screen.

RAM (RANDOM ACCESS MEMORY): This is a memory chip which you can load programs and data to and from.

RAMPACK: A cigarette-case sized pack of extra RAM which plugs onto the back of a Sinclair ZX81.

RUN: Basic command word tells the computer to perform the numbered sequence of actions referred to as a program.

SOFTWARE: Another name for computer programs, it can also refer to computer documentation.

STARTRAK: A popular computer game based on the TV series of the same name, in which the player takes command of the Starship Enterprise and roams the galaxy, destroying Klingons and investigating solar systems.

STATEMENT: An instruction in a computer program.

STRING: Usually represented by a S sign on the computer keyboard, a string is a connected sequence of characters or words, usually placed within PRINT statements.

SYNTACTIC ERRORS: Typographical mistakes in program lines. Information put in the wrong order, information which conflicts with other information or program lines which refer to other unentered lines.

UART: Abbreviation for Universal Asynchronous Receiver Transmitter.

VARIABLE: A symbol whose numeric value can be changed at all times. It is used when writing programs.

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HARDCORE

A GAMES PLAYER'S GUIDE TO THE ATARI 400/500

If you want to write any of your own programs you will need to buy the Atari Basic cartridge from any Atari dealer. Atari can supply you with a list of dealers and distributors on request. Most Basic disks closely to the industry standard Microsoft Basic, but has additional commands to cope with graphics and sound.

Both the 400 and 500 have a number of features in common including 15 colours with 16 intensities, four independent sound synthesizers to facilitate musical tunes or game sounds in four voices. You can alter the volume and tone of the sounds which are controlled via an internal speaker.

There are 57 keys on an alphanumeric keyboard and four extra control function keys in both lower and upper case. Inverse video can be achieved and you can carry out on-screen editing. Graphics are Atari's characteristic and there are 24 ways of setting graphics characters. The highest graphics resolution is 320 x 192 characters and the screen can handle 24 lines up to a length of 40.

Atari has recently brought the cost of its 400 down to £199.95. The 500 still retails at £299.

Many U.S. firms produce software compatible for the Atari 400 and 500 computers and these are now on tape from British distributors including Music Electronics, which has recently set up a software line called Mapepsi. You can contact them by writing to PO Box 3, Reading, Essex.

Another firm operating on the same lines is Calson Computers. Calson has an extensive range of games including Scott Adams adventures, and arcade favourites Ghost Hunter and Galactic Chase, for 100 machines costing £79.95 and £79.95 respectively. Calson can be reached at 118 John Bright Street, Birmingham B71 1BS.

Holco produces an intriguing adult only game entitled The Naughty One.

Other Holcoo games include Gold, Peter Rabbit and the Magic Carrot (for children), Peter Rabbit and the Naughty Owl, Peter Rabbit and Father Willow, and Lord of the Rings, part 1. Holco is based at 18 Britton Street, London EC1M 6WQ.

A recently formed company currently devoted to Atari software is Centaurus. The first two games to come off the production line are Shing and TT Race, both of which will sell for £19.95 at Corgis.

Other software suppliers are Angle American Software at 128a Stratford Road, Spentish, Birmingham B71 1BS. Software City which can be reached through Solent, 26 Bayford Road, Littlehampton, West Sussex, and the West End Atari Centre at 114-116 Charing Cross Road, London WC2.

MEMORY SPACE

The Atari 400 comes in a standard 19K unalterable version — but owners can take the 600 up a grade.

The more sophisticated 600 can handle up to 48K memory. The way to expand the system is to plug in three 16K 8000 pack cartridges. But remember that in reality you only have 40K of total addressable memory out of the 48.

Atari dealers and distributors should have stocks of these RAM packs which cost £55 each. In America the system can be upgraded to 128K via a Ramdisk from a firm called Adata. These are not yet on sale in the U.K.

For most owners' purposes the Atari maximum is quite adequate. Further memory space is only necessary only if you want to build up vast data banks of storage capacity.

EASY READING

There are so many facets to this fine computer that it is difficult to know where to start.

The computer itself comes with comprehensive manuals and an excellent Basic book to start you on the road to programming. All of the books are in an easy to read style. If you are new to computers I can recommend the invitation to Programming series.

This "listen and learn" series utilizes the Atari cassette track which allows synchronous speech through the TV speaker. This combination of speech and computer graphics really make learning fun.

The Atari's modular concept has meant that I have expanded my 600 from 16K to 48K in easy stages. To increase the memory all that is required is a 16K RAM module. Lift off the top of the computer and plug it in the slot allocated. This modular concept is also applied to the computer languages and games. It is the work of seconds to remove Basic from the front of the machine and plug in Pascal or an assembly language cartridge.

It, like me, you find it necessary to buy a disk drive, a whole new world of software becomes available as well as languages such as Microsoft Basic, Pascal and Fort. Unfortunately it seems that more and more of the American software houses are resuing their products on disk. If the Atari is a top seller in the States and disk drives are common place making a disk drive a must if you want to play some of the fantastic games that are becoming available.

One book I have found invaluable of late is Four Atari Computer by Len Poole, published by Deanna/McGraw-Hill. This book covers first principles and goes through to advanced programming.

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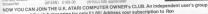
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Variable	Mean	SD	Min	Max
Age	38.5	10.5	25	55
Gender	0.5	0.5	0	1
Marital status	0.5	0.5	0	1
Education	12.5	1.5	10	15
Income	3500	1500	1000	6000

Table 1

Category	Value	Unit
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Account	Debit	Credit
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Inventory	1,000	
Prepaid insurance	1,000	
Equipment	1,000	
Accumulated depreciation		1,000
Common stock		1,000
Retained earnings		1,000
Dividends	1,000	
Interest expense	1,000	
Income tax expense	1,000	
Net income		1,000
Total	10,000	10,000

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Nonmarket Transactions				
Nonmarket transactions:	1	2	3	4
1. Gifts	10	100	100	100
2. Charitable contributions	10	100	100	100
3. Other nonmarket transactions	10	100	100	100

Key: C = Control; P = Post-Test; T = Test; S = Stimulus
[C] or [Controlled]; [P] = Post-Test; [T] = Test; [S] = Stimulus

[illegible]

Country	Year	Population (millions)	Population growth rate (%)	Population density (per sq km)	Population density (per sq mile)
United States	1990	248	0.7	30	77
United States	2000	268	0.8	32	83
United States	2010	288	0.9	34	88
United States	2020	308	1.0	36	93
United States	2030	328	1.1	38	98
United States	2040	348	1.2	40	103
United States	2050	368	1.3	42	108
United States	2060	388	1.4	44	113
United States	2070	408	1.5	46	118
United States	2080	428	1.6	48	123
United States	2090	448	1.7	50	128
United States	2100	468	1.8	52	133
United States	2110	488	1.9	54	138
United States	2120	508	2.0	56	143
United States	2130	528	2.1	58	148
United States	2140	548	2.2	60	153
United States	2150	568	2.3	62	158
United States	2160	588	2.4	64	163
United States	2170	608	2.5	66	168
United States	2180	628	2.6	68	173
United States	2190	648	2.7	70	178
United States	2200	668	2.8	72	183
United States	2210	688	2.9	74	188
United States	2220	708	3.0	76	193
United States	2230	728	3.1	78	198
United States	2240	748	3.2	80	203
United States	2250	768	3.3	82	208
United States	2260	788	3.4	84	213
United States	2270	808	3.5	86	218
United States	2280	828	3.6	88	223
United States	2290	848	3.7	90	228
United States	2300	868	3.8	92	233
United States	2310	888	3.9	94	238
United States	2320	908	4.0	96	243
United States	2330	928	4.1	98	248
United States	2340	948	4.2	100	253
United States	2350	968	4.3	102	258
United States	2360	988	4.4	104	263
United States	2370	1008	4.5	106	268
United States	2380	1028	4.6	108	273
United States	2390	1048	4.7	110	278
United States	2400	1068	4.8	112	283
United States	2410	1088	4.9	114	288
United States	2420	1108	5.0	116	293
United States	2430	1128	5.1	118	298
United States	2440	1148	5.2	120	303
United States	2450	1168	5.3	122	308
United States	2460	1188	5.4	124	313
United States	2470	1208	5.5	126	318
United States	2480	1228	5.6	128	323
United States	2490	1248	5.7	130	328
United States	2500	1268	5.8	132	333
United States	2510	1288	5.9	134	338
United States	2520	1308	6.0	136	343
United States	2530	1328	6.1	138	348
United States	2540	1348	6.2	140	353
United States	2550	1368	6.3	142	358
United States	2560	1388	6.4	144	363
United States	2570	1408	6.5	146	368
United States	2580	1428	6.6	148	373
United States	2590	1448	6.7	150	378
United States	2600	1468	6.8	152	383
United States	2610	1488	6.9	154	388
United States	2620	1508	7.0	156	393
United States	2630	1528	7.1	158	398
United States	2640	1548	7.2	160	403

10. *Journal of the American Medical Association*, 2000; 283: 2686-2692.

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Investment in R&D (percentage)	-0.00	-0.00000000	0.00000000
Capital structure (percentage)	-0.00	-0.00000000	0.00000000

Personal Financial Management	3	2004	2004/2005	120.00
Environmental Law	1	2004	2004/2005	120.00

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Table 1

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Abstract

Source: *U.S. Census Bureau, Current Population Reports, 1990*

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