

JULY 1982
75p

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NEXT MORNING

How would you like to win a pin? Daily has long perched at the top of the pinball manufacturers' tree and is offering one of its marvellous machines to two readers of *Computer & Video Games* magazine.

Today's pinballs are a long technological leap from the machines which dominated rule society in the 1950s and 60s. Their brilliant fantasy backdrops alone are in great demand, the skill features like drop targets, spin-level playfields, captive balls and multiple flippers, make them formidable and fascinating opponents. And some of them even talk!

Next month we'll publish the competition for you to enter but first you'd better check with your Mum, wife, husband or fatman to see if they'll let you.

Talking of Mums and wives, where do they stand as men push back the home computer frontiers. Research proves the personal computer field to be a male-dominated domain. But the title of the Computer Widow shows the view from the other side. Could



this be the start of a *Computer & Video Games* woman's page?

Haunted House, a spooky adventure for the too-too-naïve, is the pick of our games listings for August and features on the front cover of that issue.

Our readers know we like to be first with everything — so true to form we've got a Spectrum game hot off the Sinclair printer.

ZX80 owners will be able to take their computers on a hunting trip and for space fans with a VIC-20 we've got a game called *Koalas* — an arcade style asteroid adventure.

Watch out for the next issue at your newsagents or order your copy now by filling in the subscription form below.

I would like to be first to see several subscription
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FLY ME AN OWL

Owl suffered a setback on his first flight last issue.

Due to production problems beyond our control, the BBC Microcomputer supplement was late getting to the newsagents — only a matter of days but those first days are important ones in anything's life.

If you missed out on a copy of our 16-page supplement please fill in the form right and make use of our freepost facilities to make sure of your copy.

Fill in the form and address an envelope to *Computer & Video Games Owl Supplement*, Freepost, Brighton, Peterborough PE3 8BN.

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WANTED: A WRITER FOR C&VG

We keep pinching ourselves, expecting to wake up and find we are totally working for a magazine called *Computer & Video Games* at all.

It's sounder your idea of a dream job, why not write in and apply for the job of staff writer on the magazine.

This vacancy needs to be filled quickly and we thought we should give our readers an opportunity to show us what they could do for the magazine.

If you are interested, write in and give us as full a picture of yourself as you can: academic qualifications, age, where you come from, details of computer or previous writing experience, work experience, why you would like to work for this magazine and what you feel you could bring to it. Go to town, the more we know about you, the better we'll be to have you working alongside us.

If you could, also include an article, you have written yourself, which you would like to see in this magazine. Whether it's a game review, a day at the local arcade or a detailed analysis of the problems of programming *Spinal Defence* into your ZX81's chess program, it will help us gauge your writing style and ability.

Writing ability and a good knowledge of the English language are important but we are also looking for someone with an enthusiasm for home computers and getting in all its various forms.

To introduce a note of realism back to the dream, *Computer & Video Games* staff writers do not spend all their time playing games. The position responsible position and involves a lot of hard work and long hours as the present writer will testify.

We are not sure what sort of response we'll get to this request but if we are ignored, it may not be possible to draft out a proper reply to everyone. So please do not be too disappointed if you just receive a short letter back saying that we do not think you are suitable.



Please drop us a line at: Computer and Video Games, EMAP, Barnet House, 8 Bedford Hill, London EC1R 4JL.

CRACKING THE CODE

Dear Sir,

For three months I have been the proud owner of a VIC-100 computer which I have found very useful, especially for games programming.

I am, I think a competent basic programmer and, therefore decided to attempt to learn Machine Code for the VIC.

Since that time I have spent many bewildered hours reading through VIC Revealed by Nick Hampshire and have so far learned nothing.

In there an alternative book which caters for newcomers to machine code?

G. Freeman
Ardara
Essex

Editor's reply: Commanders itself produces a Machine Code Monitor cartridge which comes complete with a book and helps the user get to grips with 6502 assembly language.

BAFFLED ADVENTURER

Dear Sir,

I was most interested at the thought of being able to write my own adventure after trying the first issue of Computer and Video Games.

But in my dismay, in further issues they seemed to leave me behind as they went on LEX, RIGHT, LEFT, and such statements without explaining anything about them and I cannot find them in my BASIC guide book.

After that they seemed to leave me further behind without any explanation of why you should set it out in a particular way and how to get the computer to do what you exactly want, with a sort of "You must do this otherwise it doesn't work" attitude. I found this quite annoying.

Both my friends and I

found this most baffling and hope you will maybe include an extra page for the Adventure explaining the use of the statements etc.

M. Godfrey
Bright-on-Sea,
Essex

Keith Campbell replies: The statements you mention are standard Microsoft BASIC and have the following meanings:

LEN(X) — returns the character length of the string held as variable X.
RIGHT(X,Y) — returns the Y rightmost characters of the variable X.
LEFT(X,Y) — returns the Y leftmost characters of X.
MID(X,I,L,Y) — takes Y characters from X, starting at position I.

These statements are illustrated by the program below.

I did mention in the December issue that your computer would need similar statements to effectively program Adventure, which involves a lot of string manipulations.

Unfortunately, it is beyond the scope of my hotel and the space available to explain the BASIC language as well as a particular programming application.

As regards getting the computer to do exactly as required, every programmer will have different views on the precise method of coding.

My article aims to explain a basic technique, leaving the reader to think through the logic in detail. I try to point out some of the likely pitfalls.

For example, in the February issue I suggested that the verb "GO" would have to be pointed out with a blank or an error would result in the setting of R4. This, I hoped, would be sufficient for the reader to

deduce that to find the 3 leftmost characters of a string of length 3 would cause a computer error!
10 REM Demonstration of
LEX, RIGHT, LEFT,
MID

20 LET X1 = "COMPUTER &
VIDEO GAMES"
30 LET Y = 5
40 LET Z = 12
50 PRINT LEN(X1)
60 PRINT RIGHT(X1,Y)
70 PRINT LEFT(X1,Z)
80 PRINT MID(X1,2,Y)
90 END

THE FETE OF DEFENDER

Dear Sir,

As an avid Defender player I am wondering if there is such a game available for the ZX1 apart from Quixote's version.

Also, although I appreciate the Research Machine 2002 is not a cheap computer, would it be possible to point an arcade style game machine to be used at my school late later in the year.

Simon Ray,
Ipworth,
Hertford.

Editor's reply: Quixote's seems to be the only firm with a version of Defender in its catalogue at present.

If you turn to page 58 you will find a program listing of Minid Command which runs on a Research Machine 2002 computer. Perhaps you could use that at your school late.

SOLUTIONS ON APPLE

Dear Sir,

I would like to help Apple users to get the most out of their computers by giving some solutions to the problems that Paul Caine has written to you about in your May edition Mailbag.

The problems that Paul had with sound is easy to solve. All he needs is this solution:

```
5000 POKE 260,0:POKE  
2602,POKE:270,0:2  
5010 POKE 271,0:POKE  
272,0:POKE 273,0:2  
5020 POKE 274,0:POKE  
275,0:POKE 276,0  
5030 POKE 277,0:POKE  
278,0:POKE 279,0:2  
5040 POKE 280,0:POKE  
281,0:2
```

```
5050 NOISE=260:  
PIT=272:DB=278  
To get a sound, use POKE  
PIT, (PITCH-128):POKE  
DB, (DURATION-128):  
CALL NOISE
```

To get good sound effects you should use loops which change PIT or DB. The sound which I find is good for a laser is:

```
FOR I=1 TO 300 STEP 5  
POKE DB, 2:POKE PIT,  
12:CALL NOISE:NEXT I
```

If you don't find that satisfactory you can change DB or the loop or try to make your own sound. There are thousands of possibilities!

A. M. Store,
Hertford,
Hertfordshire.



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MAILBAG



ADDING TO THE ZX81

Dear Sir,
I am another lover of your first cover picture, especially April's Medusa pinball machine.

The main reason, however, for writing to you is to ask you about the compatibility of two add-ons for the ZX81.

Supposing someone who wanted two add-ons — in my case these are the Di-Tronics graphics ROM and the Micro-Gen joystick — wanted to use them together. How do you know whether it will work?

Could you please tell me if the above two add-ons will work in conjunction with one another, and how to find out whether any two will work together, or I can ease this is not an uncommon problem. Jonathan R. Perkins, Stoke-on-Trent, Staffordshire.

Editor's reply: The Di-Tronics graphics ROM resides at 8K—12K in the ZX81 memory map. If your add-on uses particular part of memory then you will have problems. One case where this is true is Telemation I/O port. Two add-ons will work with each other but obviously not in the same area of memory. For the smaller add-ons such as graphics or sound boards microboards are recommended on several companies including Quikdrive.

EXPANDING BEYOND 16K

Dear Sir,
I am writing this letter in the hope that you will publish it, if not, part of it as a warning to all ZX81 first-time owners/users who are contemplating expansion beyond 16K.

On the surface the series of 32, 48, 64 and 128K units do appear to be the answer. Once the decision is taken and your money is down — the simplicity ends right there!

After a wait of five

weeks my 64K unit arrived. Enclosed were two single-sided sheets of keypad size instructions and advice.

The unit was well made and very professional in appearance but it took me two days to discover that it was probably faulty. The main problem was that I was simply not convinced enough in programming or user capability to be able to decipher the instructions.

Where the unit should have accepted "ZIMA 0000" it would only accept a maximum of "ZIM 0000". Next was a "SIMPLE RAM TEST PROGRAM" which gave an "ERROR AT" error byte. I entered "CONTINUE" each time it stopped for 160 bytes. I gave up on this lot!

The final section dealt

with how to use the unit. Considering how many ZX81 owners are now composing very rude letters to the manufacturers concerned, R. H. Leathers, Birmingham, M. Roberts, Here.

ANNOYING HABITS

Dear Sir,
Being the reasonably proud owner of a ready built Sinclair ZX1, I have recently discovered an annoying habit the machine possesses. I purchased the computer about five months ago and now it refuses to edit any lines of a program after being in operation for an hour or more.

You can imagine the frustration this can cause

your magazine by accident in a local newspaper and find it both entertaining and informative. I shall be placing a regular order for the future. Thank you for a month of break with D. McEwan, Birmingham, Scotland.

Editor's reply: This is a recurring problem. I have experienced the same difficulty, but on a number of other bags as well. It could be a number of things.

The leads from the keyboard to the main computer sometimes get loose, especially as the cursor editing keys are very close to where the leads join. To edit, by the way, use the cursor control keys on 6 and 7 to move the up and down after a LBST. Then push shifted ONE to bring the line down.

PICTORIAL POSER

Dear Sir,
There are many viracily handicapped owners of micro computers who depend on the computer press as a source of information and programs. Being of independent nature, most of us like to read for ourselves using visual aids rather than rely on another person to read out loud. Most of the popular magazines provide reasonably clear print, but I'm afraid that Computer and Video Games has to come bottom of the list by your habit of providing pictorial backgrounds not only to articles but to program listings.

Perhaps the worst example to date is in the Adventure series in the April issue where text is in black on a dark grey background. P. V. Bamfield, Brighton, East Sussex.

Editor's reply: Please tell me, Mr. Bamfield, we will try to cut out certain screens but please advise us to skip the odd illustration under copy to keep our design tidy.



with "CONFIGURATION OF THE MEMORY SWITCHES". MODE I states "THIS MODE PROVIDES 64K OF MEMORY AND IS FOR FUTURE DEVELOPMENTS".

This statement worried me because I was under the very definite impression that I had a 64K unit available now! Though you have probably guessed the source of the firm concerned I have deliberately avoided stating it as they have yet to have their say. However, in no way can they be excused for making a complete mockery of the concept of the ZX81. I will be posting the unit back at the same time as this letter.

No matter what the final

when one has to type out whole lines in order to get rid of the odd six legged scatty! I would be interested to know if anyone else has the same problem.

I assume that I am operating the machine correctly — SHIFTED ONE — to bring down the line notified by the cursor.

If this fault cannot be rectified as it happens to be a fault of the machine, this is inclined to make me apprehensive about purchasing software etc. I have written to Sinclair Research about this problem at the same time I am writing to you and I will forward any reply I receive!

By the way I discovered

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C.V.



MAILBAG



DELIGHTFUL LISTINGS

Dear Sir,
Having decided to purchase an Atari 800 some four months ago, I was distinctly delighted to discover **Computes and Video Games** and, in particular, to find the Atari program listings. The French program is an achievement in graphics, as is *Chif*, both of which were well worth the effort involved in punching the keys.

Changing hearts proved to be more of a diversionary story until I deduced that there must be an error in line 45, defining *CH*. The correct expression is *CH="RUELEANC, JOCIF,ADG, JOCIFLOFL, JOCIFLOFL, JOCIFLOFL"* all with control pressed for the characters between the quotes.

Experience of punching in programs from a number of magazines shows that the first place to look is for errors in punching the keys — Atari line by line error messages help a lot here — but if everything else fails, check any related material in the descriptive text.

By the way, the plastic ruler really is a great help when entering programs but it is quite good for scratching your head when you are trying to find the bugs in the software.

I've been to see you publish a guide to the differences between varieties of BASIC. I would love to convert some of your listings to run on my machine. Treasure Hunt looks very easy!
Nigel R. Hughes
Flint
Northampton

OF PEEKS AND POKES

Dear Sir,
I was most pleased to see such a long list of Trek programs featured in the March issue of your magazine last towards the end of it I noticed the usual problems, **PEEKs and POKEs**.

I know that you have said before that publishing conversion tables was not practical, but I have found your magazine next to useless as far as the program listing

I would like to try and convert because of the incoherence of these commands.

Perhaps you could at the end of each issue give conversions for just those **PEEKs** and **POKEs** appearing in that issue, or could devote one page each month to conversions so that the tables can be collected by the many people, who, like me, are learning about **PEEKs** and **POKEs**. Perhaps you could even print a special issue of conversion tables at some time in the future, although it might be easier still if you could only show programs that avoid **PEEK** and **POKE** altogether.

If for some reason none of these suggestions are practical could you give suggestions as to what books I would have to buy to do my own conversions between the machines you cover. I have a BBC machine.
P. Crossley
Aldershot
Hants

Editor's reply: *Moira Morris's Down to Basic* series is currently detailing the intricacies of *Basic* on individual machines.

PEEKs and **POKEs** do present a more complicated problem but as they are responsible for many of the most interesting graphics and sound features on many machines, it is too limiting to discuss programs that contain them.

David Lane's *The Basic Handbook* by Computer Publishing is the time we usually recommend to help with conversion problems but our copy unfortunately doesn't contain any references to the BBC Microcomputer.

MORE TIPS ON CRESTA

Dear Sir,
Regarding your *Moira Morris* article in the March 1982 issue, I find that you have missed what I consider the most important tip on the machine:

1. The second screen of *Gold Eyes* — the first type of alien — the yellow ones, will loop underneath and blow up anyone who hides for any length of time in the bottom left hand corner. To avoid, move to the right as the alien starts it's last loop.
 2. On many machines, after completing two successful missions the last one of each type of alien becomes faster, much faster than your ship.
 3. Docking occurs after the interlude if all three ships are intact, so get in the middle of the screen after the 5th pair.
 4. The last 4 D will materialise at the top of the screen, then become invisible until the bottom of the screen. However, it never goes into the left hand corner, making this very safe.
- Ken Bland
St James
Northampton

BINDERS ON THE WAY!

Dear Sir,
I have enjoyed your magazine, right from number one, and as you can imagine they are getting a bit of a muddle, so could you tell me if you have any plans for releasing a binder for them.
Also how about reviewing

some old computers? — by that I don't mean ancient models, just the ones that have been on the market for some time. I have been trying to find a review of the Sharp MZ-600 but without luck.

T. Carr
Cherry Hinton
Cambridge

Editor's reply: In the near future we are going to review some of the other computers in our Hardware section. Regarding the binders for the magazine, we are in the process of getting these organised and they will be available in a few months' time.

VIC FAN'S QUESTIONS

Dear Sir,
I am a proud owner of a VIC-20 and have three questions to ask. Firstly, I would like to know if complex games of 14K or above will fit available on cartridge without expanded memory i.e. the cartridge is the full memory needed to play a game, such as aircraft simulation.

Secondly, what are the advantages of cartridges over cassettes? And, finally are there likely to be any modern arcade games available for the VIC-20 such as Defender, Tempest or Galaga which offer superb sound and graphics and would easily find a place in anyone's software library.
Richard Brayshaw
Scotbury
Macclesfield

Editor's reply: Advantages are considered among the most memory-consuming and complex of computer games, Richard, and Commodore is releasing a series of five of the better-known adventures for the VIC-20 in cartridge form which will not need any expansion.

Although Commodore will not be releasing the games you mention in the near future, the company is producing a large range of software closely following the arcade trends. Versions of several arcade successes like *Cent* and *Omega Race* will be available soon.

The main advantage of cartridges over cassettes is that no extra memory is needed to play quite sophisticated games.



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**YES YOU CAN
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Could you Beat-the-Bug in the giveaway puzzle on the front of our June issue?

A BBC Microcomputer goes to the writer of the best computerized solution we receive but the puzzle can also be solved by good old-fashioned brain power.

In all there are eight solutions if you count the first movement of two pieces of Data as one move. But all eight are just variations of each other with the Bug's first move dictating the rest of the solution.

If you found the puzzle beyond you, we have noticed a solution below which should help you to solve it.

We have given each position a number (as indicated to the right), and the "Z" stands for Data Z; the "A" for Data A; and the "B" for the Race's answer.

Using these abbreviations, the solution is demonstrated by showing which piece is moving, then giving the position it presently holds and the new position it is moving to. So A 2-4 means that the piece of Data A on position 2 moves to position 4 — the central square.

Z 3-4; Z 3-5; 图 3-5; Z 3-7; 图 3-6; 图 3-7;
 图 3-8; Z 4-2; 图 3-9; Z 4-4; 图 3-7; 图 3-8;
 图 3-9; 图 3-9; 图 3-7; 图 1-3; 图 3-9; 图 3-9;
 图 3-7; Z 4-2; 图 3-4; 图 3-8; 图 4-7; 图 3-8;
 图 3-8; 图 3-8; 图 3-7; 图 3-7; 图 3-4; 图 3-7;



Confessions of a Bug

We bugs have done the dirty on Acorn Atom owners for the last couple of issues. First there was a barely noticeable little flaw which cropped into line 3071 of *Spiderman in the May* issue.

Age Group	Total (%)	Male (%)	Female (%)	Unknown (%)
18-24	15.2	14.8	15.6	14.9
25-34	22.1	21.5	22.7	21.8
35-44	28.3	27.9	28.8	28.1
45-54	20.5	20.1	20.9	20.3
55-64	12.7	12.3	13.1	12.5
65+	2.2	2.1	2.3	2.0

2011 IFAT00+021 32 and A700+021
BAND 4

We also lampored with Save The Princess in June — well, who wouldn't? — and the corrections for that program read:

Delete line 270 and the first 145. Add:

```

240 0.000
250 PA=DETA-A+E-FA=M; REM
MOVE ME
ADD5 0=0

```

4840 APT C-32.7(3)
G-8+48.5.108
4828 IF APT C-12.9-7
5866 P. 60-22.6(3)-22.7 STARS
"58.5.35" "58.5.35" "58.5.35"

But perhaps our biggest coup was the smuggling away of the Go program from June. The program, which turns your T.V. screen into a Go board, is featured below.

```

10 REM KIOKIO Main Routine
20 DIM P415,10
30 REM Initialize board
40 GOSUB 3000
50 REM display entire board
60 GOSUB 3000
70 REM accept move
80 GOSUB 3000
90 IF P415(1)=0 THEN GOTO 100

```

```

0000 REM Store score
100 SCORE=0000
120 GETO S0
140 GETP
160 GETO S0
2000 REM Initialize Board Subroutine
2020 FOR T=0 TO 9
2030 FOR D=1 TO 9
2040 LET B(0,T,D)=0
2040 NEXT D
2050 LET B(1,T,D)=COS(PI+2*PI*D/9)
2060 NEXT T
2070 RETURN
3000 REM Display Board Subroutine
3020 PRINT AT 0,0
3030 FOR T=1 TO 9
3040 PRINT B(0,T)
2060 NEXT T
3070 PRINT "123456789"
3080 RETURN
4000 REM Accept Move Subroutine
4020 PRINT AT 20,1;"COMMASD?"
5000 INPUT C$
5010 IF C$="?" THEN GETO 3000
5040 PRINT AT 20,1;"?"
5050 INPUT I
5060 PRINT AT 20,1;"?"
5070 INPUT J
5080 RETURN
4000 REM Score Move Subroutine
4010 LET B(0,I,J)=COS(PI)
4020 RETURN

```

BRAINWARE ANSWERS

The answer to our June Mind
Benders problem is:
SEMPER PARVUS OFF-
FARTOG

The correct solution to last month's Nevada Crossword is printed right and the winner's name will be published in next month's issue.

For more puzzles to test your brain, turn to page 71 for this month's Mind Routine and *Newsies Continued*.

[illegible]

yours Mad

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS GAMES NEWS

THE CHATTER OF FALLING ALIENS

DEFENCE COMMAND

Now games can speak to you while you fire away at enemy invaders.

That is one of the features of a recently introduced game *Defence Command*. Hordes of aliens coming in a plethora of shapes, sizes and armaments are attacking your planet's fuel sites.

You are put in charge of defending these vital supplies from the enemy force and must destroy them before they land on one of the line of fuel tanks and try to whisk them away.

All is not lost if one of the attackers manages to reach a fuel can. You can wipe him out as he makes good his escape but it can be tricky if you leave it too late. After killing the alien you must catch the fuel can as it falls from the creature's clutches.

At certain points in the game a synthesized voice bleats at you — but never to offer peace.

Defence Command runs on the TRS-80 and the Video Game with 16K memory space. It costs £10.95 with an extra 10p for postage and packing and can be bought through dealers or mail order from the London based Essential Software Company.



ANOTHER VIC IN THE WALL

THE DEMOLITION GAME

Another Vic in the Wall spends rather like the title of a certain song. In fact it is a new game for the Vic-20.

It is like the arcade game *Breakout* where the player manoeuvres a ball at the bottom of the screen to hit a ball against the wall opposite.

As the ball hits the wall it breaks bricks slowly demolishing it one brick at a time.

The game uses a curved ball and the game gets harder

CHOMPING, CHEWING AND CHASING

ATOM MAN

Chomping, and chewing then may round your Atom are lots of little Atom men.

The Atom men are dangerous beasts maniac for their voracious (and very healthy) appetite. Atom Man is the latest version of Pacman for the Atari Atom computer and its predecessor's say time has been sacrificed from the original successful arcade game.



You cannot see monsters who run along the walls of the maze eating up the dots living there. The five Atom Men are usually in pursuit of you but the rules can be reversed as you have the power to devour them. You get three lives to play with and if you score 10,000 points or over you are given an extra life.

Incorporated in the game are different fruits which are worth bonus points if you can eat these. Also included is a tunnel running from top to bottom of the maze where the chasers, slow down and are therefore more vulnerable.

A visual warning flashes on the screen moments before the monsters revert to their chasing role, and sound effects include a beep each time you eat a dot. Written in machine code for fast action there are two speed levels for you to attempt and three skill levels.

Graphically the game gives a fair imitation of the original characters and uses Atom's high resolution graphics level four. It runs on a full 128 Atom and costs £6.75 from Hopesoft.

AN UP-TO-DATE CHESS CHUM

If you have difficulty finding a mate of similar chess standard to yourself there is now one who keeps himself up to date with computer chess advances.

The Mate is a combination between software and hardware with the powerful program system on disc but also including a board. There is no need to tap in your moves, just place the pieces as you normally would in a conventional game and the new position is picked up by the magnetic sensors on the board.

The program is written by Applied Concepts, manufacturers of the Boris and Morphy chess programs and comes on a floppy disc which can be upgraded.

When the system is hooked up

THE MATE

a picture of the board is displayed on the screen. The Mate makes its own move which is indicated by L.E.D. lights positioned on each square.

The chess program includes the on-passant move and castling and if you link the computer up to a printer you can get a printout of every move.

At present your little Mate only runs on the Apple II computer but plans are afoot to adapt it for use on the Pet and Lundy.

Priceview it falls into the more expensive and of the market retailing at just under £200 including VAT, from Database.



NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS

DEATH LURKS IN THE LABYRINTH

MACROSS

War things are mild-mannered compared to the Macross found wandering the tunnels of this labyrinth.

Your quest is to search the corridors of a complex maze for hidden treasures contained within it. But as you traverse the

confines of the maze there are 50 evil-minded Macross on the lookout for you.

Guiding you on your journey are processes who have been spared death on their quests. Instead of being killed the Macross have placed them in a state of suspended animation and locked them up in the walls of the maze.

Only when you, the explorer, investigate the maze's corridors do they come to life again. You can recognize them by their blinking eyes, and they will give you information.

Unfortunately, you have been endowed with a poor memory and can only retain this information for 10 seconds.

Getting the Macross is possible with the 10 rewards which are stored about the underground passageways for you to pick up and use in your defence. But beware, you can only use them once, and can only pick one up if you are unharmed.

Three game variations are available on the cassette which can be brought from Liverpool based Big Byte for £10. It runs on a Sinclair ZX81 with a ZX81M pack.

NEVER A CROSS WORD

SCRIBBLE

Two new computerized word games will help Scribeble lovers to develop their lexicography skills.

Scribe is like Scribeble, that old favourite board game. For one or two players you use a chequered board where you spell a word from letters which are randomly thrown up by the program.

But you can't hold on to letters you don't use during your turn.

You can place the word on the board as you do in Scribeble, so that at least one letter in the word you create interlocks with one of the words already placed on the board.

Points are scored for every letter, the value of each one depending on the degree of difficulty there is in using the letter.

Keeping score for the players is the computer, and it also places the letters.

This game runs on the Texas Instruments 5944, and is produced by FRP Computer Graphics. It has also brought out a crossword game in which the player has to fill in the frame with six words.

Both cost £5 inclusive of postage and packing with discounts available. Copies are obtainable by mail order from Stephen Shaw, 10 Alstone Road, Stockport, Cheshire.

SHUTTLE OFF ORE ELSE



FOR THE SERIOUS GOLFER

GOLF

Grab your nine iron and head for the bunkers — the game of golf is scoring a hole-in-one with micro users.

One version of golf — one of several around at the moment — runs on Atari and the Apple. You can play games, simulations of courses that actually exist, with a full selection of clubs available for your use.

The game contains all necessary information for a realistic simulation. Wind, weather, and other atmospheric factors are taken into consideration.

You are in total control over almost everything you do. You can make any type of shot that you want. You can determine the amount of force you want to use when hitting the ball.

This is a good colour simulation which could substitute for the real thing on rainy days.

Golf is available from Hudson or Scribeble for the Apple and Atari. It requires 64K of memory and costs £29.95.

APPLE JOB FOR SELWYN

Reviewing games has blossomed into a full time job for Computer and Video Games Apple reviewer Selwyn Ward.

Now he has implemented his vision by bringing out a new bi-monthly magazine Computer Games Review.

The first issue is due out in June.

Computer Games Review is published by Kent-based Computer Publications and is available by subscription only.

ESCAPE FROM PULSAR 7

has grown into a vicious beast the size of a small town.

The cops can no longer contain it and before your men have a chance to dope him into a state of suspended animation he breaks out and over-charge kills them all.

Now your only chance of escape is to take to the shuttle craft and head back to your own planet. But the evil beast is playing a cat and mouse game hiding in the recesses of the Pulsar 7 freighter, and biding and moving to trap you.

This is a space adventure game and the way to escape is by trial and error, but head carefully and choose your path to the shuttle craft wisely. The monster could be waiting around the next corner to attack you.

Escape From Pulsar 7 runs on a TRS-80 or Video Game and

costs £10.50 including VAT and postage and packing for the tape version, and £14 for the disc version. It is available from Malvern of Buxton on Sire.



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NEW PRODUCTS NEW PRODUCTS NEW PRODUCT

GAMES NEWS

CUT OFF THE FEDERATION'S SUPPLY LINES

SUBSPACE STRIKER

Take control of an airborne Swordfish and rid the galaxy of Federation moops.

The Federation has taken over the planets in the universe ruling with austerity. As the commander of a super space cruiser your job is to disrupt the Federation's space lanes to cut off their fuel and arms supplies.

You man the flight deck of a sophisticated cruiser, a sub-space striker named *Swordfish* which is equipped with a newly developed subspace drive. This facility allows you to hide in deepest hyperspace and "surface" when you want to attack the enemy using lethal Atomic torpedoes.

Detecting the enemy is made easier for you with a real space sensor probe which can indicate the location of vessels and give you a readout of their speed and range.



THE MEANEST MARAUDERS

SPACE MAZE

Locked deep in a space maze lurk the Frago aliens. A meaner band of marauders you wouldn't hope to meet.

You are dropped on a planet in the middle of a maze which is infested with Fragoes. As you tread the paths of the maze in an effort to escape, the Fragoes are alert to your movement and scurry through the corridors.

Once they stand in an your position it means certain death for you. Without a moment's hesitation they will attack you.

Space Maze is a full colour game and shows up a different maze when you begin a new game. Each one is drawn in 3D to heighten the interest and the maze contains additional doors which you can choose to go through if you feel brave enough. But beware if you don't know what awaits you the other side.

Program Power is the brain behind this new game which numbers amongst the first to be released for the BBC Microcomputer. It's out now from the Agents based firm for £5.95, a copy. It's only compatible with the model B machine.

DODGE THE DEADLY RAIN

VIC GALAXIANS

Instantly turned out.

On the Fun pack you get a version of the best-and-bell game, *Breakout*. *Dodgers*, the car collision game, *Simon*, the musical memory game and the very campy *Snake*, which has the player controlling a gradually growing snake as it romps around the screen gobbling up letters.

The second tape brings to life, a *Star Trek* game called *Galaxy*, the Japanese five counters war game of *Goemoku*, the colour code game of *Mastermind* and a hard-to-beat *Reversi* program which will test all but the very best players.

The cassettes make good use of the computer's marvellous graphics and retail at £8.

Wipe out the waves of bad like creatures to save yourself from certain destruction.

Out now from Bug Byte is a version of the popular arcade game *Galaxians* called *VIC Galaxians*. Dodge the rapid fire raining down on your laser site but keep up your own shots to blast the alien force off the screen.

Bare hazards for your ship are large asteroids which split up into smaller, deadly rocks. The game displays a high score and is written in machine code to make the on screen action faster for a more addictive game.

It runs on the unexpanded VIC-20 and is priced at £7 available by mail order from the Liverpool firm.

A GALAXY OF GAMES

FUN & STRATEGY

A galaxy of games for the BBC Microcomputer have recently found their way onto the market.

The BBC itself is producing two games cassettes which have been written for the company by Acornsoft. The cassettes are titled simply *Fun Games* and *Strategy Games*. There are four on each cassette and they are all tried and trusted favourites, previously turned out.

TIME TO PLAY APLENTY

VIC 5

Hours of playing time is packed onto one cassette in the shape of six addictive games.

The *VIC 5 Pack* will keep you entertained with games like three real fruit machines, the word guessing game *Hangman*, a missile attack game, a version of *breakout* and a space battle game.

It comes from Bolton based *Bedlam*.

More than six packs and in the pipeline for the VIC featuring different games at a reasonable price. *Vic 6* will cost you £10 and is available by mail order from Bolton-based *Bedlam*.



The Federation has a fleet of sweepers, fighters and cruisers which are on red alert to attack your ship when it surfaces. Their cruisers are equipped with sub-space mines and are on the verge of mastering the technology of subspace drive.

This game is the first product from a new firm *Pixel Productions* can up to write software for the VIC-20 and the Sinclair ZX81. Based in Southwest London, the firm plans to bring out more software for both machines on a regular basis.

Subspace Striker runs on both the VIC and the ZX81 with 10K expansion RAM pack. It's obtainable by mail order for £9.95 (VIC version) and £9.95 (ZX81 version).



TV GAMES CENTRES TV GAMES CENTRES TV GAMES VIDEO SCREEN



THE MUTANT SWARM ATTACKS!

YAR'S REVENGE

A band of mutant hound flies were the result of a mad scientist's experiment which went drastically wrong. The Yars are a powerful race and have been in conflict with an enemy called the Goolie for a million years. Now they are embarking on a savage assault to do away with these evil beings.

The Goolie control a section of the galaxy controlled by an impenetrable shield.

The Yars have been trying to build a suitable weapon with which to destroy the shield and their enemies.

At last they have perfected the Zenlon Cannon. Once the soldier penetrates the Goolie shield the Yars can use their super sophisticated, and highly accurate Zenlon Cannon to wipe out the attacking members of the Goolie. You control a weapon which can destroy the protective shields surrounding the Goolie.

In the last of the Yars onslaught the Goolie fight back in defence of their space territory. Yar's Revenge was developed in the states by Atari and is hailed by the firm to be a "totally new game concept developed by Atari engineers".

Yar's revenge runs on an Atari WCS and is scheduled for release in July. There are eight different versions of the game on this cartridge catering for one or two players and various degrees of skill. The retail price is £29.95.

MONKEY BUSINESS

MONKEYSHINES

You can keep swinging in Jungle Book style in Monkeyshines.

In this game purely for children there are two different versions to learn and practice the art of hand-eye co-ordination.

The first is Monkeyshines. For one or two players the object is to steer clear of a cage of four enraged yellow monkeys.

When the game begins the four creatures swing from the top of the cage and gradually keep from bar to bar around the cage. You must avoid the monkeys by jumping onto various bars yourself.

If you can't beat them join them, and leap on top of one.



When you press the action button the angered monkey turns a vivid, livid red. Now he's at his most dangerous.

All you can do to survive is to keep away from the red monkey by keeping an eye on his whereabouts. Like the joystick controls to move your man about the cage by pressing the action button simultaneously with the joystick.

The computer's brain keeps track of the score and adds a point to the score board.

If you get caught out by the agile red monkeys you will find they strike to kill and your man will stand frozen to the spot with arms akimbo.

The controls are quite difficult to master but once you have got the better of them the game loses its appeal. Children however will find their interest is sustained because of the degree of difficulty.

Monkey Chess is the second game on the cartridge and features an extra player — on your side. He has special abilities and can remove and add bars whenever and wherever he pleases, if you can get him there in time to thwart the offending monkey.

This clever player can also help his team mates out by building ladders for them to climb to bars which would otherwise be out of their reach.

Throughout the game this useful addition can alter the pattern of bars making whatever strategic layout he likes.

Reusing Monkey Bars adds another dimension to the game. The bars rotate in the cage while you make your man leap quickly, and swiftly before the bars move into their new position.

In Shouties the bars of the cage are invisible to you most games where they are. You can sneak a look at their position by pressing the "I" controls key.

The last game on the tape lives up to its name and will draw you bananas. It comprises a mixture of three of the previously mentioned games, the choice of which is up to you. Having played a you won't want to shake another banana in your life.

Monkeyshines runs on the £1099 Philips Videopac Computer and is the 37th pack in the range. It costs around the £20 mark.



THESE SLOW MOVING ALIENS MAKE EASY TARGETS

INTERTON INVADERS

If you were under attack from the Interton alien invaders you would not have a lot to worry about. In this Interton VC4000 version of space invaders the creatures move so slowly that the game loses much of the addictive quality of the original.

The rows of invaders are spaced wide apart and their firing rate is fairly slow. Sometimes the shots come in short, sharp bursts from the same alien making them easy to dodge.

Instead of three shields your firing base can hide behind the Interton game has eight.

Graphically the invaders are quite creative. A spaceship worth bonus points appears ran-

dently across the top of the screen as in the original game. But it doesn't move at the speed of light and is fairly easy to shoot.

There must go to the effort put into the packaging of the Interton



games. Each one is beautifully presented in glossy professionally produced boxes. The cartridge costs £9.95.

CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN

THE GAME OF THE FILM OF THE GAME

TRON, FROG BOG AND STAR RAIDERS

Video games are soon to make their debut on the silver screen.

This winter the electronic character Tron will burst to life among brilliant flashes of optical and light effects and computer graphics. The film Tron, named after the star of the posters, revolves around two worlds. Firstly the real world in which a mammoth computer system in a communications giant under the control of one program.

And secondly the electronic

world is the world belonging to Tron. He and his electric and light beings have conquered their real-world masters and are intent on overthrowing the program which rules their lives.

Tron is a totally fantastic story in a futuristic world and is the first time video games have been the theme of a major film. Capitalising on the idea is Mattel and a Tron cartridge for the Intellivision home games centre is due out later this year.

In America two Tron packs are



planned. Tron 1 in which you take the part of the video star being directly into to engage the enemy, the evil blue warrior. In Tron II the story of the film is continued and your job is to penetrate the master control program's inner circle to gain control of it. Perhaps alien include

alien creatures which you must destroy to reach your target.

In the UK version the two are combined. It is due out in September but the release date is subject to change. We will keep you posted on the latest information about the game and will review it when released.

A game with an unlikely sounding name Frog Bog is due out before the more inspiring Tron. But quite in the same graphically exciting vein, Frog Bog is aimed more at young children.

Players operate two frogs sitting croaking the day away on a couple of lily pads. Floating above their heads are dragon flies which are your passport to points. When you think you can move your frog into a suitable fly-catching position use the joystick to make him leap.

You do not have to stay on one lily pad. Your frog can leap around from pad to pad to try his luck out elsewhere, but make sure of your leap or you could end up in the water.

A couple of years after the release of the much acclaimed Atari computer game Star Raiders on a version for the VCS is an alternative for launch later this year.

The game is a space simulation game of a kind of super Star Trek in which you control a spaceship on a mission to locate and wipe out alien spaceships. They patrol quadrants of the galaxy where you seek them out. In the computerised version there is a hyper drive option, an escape mode facility, as well as the use of a refuelling station. Whether or not the VCS Star Raiders will match the Atari 400/800 game remains to be seen. So far no release date has been set.

STOP THE ALIEN SLAVE TRADE

The humanoid slave trade is enjoying a boom year in the Galaxy but you have been detailed to prevent alien races making off with too many of your planet's populace.

Atari has made a point of taping up the licences to copy successful arcade games and it will surely pay off with the popular Defender game.

When the alien race detects a human on the planet's surface, it sends in its Landers to catch them off. These are equipped with specially sensitive grabbing mechanisms which can lift the poor unfortunate off the surface.

You can defend the poorly equipped humans by racing your spacecraft over the country bleeding aliens with your high-powered laser cannons. It is a question of raising as Landers can come down off screen and pick up humans while you are occupied elsewhere.

If a Lander has a human in its delicate grip, it holds the hostage beneath itself as it heads for the top of the screen.

This leaves it open for you to fire at the Lander and make it drop its prize. If it's not too far from the ground the human will land safely, otherwise you may have to rush to his aid and help him survive the drop.

The alien force is a strong one — including Pods which house

DEFENDER

the bodies of swimmers. When you score a hit on a Pod, it will release a multitude of small swimmers which live up to their name and chase after you.

Landers too wander across the landscape close to the surface leaving their deadly trail of death. And when the Landers

reach the top of the screen with a humanoid in their grasp, they are transformed into the formidable dangerous mutant craft.

There are 26 different versions of Defender on the Atari VCS cartridge. It features some creative graphics and appropriate sound effects.

It will be available from mid-July and will sell for around £29.95.





Music Composer



Screen



Graph



Intro to BASIC



Star Raiders



European Countries



Missile Command



Basketball

12 million reasons why the Atari Home Computer is something to see. The display screen, used with our computer, is composed of 192 horizontal lines, each containing 520 dots. Delivering colour and luminosity instructions to each dot for a second requires 12 million cycles... a lot of work for the normal 6802 processor.

That's why the Atari computer has equipped its 6802 with its own electronic assistant. It's called ANTRC, and it handles all the display work, leaving the 6802 free to handle the rest. What this means to you is uncompromisingly spectacular display capabilities without loss of computer power needed to carry out the demands of your program.

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CHESS



The first question prompted by computerized chess has still to be answered. How soon they will reach world championship standards, is still a popular topic.

In fact such statements have been made almost constantly over the last 30 years, but it is only fairly recently that strong players have begun to take them seriously. This month I present two games played by computers against world (Human) champions, both of which show the human emerging victorious.

The first game was played by Bobby Fischer, an American who is — or was — arguably the strongest player in the history of the game. Since winning the world championship against Boris Spassky at Reykjavik almost 15 years ago is a match which made headlines world wide, Fischer has virtually shattered chess stereotypes.

Even including "friendly" and casual games, Fischer's total collection of games since the match against Spassky could probably be counted on the fingers of one hand. Of this collection one was a joke game played for the Bob Hope television show in America where some of the moves were illegal! The only one of the games which seems to have been published was the following one, which was played in 1972.

The opponent was a version of Matchack, a program written by Richard Greenblatt at MIT, which competed with some success in tournaments in the late 1960s. Its playing strength has been estimated as around 2000 on the Elo scale (about 180 on the British Chess Federation scale).

Where: Bobby Fischer, Black
Greenblatt Chess Program

1. P-K4, P-K4; 2. P-KM4, P-P; 3. B-M4, P-Q4

The Kings Gambit is an opening long out of fashion at master level, but one which Fischer has occasionally played.

4. B-M4 A favorite line.
4. N-K3; 5. N-QB3, B-QN3; 6. N-B3, B-Q; 7. B-Q, N-K3; 8. N-K3, B-Q; 9. P-Q4

White has clearly emerged well from the opening, and now threatens to regain his gambled Pawn with a strong King's — side attack.

9. ... P-KN4; 10. N-KP4

A sacrifice which demoralized Black's position.

10. ... Q-K5; 11. P-K3

If now, say 11. ... B-K2, White captures on K4 with an overwhelming position. So Black tries to gain counterplay by returning the piece.

11. ... B-KB6; 12. B-B2, B-KP; 13. P-B3, P-QB3; 14. BxP, Q-N2



15. N-B3 ch, B-K1; 16. Q-B3

White now threatens both Q-B3 and B-B3 and it is impossible to prevent both threats at once. However, the computer plays on — as computers usually do.

16. ... B-Q1; 17. QxR, B-B3; 18. B-B3, Q-B3; 19. B-QB1, B-N5; 20. B-KN3, B-K1; 21. Q-R6 mate. A very pleasing finish.

Fischer's successor as world champion was Anatoly Karpov of the Soviet Union. Unlike Fischer, Karpov has played in innumerable tournaments since acquiring the title in 1975, with an outstanding record of success. After one of these tournaments in West Germany a couple of years ago, Karpov was persuaded to take on 25 versions of the so-called "Chess Champion Super System II" in a simultaneous display. Karpov won this contest 23-2 but had one "near miss".

The above position was reached after Black's 16th move with Karpov playing White. Karpov's position is overwhelming.



a b c d e f g h

20. P-N4, N-Q5

Black's move contains an insignificant threat, which Karpov — probably bemused by the computer's previous uninspired play — completely overlooked.

21. B-B2? N-N6; 22. Q-N2, N-K3

White has not only lost his King but cannot even recapture the Knight. If 22. QxN then BxP, whilst if 22. BxN, B-Q3 leads to fatal exchanges.

22. P-B3, P-B3; 24. N-QB3, P-Q4; 25. PxP, P-P; 26. B-N2, P-Q4; 27. N-N5, Q-N3; 28. N-K3, QxN; 29. P-B4, PxP; 30. PxP, P-P; 31. QxPch, K-N1



a b c d e f g h

Karpov is still a King behind and now tries a suicide.

32. N-N6

If now 32. ... P-B2; 33. QxPch gives at least a draw by perpetual check. However, 32. ... Q-N3 pins the Black Queen avoiding mate. If then White plays 33. M-Kch, K-B3; 34. B-B4ch then P-B4 wins, since the Queen is still pinned. However, the computer selects the worst possible move.

32. ... KB-QN7; 33. Q-B3 mate.

A narrow escape for Karpov but the computer's play for the first 30 moves did not merit a win.

By Max Bramer

PRESTEL

Telesoftware is a topic you are going to hear a lot more about this year. It is an exciting new way of loading programs and data into micros, because it is all electronic. The secret is to use videotex — that is, teletex or Prestel — as the storage medium.

All you have to do is tune in to teletex, or dial in to Prestel, using your micro, plus a special adapter. You select what you want — for instance a particular program — and download it into your micro. Then you disconnect, and RUN the program. Telesoftware will give you access to a far bigger library of software and data, and avoid the hassle of drawersful of assorted cassettes or discs.

How does it work? At the technical level, it is pretty complex. But the principles are straightforward. Let's look at it first from the teletex/Prestel end. A reminder for those not familiar with these terms — teletex is broadcast via T.V. transmitters to your — modified — T.V. set — e.g. Ceclax and Oracle.

Prestel is British Telecom's videotex service, which offers over 500,000 pages of information via the telephone line.

Now, each teletex/Prestel page is stored as a string of alphanumeric characters, together with some additional control characters for colour, etc.

The characters are, by and large, standard ASCII ones. Suppose a page had not, say, a weather forecast, but a games program written in BASIC. If you could somehow feed that string of characters into your micro, you would then be able to use that program. That, in a nutshell, is the idea behind telesoftware.

The actual implementation of this idea is a bit more tricky. For a start, each Prestel character is made up of seven binary digits, plus a start and stop bit, and a parity check bit. These extra bits have to be stripped off, and the remaining bits converted into something your micro understands.

This is normally done by software or firmware — ideally just a ROM



By Peter Linton

lined into your micro. Then there's the question of feeding the Prestel characters in, which needs an interface of some sort. The commonest one is what's called RS232C. This is a standard computer industry interface to allow various peripherals, such as printers, etc. to be hooked up to a micro.

These days more and more micros have RS232C either built in, or as an optional extra. For instance the Sinclair Spectrum will have an optional RS232C interface available (this amount for around £20). If your micro does not have a standard interface, then one has to be designed. That's why Prestel can a competition earlier this year to find an interface for the Sinclair Z801. A few interesting prototypes emerged, and production models should be available in due course.

So what do you actually need to make telesoftware happen on your micro? For teletex, you will need a special adapter. For videotex, if your micro already has RS232C (or equivalent) all you need is the software and a modem.

The modem is there to convert the digital signals from your micro into the analogue signals needed on the telephone line. The adapter must also have a special connector for Prestel, or an acoustic coupler that fits on to your telephone. One acoustic coupler — the FAC-M1 made by CEL has a modem built in, and makes possible a very simple, easy connection.

Before we look at what you can do with telesoftware, let's clear your worries about cost.

Adapters are coming down to the

£200 area, and heading for £100. The target is £50. As for running costs, programs on teletex are free, once you have a teletex T.V. and adapter. On Prestel, you pay the normal phone charges for using the phone line, plus computer access time. At peak times, this is not cheap — but in the evening it's much more reasonable — about 5p for an eight minute phone call, plus 4p for four minutes computer connect time. You may also be charged for looking at certain pages.

The prices are set by the page owners, who can charge anything from 0.1p to 50p.

Suppose you dial in and find a program you want to try. Let's assume it is 10L, occupying say 12 pages with a charge of 5p a page.

It would take something over two minutes to load. Let's assume you spend another five minutes looking at other Prestel pages.

Total cost — in the evening and weekends — 5p + 5p + 34p = 39p for a 10L program. Not bad, compared to the price of software generally.

So what's in it for you? Above all, a simple easy way of getting software. Already there are dozens of pages of telesoftware on teletex and Prestel, with more being added.

It won't be long before computer magazines offer programs both in print — and in telesoftware form. Once you have an interface, you will of course have access to the whole of Prestel, with its large database of information and Mailbox services, as well as other videotex systems.

It also offers another intriguing possibility — you can download, and store, ordinary videotex pages.

Suppose you designed a Stock Market game with share prices. Then instead of inventing prices, you could dial in to the Stock Exchange's Prestel pages, and transfer real share prices into your game. That would add a nice touch of reality. Then the next day you could check if you really had made a killing, by comparing the results of your game with what actually happened.

ARCADE



A FUNNY THING HAPPENED ON THE WAY TO THE POND

Naturalists are worried that Bitter's frog is fast becoming an endangered species.

Players of the popular arcade game of Frogger will understand why... It's because of all the trucks, snakes, sinking turtles and alligators! These are just some of the dangers which confront a frog on his way to the breeding holes.

Frogger is a game of calculated risk and calm nerves which rewards experienced more than most arcade games.

The Frogger screen can be broken into two areas, the road and the river, divided and surrounded by banks.

From the bottom of the screen, the frog must first negotiate the road with four lanes of traffic, then the river by jumping on logs and turtle backs.

Five frog holes are on the opposite bank and all must be filled to earn a new screen with increased dangers.

The first screen has slow moving traffic and the only danger is that the beginner will miscalculate the distance or the speed of his own frog's leap and accidentally crash against a fender or jump into the back of a passing car —

TIPS ON FROGGER

always leave plenty of space before jumping after a car.

The left-hand frog hole is the most difficult to fill as the river current moves from left to right.

The other aquatic hazard is sinking turtles. These appear to be the same as normal turtles but periodically turn green and sink

below the surface. Only one in four turtles is prone to this disturbing behaviour. Before you leap check the line to see where the last green turtles in that line were. Sinking turtles are never together in a line.

Small purple frogs can be picked up from logs and carried to safety for bonus scores. If these are missed at first, remember you can always go back and pick them up again — but keep an eye on that time.

On the second screen, alligators appear and the traffic speeds up. Don't be intimidated by the increased traffic flow; get out and use sideways jumps to the flow of traffic to reach the middle. The fourth lane of speeding racing cars is the main danger, so try to join the third lane of a plain where there is a corresponding gap in the fifth and break for a jet after the speeding cars fly past.

The alligators do not have to be avoided at all costs — just avoid their jaws. They are mainly a danger when you want to fill the left-hand frog hole and are waiting for a log to appear. It is possible to get into a froghole with a 'gator waiting there as long as it is not about to leap fully out. The third screen's snakes can also be ridden on as long as you avoid their gaping jaws.

When logs are scarce make use of fast moving turtles to go back and find an emerging log.

Be positive in your joystick movements as many lives are lost by carelessness or accidental nudges. And may you spawn many tadpoles.

THE CROAK ON THE STREET

Frogger players have a full vocabulary of phrases to describe the way they met their end on screen.

Some of those we've heard hurled out by disgusted frog controllers are:

● Fender sandwich — being caught between two streams of traffic.

● Turned turtle — stepping on a sinking turtle.

● Out of luck — miscalculating a frog leap and ending on the bank.

● Wide-eyed and legless — one of the favourites, overheard when a friend yelled off the screen while still waiting for a log to appear.

PLUMB LOCO IN THE WEST

There's danger in them that hills, it's up to you to see that the locomotive wins through.

Wild Western takes you back 150 years to relive the colourful history of the opening of America's western states.

You take the role of a sheriff, faced with an outlaw gang which is determined to hold up the train.

Mounted on your brave steed you race alongside the chugging loco dodging the returning bullets fire by means of an eight-way joystick.

The game ends when you have lost all three sheriffs or three bandits have jumped

WILD WESTERN

aboard the train.

If a bandit hops onto the train, you must also climb on board in order to shoot him. This requires skill and timing to run parallel with the train at a safe distance and push the jump button.

Riding on board the train can also be hazardous as waterpipes from the motorcycle tanks can dislodge you.

For shooting practice you can hit coins tossed in the air by your horse. You double your bonus if you hit a and get a horseshoof if you miss. Additional sheriffs are obtained after 30,000 points.



ACTION

THE SCENIC ROUTE

Realism is the name of the arcade racing game. Turbo bears more resemblance to the real thing than it does to the arcade industry's first genuine attempt to provide Grand Prix thrills.

It features a small diameter racing steering wheel, a two-speed gear stick and an accelerator pedal.

But the main improvement is the marvellous graphics capabilities which puts a whole variety of backgrounds and racing conditions on the screen.

The video is a czech country scene to test your road-handling

TURBO

skills. The Turbo course winds through busy city centres, across narrow suspension bridges through dark tunnels and open stretches of country.

The driver's capabilities are further put to the test by some sudden changes to the road conditions. These range from surprise snow flurries to wrecked competitors — and even include an emergency road ambulance.

The points score can be the fastest moving thing on the screen as the driver weaves from side to side and changes quickly down to avoid an otherwise inevitable crash.

Drivers can monitor their progress and race position by a quick glance up at the readouts at the top of the screen, which tell how many cars have been passed and the time remaining.

Any first lap collisions send the driver back to the start — after that collisions result in a screen-filling crash.

Extended play bonuses are awarded to drivers who have passed sufficient cars with time to spare.

Some particularly dangerous parts of the course are: the rolling rural hills, where road dips can obscure the cars ahead; the drop-in tunnels where cars appear suddenly out of the blackness; the ocean front passade where tight corners around a high wall also restrict the view ahead.



ZONING IN ON A TOP SCORE

There are certainly a lot of record-breakers at work in Britain's arcades.

In response to our May issue rundown of top scores on the more popular games, we have traced from a list of budding arcade champs.

Perhaps the most astonishing score came from Matthew Parram who is claiming a score of over five million on Battle Zone. A quick bit of work with a calculator gives us an estimate of six hours spent at the machine to achieve this score. Although we have had several entries on Battle Zone no-one else topped 275,000 which was matched up by Mark MacLean. Matthew says that he managed his high score after reading our tips on how to play it in the April issue.

Below we present our top 10, to give you something to aim at.

RECORD BREAKERS

If you can beat any of the scores in our chart or have another game you are scoring highly on, please drop us a line and tell us where you achieved your top score and how long it took you. New games we are currently awaiting top scores on are: *Out Crash Ruler* or how about *Out-gal*?

GALAXIAS

411,000
Steven Mathers

SCRAMBLE

813,000
Richard Cooper

COOP

238,570
John Lee

SPACE FIRE BIRD

795,000
Martin Lund

BATTLEZONE

1,901,000
Matthew Parram

MOON CRESTA

126,000
Andrew Davies

PACKMAN

281,260
Stephen Matthews

FRIGGER

87,000
Garry Blackman

MISSILE COMMAND

1,356,000
Richard Holt

CONKEY KONG

389,000
Richard Hill



PINBALL

Pinballs have been brought down to size in America with the introduction of the new Micropin. This is a table-top pinball, electronically sophisticated but introducing the word "portability" to the arcades.

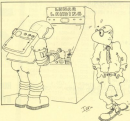
The latest stainless steel machine keeps its high score on a U.S. display and if it registers a high score after 200 games it will automatically switch to display the best high score during that period.

The machine will fit on most tables and includes most of the features common to pinball tables. It will give out sounds whose noise level adjusts itself to the surroundings.

It has a two-level tilt mechanism which will result in the loss of the ball in play.

A battery back-up system will retain scoring even if the game is unplugged.

The Micropin is expected to feature in test centers where it would be impossible to place a full-size "pin" and if successful in the U.S. will undoubtedly be crossing the Atlantic soon.



H

COMPUTERS & VIDEO GAMES 27

S · O · L · I · T

Solitaire may be the loneliest game in town — but it can be a lot of fun too! This computerized version of the famous board game follows the rules of the original closely.

All you have to do is remove as many counters as you can from the play area by jumping them diagonally over each other. With any luck you should end up with just one lone counter in the center hole of the board.

The author of this Sharp-sized version says that if you are left with 11-15 pieces you have played an average game, if you are 6-10 counters left on the board then you can rate yourself a good player. Anything below eight pieces — well that's excellent! Mr. Kandle has been left with only five pieces after playing his game — can you beat that?

RUNS ON A SHARP MZ-80K

BY PETER RANDLE

```

9 DIM C(8,8)
10 TEMPO = 4
11 REM COMPUTER SOLITAIRE*****
12 REM BY PETER RANDLE *****
13 REM *****
14 PRINT "R"PRINT TAB(25); "COMPUTER "
15 PRINT TAB(25); "SOLITAIRE"
16 PRINTPRINTPRINTTAB(50); "MAKE YOUR MOVE! DIAGONALLY"
17 PRINT%; "JUMP OVER 1 PIECE INTO AN EMPTY SQUARE"
18 PRINTTAB(50); "EACH MOVE CONSISTS OF TWO NUMBERS,"
19 PRINT%; "JUMP FROM 22 TO 45"
20 PRINT%; "FROM number then COLUMN number)"
21 PRINTPRINT
22 PRINT";ORDER TO END-TYPE 9 FOR next move."
23 PRINT";*****"
24 FOR I=44 TO 22 STEP -1
25   PRINTTAB(45); IPRINT";GOOD LUCK!"
26 PRINT";PRESS ANY KEY TO START then CR""MUSIC""JOLAS"
27 INPUT$
28 PRINT";"
29 PRINT"; 1 2 3 4 5 6 7 8"
30 PRINT"; 1 | | | | | | | "
31 PRINT"; 2 | | | | | | | "
32 PRINT"; 3 | | | | | | | "
33 PRINT"; 4 | | | | | | | "
34 PRINT"; 5 | | | | | | | "
35 PRINT"; 6 | | | | | | | "
36 PRINT"; 7 | | | | | | | "
37 PRINT"; 8 | | | | | | | "

```




IMH

BY TERRY CLARK

In Egypt, during the reign of Zoser, there lived a wise man named Imhotep.

Zoser desired that a great monument be built so that the Gods would grant him eternal life.

Imhotep was renowned throughout Egypt, as they called their country, as a man of great intellect. The discovery of medicine and science as they know it, and the relatively new techniques of architecture were attributed to him. Therefore, Zoser chose Imhotep to erect his monument.

Upon the desert of the east the first pyramid was raised, the famous step pyramid at Saqqara. Through a long way from the perfection and sheer size of the later Great Pyramid, the step pyramid of Zoser is a good first try.

Imhotep must have been a remarkable man, possibly even worthy of the posthumous granted him by later generations of Egyptians. He was revered until the very end of the culture.

In this game I have tried to simulate the frustrations involved in the construction of a pyramid. The strain on the entire country must have been great indeed. From the hundreds of thousands of people involved, to the vast amounts of grain needed to feed them, all had to be co-ordinated.

This task fell for the first time on the shoulders of Imhotep. He did not have the luxury of past failures to rely upon for guidance. He had to devise all the wisdom needed to perform this task. The fact that the pyramid was finished in, to itself, a testament to the intelligence of this man.

In this man, Imhotep, fulfilled the wishes of his lord and master, Zoser the Pharaoh. The step pyramid has brought the memory of Zoser into the present day and made his name immortal. But also the name of Imhotep lives on.

To this day no one has located his tomb. Somewhere it may still exist, waiting, as did the tomb of

Tutankhamen, for the light to re-enter its now-darkened confines and illuminate the many wonders newly encountered with the great master master Imhotep.

List of variables used in Imhotep.

AS - used in INPUT statements to advance the game.

B - the number of tals (of land) to be planted.

BI - current owner's name.

D - the number of tals flooded by the Nile.

ED - stores the top and bottom border design.

E - used in the graphics of the Pyramid as the starting point of each course.

ER - stores the number of mistakes the player has made.

F - the end-point of each course in the Pyramid graphics.

G - FORWARD loop in the pyramid graphics.

GE - contains a string of three pyramids as used in the border.

H - the number of lines PRINTED on the screen. Used to avoid scrolling in the case of an eventual year.

I - the number of storehouses allotted to fed the work force.

IMH - the name and hierarchy of IMHOTEP.

J - the number of storehouses to feed the general population.

K - the random harvest.

L - the number of people fed in the general population.

M - the number of people fed on the work force.

N - the number of courses completed on the Pyramid.

O - the number of storehouses either claimed or given by the priests.



P - the total population of Egypt.

Q - random chance of plague, tribute or Zoser's campaign.

R - increase in population for each year.

S - total number of storehouses.

T - time in years.

U - random chance of rebellion by the work force.

UI - temporary counter of those killed in rebellion.

V - the amount of tribute from Nubia.

VI - temporary counter of population killed due to various causes.

VS - used in line # 688 to call a new game.

W - the number of people in the work force.

WA - the chance of war, invasion, Minosian rebellion and a bribe for Pharaoh.

Z - loop in Pyramid graphics used to draw each course of stone.

T - level of each course in Pyramid graphics.

Z - chance of collapse.

ZZ - timing loop on "NEW GAME" input at end of game.

[illegible][illegible][illegible]



Spaceships armed with awesome missiles are swarming around your vulnerable cities on a planet at war. Can you protect the population of the cities and prevent the apocalypse?

In this game — based on the popular arcade version — you have to protect four cities from numerous marauding aliens.

To do this, you have three missile buses, each bristling with 10 missiles. These, of course, must also be defended against the aliens, because, when a bus is hit, all its missiles are destroyed. The aliens are represented as white dots, and leave a red radiation trail. When hit they are worth 10 points.

A bomb sight, in the form of a cross, can be controlled in four directions from the keyboard — F-left, G-right, T-up, V-down. Once one of these is pressed, the sight will continue to move in the appropriate direction until another key is pressed.

To fire, press the 1, 2, or 3 keys depending on which missile base you wish to use. When you fire, your missile will streak up to the centre of the night, and a multiple explosion will occur, giving you more chance of destroying the aliens. However, to compensate for this, as they move down, the aliens can divide into two or more.

Once you have destroyed all the aliens, or lost all your missiles, the screen clears, and then displays any bonus points — 10 for each remaining missile, and 50 for each city. If you have no cities left, the game ends after a suitable display, also as proceed to the next, faster, attack wave.

The game requires a minimum i86 machine, with Basic V3.0 H, and the colour high resolution board.

WILLIAM PENNELL

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2000-2001

1000

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Year	Number of cases	Percentage of cases
1990	10	10.0
1991	15	15.0
1992	20	20.0
1993	25	25.0
1994	30	30.0
1995	35	35.0
1996	40	40.0
1997	45	45.0
1998	50	50.0
1999	55	55.0
2000	60	60.0
2001	65	65.0
2002	70	70.0
2003	75	75.0
2004	80	80.0
2005	85	85.0
2006	90	90.0
2007	95	95.0
2008	100	100.0
2009	105	105.0
2010	110	110.0
2011	115	115.0
2012	120	120.0
2013	125	125.0
2014	130	130.0
2015	135	135.0
2016	140	140.0
2017	145	145.0
2018	150	150.0
2019	155	155.0
2020	160	160.0
2021	165	165.0
2022	170	170.0
2023	175	175.0
2024	180	180.0
2025	185	185.0
2026	190	190.0
2027	195	195.0
2028	200	200.0
2029	205	205.0
2030	210	210.0
2031	215	215.0
2032	220	220.0
2033	225	225.0
2034	230	230.0
2035	235	235.0
2036	240	240.0
2037	245	245.0
2038	250	250.0
2039	255	255.0
2040	260	260.0
2041	265	265.0
2042	270	270.0
2043	275	275.0
2044	280	280.0
2045	285	285.0
2046	290	290.0
2047	295	295.0
2048	300	300.0
2049	305	305.0
2050	310	310.0
2051	315	315.0
2052	320	320.0
2053	325	325.0
2054	330	330.0
2055	335	335.0
2056	340	340.0
2057	345	345.0
2058	350	350.0
2059	355	355.0
2060	360	360.0
2061	365	365.0
2062	370	370.0
2063	375	375.0
2064	380	380.0
2065	385	385.0
2066	390	390.0
2067	395	395.0
2068	400	400.0
2069	405	405.0
2070	410	410.0
2071	415	415.0
2072	420	420.0
2073	425	425.0
2074	430	430.0
2075	435	435.0
2076	440	440.0
2077	445	445.0
2078	450	450.0
2079	455	455.0
2080	460	460.0
2081	465	465.0
2082	470	470.0
2083	475	475.0
2084	480	480.0
2085	485	485.0
2086	490	490.0
2087	495	495.0
2088	500	500.0
2089	505	505.0
2090	510	510.0
2091	515	515.0
2092	520	520.0
2093	525	525.0
2094	530	530.0
2095	535	535.0
2096	540	540.0
2097	545	545.0
2098	550	550.0
2099	555	555.0
2100		

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

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High Security is a puzzle game requiring skill — and a little bit of luck! Seven robots are chasing you around the top secret centre. You must destroy them by luring the metal men into high radiation zones which you can find by using the map you have been given.

To win you have to destroy all the security robots. The game can be made harder — should you feel the need — by increasing the number of robot chasers in line 38.

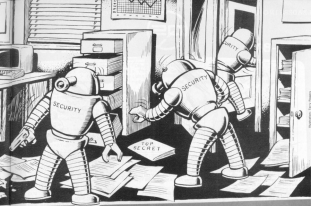
On the model III TRS-80 there is a small character which can be used to represent the player. As the model I and video game do not have this character line 60 should be changed to show the player as a ". The instructions should be changed accordingly.



HIGH SE

```

10 CLEAR200
20 L1=64:REM width of screen
30 H1=7:DIMR(140):REM number of robots
40 T1=0:R1=0:DIR=0:R1H=0:REM number of hazards
50 M=1000:REM maximum score
60 PG=200:REM Players' graphics,change to 42 for model I & Video Game
70 TC=15450:SP=10000:TTS=STRING$(48,191)
80 REM T1= Time   EC= Robots Remaining R1H= Passage
90 REM M= Players' Position R1H= Robot n's Position
100 REM H1= Hazard n
110 T1=0:EC=H:CLS:PRINT800,"Risk Security
You are within the grounds of a top secret research centre and
there are "H1" security robots trained to destroy you.
You are the small man : the robots are 'O' and the 'R's are
dangerously radioactive Places.
120 PRINT"Your only chance of survival is to maneuver the robots
into the 'R's.Your score will start at 'M'. Points and will
decrease with time."
130 PRINT"If you are caught or destroyed your score will become zero.
Use the arrow keys to move."
```



SECURITY

RUNS ON A TRS-80 IN 48K

```

140 PRINTB226;"Press any key to continue.";
150 Z0=Z0Z0Y0:ZF22=Z0TH0Z00L$0250
160 R0=RE40F:R0=RE50K:R0
170 IFR0<0Z0TH0P0K0RE:30:P0K0R0:PG:R0=00:RETURN
180 IFR0<0P1TH0P0K0RE:30:P0K0R0:43:G0T0040
190 IFR0<0Z0TH0P0K0RE:30:P0K0R0:43:G0T0050
200 DFR0<0Z0TH0P0K0RE:30:P0K0R0:43:G0T0060
210 P0K0RE:30:P0K0R0:PG:R0=00:RETURN
220 R0=RE40:40=R00:10$ALL*10
230 IFR0<0R0<0Z0TH0Z00L$0250
240 R00 set up screen for game
250 CLS:PRINTB28;"High Security";
260 PRINTB130;T00:PRINTB302;T00:PRINTB330;T1:50=PG
270 PRINTB330;"Score":PRINTB430;50:PRINTB350;"High Scores":IFR0<0Z0TH0P0K0R0
3022;R00:Y0:1":G0T0000
310 P0K0=[100:PRINTB350$ALL$R0$K:30:IFR0<0Z0TH0P0K0R0:R0$K:30
320 NEXT
330 PRINTB300;"Robots Remaining ";PRINTB317;50:
340 P0R0=1010:P0K0TC$ALL$1:191:P0K0TC$ALL$1+51:391:NEXT

```

BY DAVID JONES



ZX-81

**QZ DEFENDER.**

UP - DOWN - THRUST - FIRE
First and only full screen display.
Software to drive QZ SOUND HD.
Moving Planetary surface. Up to
64 fast moving characters on
screen at once. On screen scoring.
Ten minutes of game. Increasing
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ROM, and 4K min. of RAM. **£8.95.**

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A programmable sound effects
board using the AY-3-89110. 5
TUNES, 1 NOISE, ENVELOPE
SHAPE: + TWO-8 BIT C/D PULSES.
Easily programmable from
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the work leaving your computer
free for other things. Signal C/P
via 2.5 mm clock socket. Ports C/P
via a 16 pin D. Socket. **£49.00.**

QZ CHAS HD./

A programmable character
generator giving 128 256
ASCII/ASCII PROGRAMMABLE
CHARACTERS. ON/OFF SWITCH
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creation and display of your own
characters in direct or indirect
ASCII ascenders of fast machine
code operation routines and lower
case alphabet included. See below
for ZX PRINTER listing. **£49.00.**

QZ - LOWER CASE

00000000 00000000 00000000 00000000

**QZ INVADERS.**

LEFT - RIGHT - FIRE
12 x 9 INVADERS. High score. 3
levels of play. FWD square. Bonus
game. Drives Sound HD. PCHMS to
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**QZ SHIP HD.**

A Hi-res graphics board giving -
800 x 100 PIXELS. 8K ON HD.
RAM. SOFTWARE SELECT/
DESELECT. MIXED TEXT AND
GRAPHICS. 2K ON BOARD ROM.
Resident fast machine-code
graphics software (in ROM) -
provides the following 80-800
Commands - MOVE a, y, PLOT a,
r, DRAW a, y, BOX a, y, UP, DOWN,
LEFT, RIGHT, PASTAR, SCROLL,
BLACK, WHITE, CLEAR/CP. See
above for ZX PRINTER listing
using COPY. **£49.00.**

ZX-80

**QZ ASTEROIDS**

LEFT - RIGHT - THRUST - FIRE
Software to drive QZ SOUND HD.
Multiple missiles firing in 8
directions. On screen scoring.
Increasing number of asteroids.
Full mobility of ship in all areas of
the screen. Two asteroid sizes.
Bonus ship at 50,000 points.
Requires 8K ROM, 4K min of RAM
+ SLOW function. **£8.95.**

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hd, which combines with the
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total. Plug direct in to the rear
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CONNECTOR.**

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allowing a total of any RAM pack
plus two other plug in boards to be
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regulator drives all external
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Connector in 2x23 way edge-
socket soldered back to back.
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CONNECTION -- Any QZ add on bd.
can not enter RAM pack. (2) -
COMPUTER -- CONNECTION --
MOTHER HD -- ANY RAM PACK
able to enter mother bd. Mother
board **£19.00** Connector **£4.00.**

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Please state Type of machine, Which ROM, Memory size, when ordering.

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```

1000 FOR TIME=TIME+1 TO 400:NEXT TIME:TI
ME=0
1005 REM GAMERS, BLACK-JACK
1010 GRAPHICS 2+16:POSITION 3,5:7 #6:"CA
RD DEALT" :POSITION 6,5:7 #6:"GAME # 3"
:POSITION 5,7:7 #6:"BLACK-JACK"
1015 GOSUB 6000:GRAPHICS 8:7 :?
1020 ? " " IN THE CASE OF BLACK-JACK, THE "
:?" OBJECT IS TO BEAT THE DEALER WITH "
1025 ? "HOW? 17 OR 21 OR UNDER, YOU MAY
WALK-OUT TUE TO 250. YOU MAY STOP WHEN YOU
:?" WISH, IF YOU WARE BLACK-JACK"
1030 ? "YOUR MONEY IS DEDUCTED,"
1035 ? "IF THE HOUSE DEALS OUT LESS THAN
20?" "TOTAL OF 17 OR SIX TRIES, YOU HA
LL?" "KEEP THE MONEY YOU SET,"
1040 ? " " "GOOD LUCK!!!!!!"
1045 DO=GRAPHIC: "THE DEALER WILL GET HI
S CARDS FIRST," "HIT RETURN TO START T
HE DEAL,"
1050 INPUT A$:IF A$="" THEN 1140
1055 IF A$="" THEN GOTO 1130
1060 C=ASC(A)
1065 ? "HERE I GO!" :FOR TIME=TIME+1 TO 2
:NEXT TIME:TIME=0
1070 N=INT(RND*(1000+1))+5=INT(40000+1)
:
1075 DO=DO+600000 65
1080 POSITION 10,12:7 "THE CARD IS A " :N
:?" C="
1085 POSITION 13,14:7 "SO FINE" :DO=FOR T
IME=TIME+1 TO 2:NEXT TIME:TIME=0 IF C=
6 THEN 1250
1090 IF DO<17 THEN 1180
1095 IF DO<21 THEN 1210
1100 IF DO=21 THEN 1260
1105 IF DO<21 THEN 1270
1110 IF DO=17 THEN 1270
1115 IF DO<17 THEN 1290
1120 IF DO=17 THEN 1290
1125 ? " " I STOP, THE TOTAL FOR ME IS "
:?" 50?" "NOW YOU GO!" :GOTO 1330
1130 ? " " I GOT BLACK-JACK!!!! 100
TO 1330
1135 ? " " THE HOUSE DEALT OUT LESS THAN 1
7," " "HOW YOU MUST TRY TO BEAT ME"
1140 ? "GOTO 1330
1145 ? " " JUST!!!!, YOU WON THE GAMOTES
7-17 "AMOUNT ALLOWED TO BE SET BY THE HO
USE" :GOTO 1360
1150 GOTO 1400
1155 ? " " WHAT IS THE BET?" :INPUT
B$
1160 IF B$=0 THEN 1360
1165 IF B$=50 OR B$=0 THEN 1370
1170 IF B$=0 THEN 1380
1175 ? "SEE YOU BET OVER THE HOUSE LIMIT
100!" :GOTO 1380
1180 ? "SEE YOU BET MORE THAN YOU HAVE #
10!" :GOTO 1330
1185 N=INT(130000+1)+1+5=INT(40000+1)+1
:GOSUB 65:POSITION 16,18:7 "YOUR CARD I
S A " :ASC(C)=3+1
1190 PP=PP+1:"SO FAR THE TOTAL FOR YOU
IS " :PP:IF C=6 THEN 1400
1410 IF PP<25 THEN 1320
1420 ? "STOP OR TWIST IS OR T?" :INPUT
A$
1430 IF A$="1"="5" THEN 1450
1440 IF A$="1"="7" THEN 1320
1450 IF PP=00 THEN 1500
1460 IF PP=00 THEN 1520
1470 IF PP=21 THEN 1510
1480 IF PP=00 THEN 1520
1490 IF PP<17 THEN 1540
1500 ? "THE CARD THE SAME SO HE WILL PLAY
AGAIN" :GOTO 1330
1505 DO=DO+2000:"YOU BEAT THE DEALER WI
TH BLACK-JACK!" :GOTO 1570
1510 DO=DO+1000:"THE DEALER BEAT YOU,VO
U LOST" :GOTO 1570
1515 DO=DO+1000:"THE DEALER LOST, YOU W
IN!" :GOTO 1570
1520 DO=DO+1000:"THE HOUSE DEALT OUT LE
SS THAN 17 IN-17 SIX TRIES,"
1525 ? "YOU SET THE MONEY YOU SET," :GOTO
1570
1530 DO=DO+500:"CONGRATULATIONS ON YOUR G
OOD LUCK!" :GOTO 1570
1535 ? "AT THE END OF PART THREE YOU HA
VE 512 512 DOLLARS" :FOR TIME=TIME+1 TO 350
:NEXT TIME:TIME=0
1540 IF DO=0 THEN 1545
1545 REM GAME #4, CLOCK CHIRING
1550 GRAPHICS 2+16:POSITION 3,5:7 #6:"CA
RD DEALT" :POSITION 6,5:7 #6:"GAME #4"
:POSITION 5,7:7 #6:"BLACK CHIRING"
1555 GOSUB 6000
1560 GRAPHICS 8:7 :? :? "The Dealer will
deal 13 cards, 1?" "The first is an
ace or the second a"
1565 ? "Two or the third a three and so
on?" "When you win, if no cards come up
?" "Right, the dealer wins,"
1570 ? " " YOU MAY BET UP TO 50 DOLLARS"
1575 CARD=INT(RND*(50+1))+1=INT(5000+1)
:DO=DO+CARD*100, SIX SEVEN EIGHT NINE T
EN JACK QUEEN KING
1580 ? " " HOW MUCH IS THE BET"
1585 INPUT B$
1590 IF B$=50 OR B$=0 THEN ? "SEE YO
U BET OVER THE HOUSE LIMIT 100!" :GOTO 161
0
1595 IF B$=0 THEN ? "SEE YOU BET MORE TH
AN YOU HAVE 100!" :GOTO 1610
1600 ? " " O.K. NOW I WILL DEAL THE CAR
DS"
1605 FOR TIME=TIME+1 TO 200:NEXT TIME:TI
ME=0
1610 C=ASC(A) :C=14 THEN 1520
1615 N=INT(130000+1)+1+5=INT(40000+1)+1
:
1620 GRAPHICS 2+16:POSITION 6,5:7 #6:"HA
RDEAK" :GOTO 1450
1625 FOR TIME=TIME+1 TO 150:NEXT TIME:TI
ME=0
1630 GOSUB 65
1635 IF A$="" THEN 1650
1640 IF A$="" THEN DO=DO+GRAPHICS 8:POSIT
ION 16,18:7 "YOU WIN!" :GOTO 1520
1645 GRAPHICS 8:POSITION 16,18:7 "YOU LO
ST!"
1650 POSITION 3,11:7 "AT THE END OF THE
GAME, YOU HAVE " :POSITION 16,12:7 "O" :DOL
LARS
1655 FOR TIME=TIME+1 TO 200:NEXT TIME:TI
ME=0
1660 IF DO=0 THEN ? "YOU HAVE OVER 200
DOLLARS AND YOU?" "CAN NOW PLAY THE SPE
CIAL BONUS GAME," :GOTO 1700
1665 IF DO=0 THEN GRAPHICS 1+16:POSITIO
N 6,5:7 #6:"Thanks for the game"
1670 ? " " BETTER LUCK!" :? " " H
IT TIME" :GOTO 1645
1675 FOR TIME=TIME+1 TO 200:NEXT TIME:TI
ME=0
1680 REM GAME #4, OVER OR UNDER
1685 GRAPHICS 2+16:POSITION 3,5:7 #6:"CA

```


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2779 GENEPOS CS 4=POSITION 2,101? " DGD

2000 CONGRESSIONAL PROPOSITION 2.101? 100
 LUCKY YOU SAID IT!!!!!!
 2000 CONGRESSIONAL PROPOSITION 2.102? AT THE END O

```

1765 FOR TIME=TIME+1 TO 200:NEXT TIME:GOTO 1760
1766
```

2000 年 12 月 1 日 (星期五) 14:00

P0000 RECORD NO. OF L=10000 THEN 70050
 T0000 RECORD NO. OF L=10000

```

7805 SOUND 4.97e+16
7805 SOUND 1.73e+3
7805 SOUND 1.73e+3

```

7000 FROM 11-11-11 TO 11-11-11
7000 QEND 7000

```

P0049 SOUND 0,0,0,0
P0055 SOUND 1,0,0,0 RETURN

```

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```

0010 READ FILE IF L=1000 THEN GO TO
0020 (NAME) 0.0.10.100 SETCOLOR 4.0.0]

```

09-448 60710 60810

[illegible]

TABLE 1. *Mean (SD) values of the variables measured in the 1000 subjects*

DATE: 122.2, 61.2, 65.2, 73.2, 62.2, 52.2

5.2, 6.2, 2.97, 2.122, 8.6, 14895
14895, 14895, 77.3, 8.3, 77.3, 8.3, 77.3, 8.3, 77.3,

[illegible]

==== HRP -100% +0.000000 +FLUORESC LIGH

[illegible]

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WASH. SOUND G.L. 1940
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1004 2000 0.00-0.00
 1005 2000 0.00-0.00
 1006 2000 0.00-0.00

RUNS ON A 32K PET

The scene of our game is a top dog show.

Pooh people's groomed puppies, pampered pooches; page, Pekingese, Pomeranians (poodles perhaps) proudly promenaded, parading perfectly pruned postures, providing properly processed pedigrees and lots more things beginning with "P".

The name of the little dog in this game is Flortense Flocken the Flourin, known to his friends as Flortense Flocken the Fourth, or to his enemies as Chandy. But I digress, the real star of our saga is a flea.

Malcolm J Spoggleborty is a lord among fleas. To say that his blood is nearly blue would be a lie.

He comes from a long line of fleas all of whom were well up to scratch. His ancestors include Trevor Spoggleborty, who got inside Lord Nelson's jacket during him to reach inside to scratch.

Once Spoggleborty, who tickled the Mona Lisa as she was posing, Noah Spoggleborty who bit the bird that dropped the apple that fell on the head of Isaac Newton who cried "Eureka" and fell into the swimming pool on top of Archimedes, who was having trouble with his principal at school, thus discovering water.

Or more recently, Frank Spoggleborty who bit Adam Ral on the recording session causing him to utter the famous sound that we all know and love.

But enough of this boring native, this game is about — oh, read the instructions yourself — they are in the listing.

On a serious note people with old PETs should change the convenience of Peak 151 to Peak 515, which will enable you to run the program.

BY PAUL JAY

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100 GOTO 50
101 PLOT=0
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Illustration: Peter Mayhew



Landing on the rough surface of any planet is difficult enough, but when you're got asteroids whirling around your craft threatening to do a terminal damage it makes the operation a life and death affair!

Moon Shuttle is a cross between a lunar lander and asteroids game. You have to guide your craft through a maze of deadly asteroids and land safely.

The program is designed for use with a joystick — but it can be played using the Vic's keyboard by making the changes shown below. When the program is run the computer asks you for a number between 1-15 — this decides the difficulty of the game, by deciding the number of asteroids.

By moving the joystick — or pressing any key — you start the game. The spaceship takes off from the lunar surface and then drifts across the screen. You have to land on one of the blue landing pads — but watch out for those asteroids! You also have to keep an eye on your fuel consumption — don't run out before you land! The difficulty level increases after each successful landing.

IMPORTANT: The program comes in two parts — other wise it would not fit in 3.5K. The first part is "initialisation" and sets up a character table in 512 bytes of RAM including several custom characters. It must be run each time you wish to play the game.

But please note that — each time it

BY P. A. ROBERTS

is run 512 bytes are loaded off and if it is run more than once during your session with the Vic an out of memory error will result. Attention for use without printing.

On line 410 change the value of J to 100. On line 455 change the 37037 to 103 and the 125 to 54. On line 460 change the 90 to 51. On line 470 change the 94 to 25. On line 475 change 78 to 43. On line 480 change 86 to 25. On line 1040 change 90 to 51. On line 1050 change 14 to 25. On line 1055 change 78 to 43. On line 4030 change 80 to 28. Then use keys: Up, N-down, J-right, H-left.

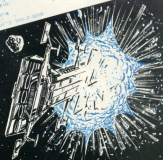
INITIALISATION

```
10 F11=00004:07=02189
20 P00001,P001060:0 P00004,P0001060:0 P00011,P0001001
30 C0=00004000:020:P0001011
40 P001407001:P00000:0:P000107:1:0:0001 000
50 P00140700000000000000:P0001:0:0001 000
60 0000 00,00,100,000,100,00,00,001
70 0000 000,000,100,000,000,100,000,000
80 0000 00,100,00,100,00,100,00,04,04
90 0000 00,100,100,00,100,00,100,00
100 P000000,00,17:100,00,000,000,000,100
110 P00000000,000:P0001:0
60 000
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0:02=00010
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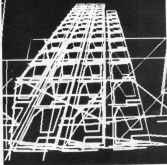
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BRIDGE

COMPUTERS IN CHARGE

Perhaps the biggest gulf between the problems of compensating chess and bridge is that in chess there is only one starting position; in bridge, by virtue of the randomness of the deal, there are over 8×10^{22} beginnings.

First, the strategies of both games can be defined, albeit in very broad terms. In chess the ultimate objective is to mate your opponent and subsidiary targets are to gain material and/or command of space in order to better your chances of achieving your prime aim.

In chess there is a wealth of literature stemming from any particular set of opening moves.

The bridge objective, on any given hand out of the possible 8×10^{22} plus, can best be put in the following form — a partnership if it has the edge in quantity of material that it has been dealt, seeks to maximize the number of points that it scores.

The scoring is notoriously complex, and discontinuous as well. Achievements have to be gained in two distinct phases. First the pair of hands has to be bid in such a way that the right suit is chosen as trumps, the right level for the contract is chosen and — sometimes — the right hand is the declarer.

Secondly, even having achieved the optimum contract, the 26 cards have to be played in such a way that the maximum number of tricks are taken. Even in that simple statement there are unexpected difficulties.

If your contract is Four Spades — where ten tricks are required. Should you try for a 100 percent chance of ten tricks? Or a 66 percent chance of eleven, with the slight risk of losing all?

That perhaps is mathematically calculable, but there is another curious reason — it may be practically better to play a hand in such a way that a human opponent has an excellent chance of doing the wrong thing rather than stick strictly to the odds. Shades of poker...

On the other hand, if the opponents hold the balance of high cards it is likely that your partnership will be cast into a defensive role. Again, this is a multi-stage decision process, the phases of which are inter-related.

1. If at all possible you should cause as much obstruction in the bidding as possible — commensurate with reasonable safety as regards loss of points — with a view to making it as difficult as

BY ALAN HIRON

possible for your opponents to bid their way to their best contract.

2. Sometimes it can be right to make a sacrifice bid. After all, if your vulnerable opponents can score 600 points in a contract of Four Hearts, it is worth your while playing in a contract of Four Spades if the cost, even if doubled, is only going to be 300 points.

3. If judgement leads you to defend rather than sacrifice, there are suddenly a new set of problems. It has been said that for every hundred computer decisions at this game, there is only one chess defender.

I have mentioned the openings in chess. The corollary, in bridge, is that a defender has to make an opening lead. Certainly this is an area about which several books have been written — mainly guidelines to help improving players — but every hand sets a new problem.

Bridge is very much more a game of percentages rather than absolute facts — except in certain rare situations.

You can hardly say that Karpov gets the first six moves of a Russian defence right most of the time. He always does for it is a sequence of events that has been well analysed from the same starting position.

By contrast even a world bridge champion can make a disastrous opening lead — and this has been well authenticated!

That was just the opening lead problem — now let us take a hand where a reasonable human defender would have little trouble.

North
♠ 4
♥ A 9
♦ Q 10 7
♣ K 4

East
♠ Q 8
♥ K 10 9 8
♦ 6 4
♣ K 10 9 8

South opened 1NT (10-14 points) North raised to 2NT and West led the five of spades. All text-books stuff us for and East — the computer was playing all four hands! — correctly won with ♠A and returned ♠Q.

No problem, and the contract duly failed as West led from five spades headed by the Jack and also held ♠A.

Now some slight changes, and here was the full hand...

♠ 4
♥ A 9
♦ Q 10 7
♣ K 4

♠ 10 9 8 3
♥ 8 7
♦ 8 3
♣ 7

♠ Q 3
♥ Q 10 4
♦ A 1
♣ K 10 9 8

♠ K 6
♥ 7 4
♦ K 8
♠ Q 1 3

Again with computers in charge of all four hands the bidding was impeccable. South opened a weak no-trump (10-14 points) and North raised to 2NT. The lead was fine — even with a sight of all four hands, who could do better than push out ♠7 — but East fell from grace at trick 1.

All human experts, arguing that they were the defender who was almost sure to get in next, put in ♠Q — rather than ♠A. In that way they made it virtually impossible for declarer to hold off — in case West held the Ace — and this led to the straightforward defeat of the contract.

Over to our computer fixed in the East seat. Just as before, he rushed in with a rather magnificent ♠A on the first trick. This would have given a human declarer no problems at all. He would hold off, win the third round of spades and tackle the diamonds. On the line of the cards West would never be able to get in to enjoy his long spades and the contract would roll home.

Oh dear! In real life the computer South threw back all of the advantage that he had gained and won the second spade instead of holding off. Now he had no chance, no matter how the cards lay.

Is this too subtle a problem, perhaps? I don't know — it is an old favourite with examiners who are testing out candidates for their Q level examinations in bridge. You can see the lead in complications — if East has most of the outstanding high cards — bearing in mind the opponents' bidding — one play is right, if he doesn't have too much cards and has a reasonable hope of his partner gaining the lead before he does, then his alternative play is correct.

In the next article I will give some thought to how machines can tackle end-game problems. If there are not all that number of cards left per player then an exhaustive search solution may prove enough to crack any normally set problem.



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Adventure

SPANNER IN THE WORKS

When I suggested that both computer and player would recognise treasures more easily if they were identified by a special symbol placed on each side of the word, I threw a spanner in the works as far as object recognition was concerned.

You will remember that the object array (O) is scanned to compare the three left most characters of each element with the corresponding characters of the second word of the player's response (R2). Now many players are like to type "TAKE 'DIAMOND'" complete with apostrophes!

A possibility not mentioned so far is enhancing nouns with adjectives, a desirable feature adding colour and mood to the game. "BLOODSTAINED AXE" sounds far more sinister than "AXE", assuming that is the impression we wish to convey!

Yet a player will automatically type "TAKE AXE" rather than "TAKE BLOODSTAINED AXE". The problem is that the first three letters of the object are no longer the three letters by which we want to recognise it. Notice the similarity to the problem of the treasure materials.

Since W23 holds the first three letters of all valid nouns, it would make sense not to duplicate these in the object array, so include only non-object nouns in W23, such as those used in location descriptions. Assign the rest to an element in C00n, this array holding the complete descriptions and symbols, and to the left of each description the three letters by which each object is to be identified. See Figure 1. Next concatenate the first three letters of each of the other nouns into string W23, and to decode the noun:

```
300 FOR I = 0 TO 4: IF R2$ ( )
  LET $O$ (I) THEN NEXT
  ELSE R2 - I : GOTO 400
310 LET C$ = W2$ : LET C$ =
  R2$ : GOSUB 2000
320 IF I = 0 THEN LET Q1$ =
```

```
"NEVER HEARD OF A "R2$ :
GOTO 100 : REM R2$ IS 2ND
WORD OF PLAYER RESPONSE
330 LET R2 = 0 - 173 + 5
340 REM R2 IS 174th OF I PLUS 4
400 REM THIS LINE GOES TO
ROUTINE FOR APPROPRIATE
VERS
```

The subroutine at 2000 is the string search given a few months ago, returning 0 if word is not found. R2 holds the coded

number of the noun.

Note that if R2 isn't found in the object array, the noun moves to the W23 string, and it found $k2 = 4$ plus the word number found in W23.

To display the objects visible at the current location it will now be necessary to use only the characters to the right of the three identifiers, which can be isolated by the expression:

RIGHT\$(C00n, LEN(O)N)-3

Figure 1

No.	Object description	Key	Contents of O(n)
0	BLOODSTAINED AXE	AXE	AXE-BLOODSTAINED AXE
1	COW	COW	COW-COW
2	JUMPING BEAN	BEA	BEA-JUMPING BEAN
3	METAL BUCKET	BUC	BUC-METAL BUCKET
4	GOLDEN FISH	FIS	FIS-GOLDEN FISH
5	SILVER NEEDLE	NEE	NEE-SILVER NEEDLE

Note that even when the key is the same as the first three letters of the whole description, these must be repeated.

HELP — GET ME OUT OF HERE!

Please don't let anyone else see this page. I'll be in dead trouble if they find out I've written it. They've had me incarcerated here since the day they carried me away screaming from the Death Maze.

Excuse me, I have to keep looking over my shoulder while I write — at any time a guard might come along and get me back into a straight jacket.

While my hands have been free I've written "HELP — GET ME OUT



OF HERE" on the back of a hand-grenade. I'm going to lob it at someone outside, to let the world know where I am. Then they'll HAVE to let me out because everyone will know it's me — and you all know how easy I am.

I manage to get out of my padded cell from time to time, it's a bit disappointing out there, all corridors

with doors on both sides and a guard on every corner. I hate it when they catch me, and they always do. They keep taking away my grenade pin and I WANT IT! I WANT IT! How has hee?

Sometimes I feel them by letting the pins fall on my head just before they can powder! It doesn't hurt make them cross! How has?

A man behind one of the doors wants me to let him out. He's promised to kill me if I do. Think I'm stupid? Set him free and he'd be off without a thought for his side of the bargain. Between you and me, I reckon he's a bit of a nutter.

There's a lady in the cell next to him. She keeps laughing in a very high-pitched sort of giggle. They say she's slightly mad, poor soul.

It's so boring here — I can't even read the newspaper I found in my cell — I forgot how to read ages ago.

Please tell me how to get out dear readers, so that I can continue to write for you. Pages of copy as blank as my mind don't go too well with editors. Quick, I hear them coming. My address is "The Anytum . . . JAGGED!"

Editors note: Anyone who can help Keith to get out of the Anytum, should write to me with details, at 8 Herbet Hill, London, E20 5J9. Do not delay as we need his copy for the next issue!

By KEITH CAMPBELL

PRACTICAL PROGRAMMING

DECIDING ON VARIABLES

Blowing a plane out of the skies is hardly the most constructive thing to program but it forms a basic computer fundamental to many of the dexterity and action games which feature on microcomputers.

Last month we ended with a detailed outline for a simple game program, and we will now look at the process of converting the outline into Basic code. I will be developing the program to run on the Compaq UK101, but I will explain the machine-dependent details to allow you to write a similar program for any machine.

The first step is to decide on the main variables and constants to be used and to determine the initial values to be set up.

If we start with the first line of the program description, "write blank to current plane position" we see that we need a constant to represent a blank or space character on the screen and a variable to represent "current plane position", and we must assign an initial value to "current plane position", the initial value being the top left-hand corner of the screen.

We can work through the whole program description in this way, assigning variable names and initial values, and then write the initialisation section of the program.

If you look at the program listing you will see that the first few lines are devoted mainly to setting up initial values. In line 1, SC=52448 gives the start of the screen, L=64 gives the number of characters across the screen, E=SC+8*L gives the final position for the plane (the end of the sixth line down) and CP=SC+16*L+34 gives the position of the gun (the centre of the bottom line on the screen). These values will have to be changed on other machines, for example, on the PET the screen starts at address 32768, there are 40 characters across and 25 lines down the screen, so line 5 would become: 5 SC=32768: L=40: E=SC+12*L: CP=SC+24*L+20

Line 10 defines the graphics characters used. BL is the blank or space character and SH is the standard ASCII code for space, used on most home computers. PL, SL, and GN are used for the plane, shell and gun; the Compaq provides suitable graphics for these, for other machines you will have to check the character set.

Line 15 is specific to the Compaq and Ohio Scientific machines, and sets up for reading the keyboard. This line should be omitted on other machines.

Lines 20 and 25 initialise the remaining variables; PP is plane position, initialised at start of screen; PC is the number of planes, initially zero; V is score value; S is the player's score. F and G are the flags "shell fired" and "gun enabled", set

initially to indicate that no shell has been fired and that the gun may be fired.

Line 30 clears the screen; although most computers have a "clear screen" command there was no such command on early models of the Compaq.

Line 50 poses the gun on to the screen and sets up to write the shell immediately above the gun.

We now come to the body of the program, which is written from the program description.

Lines 100 and 110 correspond to the first two lines in the program description:

write blank to current plane position

move plane position one place right

The next block in the program description is:

NOW STUDY THIS LISTING

```
1 SC=52448: L=64: E=SC+8*L: CP=SC+16*L+34
2 BL=32: PL=217: SH=248: GN=115
3 PC=0: S=1: KB=17096
4 PP=SC: PC=0
5 V=0: S=0: F=0: G=1
6 FOR I=1 TO 10: PRINT: NEXT I
7 POKE CP, GN: IS=CP+1
8 POKE PP, BL
9 PP=PP+1
10 N=N+1
11 IF N=L THEN N=1: V=V+10: G=1
12 IF PP=E THEN PC=PC+1: PP=SC: V=0: G=1
13 POKE PP, PL
14 IF PP=CP THEN GOTO 60
15 POKE CP, BL
16 CP=CP+1
17 IF CP=SC THEN F=0: GOTO 20
18 POKE CP, SH
19 IF PP=CP THEN GOTO 60
20 IF G=1 THEN GOTO 20
21 POKE KB, 247
22 IF PC=0 THEN SP=SC: POKE CP, SH: F=1: G=0
23 IF PC<=5 THEN GOTO 100
24 FOR I=1 TO 5: PRINT: NEXT I
25 PRINT "YOUR SCORE IS": G
26 PRINT "ANOTHER GAME": INPUT AS
27 IF AS="Y" THEN RUN
28 GOTO 5
29 F=0
30 FOR I=1 TO 10: POKE PP, 41: POKE PP, BL: NEXT I
31 PC=PC+1
32 PP=SC
33 N=0
34 V=10
35 G=1
36 RETURN
```

BY TED BALL

PRACTICAL PROGRAMMING

IF end of line THEN set plane position to start of next line
decrease score value
set "gun enabled" flag.

TESTING TIME

So far we have not made any provision for testing when the plane reaches the end of the line. It could be calculated by testing for PP being a multiple of 64, but doing it that way we would have to allow for 32-3348 being a multiple of 64. It is easier to set up a counter N to record the position of the plane on the line and test for N being equal to the line length. This gives us lines 130 and 140. Note that, because the CompuKit allows multiple statements per line we can get the whole of an IF ... THEN ... block on one line. In ZX81 Basic we are allowed only one statement after THEN, but we can keep the structure of the program by writing

```
130 IF N=L, THEN COSUB 300
400 LET N=0
410 LET V=V-10
420 LET Q=1
430 RETURN
```

Many mainframe Basic allow IF ... THEN statements only in the form IF condition THEN line number. In this case we would write

```
130 IF N < L THEN 140
135 N=0
134 V=V-10
136 Q=1
```

Continuing to work through the program description, line 140 represents the next block:

IF end of run THEN add 1 to plane count
set plane position to start of screen
set score value to initial value
set "gun enabled" flag
and lines 150 and 160 represent the next two blocks:
write plane to new position
IF hit THEN subroutine (plane destroyed).

The next block is more complicated:

```
IF shell fired THEN write blank to current shell position
move shell position up one line
IF off screen THEN clear "shell fired" flag
ELSE write shell to new position
```

We could start by writing

```
170 IF F=1 THEN COSUB 700
```

and expanding the right-hand block inside a subroutine, but I have chosen to start with IF gun not fired THEN GOTO next block. The next two lines, 180 and 190, are straightforward.

We now come to the implementation of an IF ... THEN ... ELSE ... statement. This is available on a few computers, for example the TRS 80 and the BBC Microcomputer, but on most machines it must be broken down into IF ... THEN ... and GOTO statements. By using the feature of multiple statements on a line I have kept some of the structure of the program description. However, if only one statement is allowed on a line we must write something like

```
200 IF IP < 30 THEN GOTO 210
210 POKE SP, SH
212 GOTO 220
218 F=0
```

Line 220 is identical to line 180 and corresponds to an identical line in the program description.

The final block in the main body of the program is:

```
IF gun enabled THEN check keyboard
```

IF key pressed THEN set initial shell position
write shell to screen
set "shell fired" flag
clear "gun enabled" flag

The method of reading the keyboard on the CompuKit and Ohio Scientific machines is rather complicated and I will not go into the details. On most machines we can replace line 240 and the first part of line 280 by

```
240 GET A$
280 IF A$="T" THEN ...
```

or

```
280 IF INKEY$="T" THEN ...
```

This fires the gun when the F key is pressed and ignores all other keys.

The overall structure of the program description is

```
REPEAT body of program
UNTIL plane count more than number of planes
```

Line 290 tests for end of game, and lines 280 to 310 clear the screen, print the score, and carry out the usual "another game?" routine.

The remainder of the program is the subroutine in lines 300 to 580, which corresponds to the following in the program description:

subroutine (plane destroyed)
clear "shell fired" flag
simulate explosion on screen
add score value to player's score
add 1 to plane count
set plane position to start of screen
set score value to initial value
set "gun enabled" flag

The only part of this which requires comment is "simulate explosion on screen", which is implemented in line 510. The ASCII code 42 is an asterisk "*", and line 500 flashes the asterisk on and off.

The method of creating moving graphics used above applies to most computers that have a memory-mapped screen. Usually, the last position on one line and the first position on the next line are consecutive memory locations and no special provision is needed to move the plane from the end of one line to the beginning of the next. PP = PP + 1 in line 150 will do this automatically.

However, the ZX81 does not have a memory-mapped screen. There are two ways of creating moving graphics on the ZX81, either by using PRINT AT or by POKEing to the Display File, but in both cases trying to write beyond the end of a line will cause the program to crash.

I have kept the program fairly simple in order to concentrate on the method of top-down structuring for program design and to avoid getting bogged down in details of the code.

However, top-down structuring is extremely important in the design of large, complicated programs that may end up with hundreds or even thousands of lines of code.

By splitting the work involved in writing a program into two parts, first producing a logically structured description of the tasks the program must perform and then writing the code to perform these tasks, the programmer can concentrate on the details of the code in one part of the program without having to worry about how it affects any other part of the program.

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SIMPLE SMOOTH CURVES . . .

The impact of a graphic display often comes from a simple, smooth curve which links together all the elements in a picture.

To obtain a particular effect it may be useful to make small variations to the basic shape of a particular curve. These ideas can be illustrated by examining some slightly unusual curves and then seeing how small variations can be added to them.

The location of a point, P, can be described not only by giving its row and column positions, but also by giving its distance, r, from a fixed reference point and the angle, θ , that the line from the fixed point to P makes with a reference direction. This is illustrated in figure 1.

The new co-ordinates are called polar co-ordinates and are written as (r, θ). It is usual to measure the angle, θ , in radians. Polar co-ordinates are the natural way to describe a position in

some circumstances, for example, the position of a ship or an aircraft is usually fixed by giving its distance away and its direction.

Now curves can be expressed in polar co-ordinates, and some other unusual curves are given by quite simple polar equations. As an example, the equation $r = \theta$ describes a spiral.

One revolution of this spiral is shown — in black — in figure 2. It is obtained by letting the angle, θ , take on values corresponding to one turn of a circle. The shape is scaled simply by introducing a scaling factor. Figure 3 also shows one revolution of

$$r = 3\theta \text{ (in red)}$$

$$r = 4\theta \text{ (in blue)}$$

The program that produces these and subsequent plots is essentially as follows. Note that π is written in no particular dialect of Basic.

```
30 P1 = 3.14159
30 FOR TH = 0 TO 2*PI STEP
P1/50
30 R = TH
40 X = R*COS(TH) : Y =
R*SIN(TH)
50 IF TH = 0 THEN MOVE X,Y
ELSE DRAW X,Y
60 NEXT TH
```

The equation of spiral is incorporated in line 30: by

changing this line other curves can be generated.

Figure 3 shows two revolutions of the same spirals as before. If you rotate the page while looking at these spirals you will experience a strange optical illusion. To show another unusual curve, the limacon $r = 1 + \cos\theta$ is plotted in black in figure 4.

Variations on this curve are also shown by giving:

$$r = 1 + \frac{1}{2} \cos \theta \text{ (in red)}$$

$$r = 1 + \frac{1}{2} \cos \theta \text{ (in blue)}$$

This variation seems to remove the unusual characteristic of the curve. However, the next variation shows how to keep it and even to make it cover repeatedly. Figure 5 shows:

$$r = 1 + \cos 2\theta \text{ (in black)}$$

$$r = 1 + \cos 3\theta \text{ (in red)}$$

$$r = 1 + \cos 4\theta \text{ (in blue)}$$

With this experience of making shapes and loops, we can return to the spiral and give it a ripple of a shape and frequency that we can control. The rippling spirals of figure 6 were obtained by plotting two revolutions of:

$$r = \theta + \frac{1}{2} \cos 3\theta \text{ (in black)}$$

$$r = \theta + \frac{1}{2} \cos 4\theta \text{ (in red)}$$

$$r = \theta + \frac{1}{2} \sin 5\theta \text{ (in blue)}$$

If you would like to experiment to change the shape at some other curves, then the equation of a circle is $r = 1$ and of an ellipse is $r = 3/2 + \cos\theta$.



Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6

GULP IT'S
THE
GLOOPER!

WOMAN

Stop the monsters rampaging through the circuits of your VIC in a replica of the popular arcade game.

Woman is for one player at a time and he can use either a set of four keys or an Atari joystick.

The object of Woman is straightforward. The player must guide his glooper around a maze in order to eat up all the dots. However, there are four monsters in the maze and they are out to eat your glooper up.

There are four flashing white dots and when the glooper eats one of them, he can turn the tables on the monsters.

While playing the game I found a few bugs. Firstly, if you eat a monster just outside his cage, a life monitor will appear who either comes out after you or stays in the cage. Secondly, when you eat a monster, it turns into a pair of eyes which return to the cage and revert to the monster form. The fault lies in that these eyes sometimes get stuck and so you only have three monsters after you until the street is finished or a life is lost.

Woman is an excellent version of the arcade game Puckman and will give hours of entertainment.

Woman is well worth £7.99 and is available from Liverpool-based Regisoft.

Exploding Atoms is a marvellously simple strategy game for two players on the Sharp M2000. The action takes place on a 6 x 6 grid, where both players place counters. You are not allowed to place your counter on a square occupied by your opponent or one owned by your opponent and you place counters alternately.

The game is about overloading squares. Corner squares overload with two counters, edge squares with three and the centre squares with four. Obviously, readers will have noticed that

NICE, THESE
POLISHED PUB
GAMES

The nice thing about Acornsoft programs is you know you are going to get documentation on how to load and run the software.

Games Pack II from Acornsoft contains three 5K programs for fully expanded Atoms with 6K of ROMs; namely, they are Missile Command, Snooker and Dominoes.

The missiles of Missile Command start descending on a gameboard but after the fourth attack you are in trouble if you haven't got the hang of the sight controls. Due to the lack of a standard joystick for the Atom the sights are controlled from the keyboard, the central rectangle of 36 keys bounded by "2", "1", "0" and "7" are mapped on to the screen. The space bar toggles

OVERLOAD IMMINENT

EXPLODING ATOMS

these figures correspond to the number of adjacent squares to each top. This is because an overloaded square explodes, sending one counter into each of the squares around it.

And if the corners or adjacent squares are involved then that too will explode and it is in this way that a chain reaction can begin.

If your counters explode into a square containing your oppo-

nent's counters then that square is turned to your ownership. After some initial sparring, the game quickly becomes critical as each player tries to begin the reaction.

Critical because a misadventure which leaves just one opponent counter standing is usually fatal! Exploding Atoms comes on the same cassette as Star Trek and 3-D Mouse it costs £9.99 from Aberdeen-based Knights T & Computers.

MISSILE COMMAND, SNOOKER, DOMINOES



the 6 x 6 keyboard onto the upper or lower half of the screen.

The V cursor, ctrl and shift keys live the left, central and right lower halves respectively. The graphics are clean and reasonably fast and the speaker buttons merely beep.

Snooker is a two player game which sports a snooker table with one red ball, six coloured

and a cushion displayed very nicely and quickly. The graphics are excellent. Unfortunately it is a bit like playing on a quarter sized table with ball sized balls. The wipers are a pleasure to watch, they are slowly Newmarket but slow when more than one ball is moving and because the computer doesn't play the score tends to increment in fives. (Maybe it's because the balls are square!)

Good graphics and fast play are the features of Dominoes, but not being able to see the computer's pieces doesn't inspire one with confidence in the integrity of the machine. I'm sure it rises at your Pascal!

The Atom displays your dominoes at the bottom of the screen and makes the pieces in play across the screen.

A good value for money games cassette from Acornsoft, three very polished pieces of software. A shame that the programs do not have any skill and variation options to choose from, as that would certainly increase the audience range.

NOT ENOUGH BOUNCE

BREAKOUT

The dedication and skills needed to succeed at Breakout are, frankly, beyond me.

Obviously, or probably, because of this I am hugely addicted to beating my ball against a multi-coloured layer of bricks. But, even I have certain demands of this simple game, which I was not aware of until reviewing this BBC micro cassette.

I do not expect to see the ball appear to bounce under my bat before returning to the wall. Or to find the top line of the game constantly flickering and exiting just off my lefty.

The producers have again us-

players a choice of six speed levels but I would prefer a greater depth of play area in which to judge the ball's bounce.

The BBC micro's bright colours almost compensate and I appreciate that the version was rushed out to be the first available software for the machine, but simple unoriginal games need the most thought and care with presentation. Please try again.

Breakout is from Wexham-based I.J.R. Software and costs £3.99.



Can't afford that trip around the world this year? Not going to get to visit the Mayan ruins in Mexico? NASA rejected your application to take the Lunar Cruise Tour? Well, relax. Now you can have these and dozens more adventures in the comfort of your own home. Compliments of your friendly ZX81-82.

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the system



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This book is for the programmer that needs complete answers about the ZX81. It is a book that has designed all together in the ZX81 and here the complete program code is given. It covers all ROM programs from 00000h to 00FFFh and includes all functions except for the routines used in the floating point calculator.

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Kit Ko'ther

CATCHING THE DATA BUS

Ask most people who own a Sinclair ZX81 — or even a ZX80 whether they can directly interface their machine for both input or output and their most likely reply will be no.

They are, of course, partly correct as neither of these machines, and some of the others, do not have interface adaptor chips in them. These chips would allow the programmer to input and output binary information to and from the data bus.

It is possible, however, to input single bit information to these machines with the minimum of hardware, and really it should not be beyond anyone who owns a soldering iron. The trick, if it is one, is to use the strobed keyboard along with the INKEYS function in software. This may not only be done with the Sinclair machines but with any which has a strobed keyboard. If you have ever used the INKEYS function you will know how this works. If not, just refer to the manual where it explains it in simple terms.

The principle works in exactly the same way as the keyboard in that the machine looks at each individual switch in the matrix one at a time. By using the INKEYS function you can test for any number of the keys in the following way:

IF INKEYS="1" THEN GOTO 100

where "1" is any of the lower case keys. As you would suppose you can use as many or as few of the keys as you wish. If you do not input the key that the machine expects it will just move on to the next line of program and to maintain the input mode a "GOTO 10" statement will have to be inserted after the test routine.

One of the most often add-on which uses this method of input is the joy-stick. This is just a switch with a number of positions, usually between 4 and 8.

The joy-stick is of course of use in games as a controller and, if a top switch is fitted, as a laser gun trigger. This arrangement can also be used to plot on the screen in a similar way. Although the strobe method lends itself to this sort of input it can be used for more ingenious purposes.

The best I have seen so far is a burglar system. The inputs were from the microswitches about the house and the tape output was used to trigger a recorded telephone message. Clever.

Now, although you may not have opened up the case of your machine before, if you bought it already built, you only need a little common sense and care not to damage it. You only need to know that 3 screws are hidden under the rubber feet. After the case has been opened two screws are removed to free the board. If you built the kit you will already know what goes where but if you did not a circuit diagram would be of use. The keyboard is the same for both the

ZX80 and ZX81 so that the diagram I have drawn below will do for both.

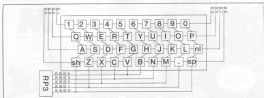
As you can see from the drawing the keyboard is in the form of a double matrix. Unless you are going to use the keyboard as well as the add-on it does not really matter which keys you wire up, as you can always allow for this in the program.

You will see from the picture that for, say, the letter "D" you would wire in on KB05 and D4, and for, say, the number "7" KB03 and C9 would be wired up.

You can wire in any of the keys, bearing in mind that you may want to use some keys on the board for auxiliary controls. Remember also that wiring on to the keys does not disable them. To make the system foolproof, you should solder the wires, preferably multi-stranded, on the keyboard side of the diodes and resistors, D1-D8 and RP 3, the resistor pack, respectively.

If you intend to fit a number of different add-ons it would be advisable to terminate the wires in some kind of multi-connector so that you need only plug in the alternatives. Try to standardise on the first one that you obtain or else the one with the most connections so that you do not get caught out with an unstable key.

Whatever you use the inputs for you will find that the machine will no longer be just a simple computing aid but a fun toy and a useful tool as well. It just goes to show how important input/output is when Sinclair's new machine incorporates a powerful command structure for this very purpose. I often wish that other well-established machines



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Brainware



MIND ROUTINES

During the recent snooker championships the following things were observed about the game.

1. There were no foul shots.
2. No colour (coloured) was potted the same number of times as any other colour.
3. The number of blue balls potted was exactly 3 times the number of brown balls potted.
4. Each player potted the same number of pink balls.
5. The difference between the number of pink balls potted and the number of yellow was only 1.
6. Billy Baskin started the frame and after his eighth shot he had scored 38 points.
7. Roger Baskin immediately followed this with a break of 18



- which didn't include a pink ball.
8. At the end of the game Billy Baskin took the pink to draw level and the black to win.
What was the final score?
How many of each ball was potted?

The champagne winners for our May issue's Mind Routines and Nevera Crossword puzzles were: Peter Harkin of Fieldhouse Lane, Marple in Stockport and Vic Burke, Claude Road, South, Cardiff.

Bottles of champagne are on their way to both of them.

Two more bottles of champagne are up for grabs this month for the first two correct answers out of the hat for this Mind Routines puzzle and the crossword below.

So get your brain into gear and tackle our two teasers this month for some bubbly.

Please send your entries to Computer & Video Games, Durrant House, 8 Herbal Hill, London EC9R 5B to reach us before June 13.

The answers to our June issue's Brainware problems can be found on page 13.

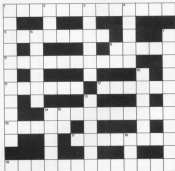
NEVERA CROSSWORD

ACROSS

1. Oxford street buyer? (8, 5).
2. Butler Biscuit Mince (6).
3. Edie endlessly, fly without a notice — improve the mind (5).
4. Confused M15 Teacher reduced by direct access (3,6).
11. Increased meeting the arrangement (6).
12. One down for example French and German articles round the point (6).
14. Victorians go, maybe, mate (5,4).
16. Give a hand to mount glue round the start of Picman (3,1).
17. Cutting way to get a right angle (5,3).
19. Sky sentences like Move and search in COBOL (3,5).

DOWN

1. Dream be quiet-high-class race the French finish video game transport (4,7).
2. Gassy train video game? (5).
3. String dimension (6).
4. Box I'd emptied contained an oxygen compound (5).
6. On which decisions are made about games? (6).
7. Mies from Dr. Who trap those in charge of a study of machine



- intelligence (11).
- Measure BASIC comment missing start (5).
- Skilful French move to the right (8).
- Establish Basic function state-

- ment in the Orient (8).
- Literal surrounding remark (5).
- Go for promotion (2).
- Exclamation of 100 Down eggs (3).

MS. PAC-MAN

With the introduction of Ms. Pacman in America especially for female game players, Elipeth Joiner has been investigating whether British distributors are planning an assault on female games players.

It's a well-known fact that far fewer women than men venture into arcades to play video games and have not fallen for the addictive nature of many of them.

But last year American women were caught up in the Pacman fever which raged across the country.

It was the first game that appealed to women as well as men, and as a result of rising and extensive marketing of the game it has gathered a cult following.

Then the American video games manufacturers realised that women are interested in playing — if a game appeals to them.

Now Pacman distributor Midway has copied Ms Pacman which was specially aimed at the female contingent. It is identical in concept to Pacman but is a variation on a theme.

Ms Pacman is identified by a red bow in her hair. In pursuit of her are the three familiar faces of Inky, Blinky and Pinky along with the latest recruit Sue.

An extra, but fascinating feature of Ms Pacman is a love story — Ms Pacman meets Pacman. It's love at first bite and results in marriage, culminating in the delivery of Pac-Baby. This scenario appears between games and takes three acts to perform.

Ms Pacman falls into the role category of video games. There are much less violent than the blast and rap games of the Space Invader genre.

Manufacturers' research in the States has shown that

cute games are more appealing to the female sex.

But in England the industry has been slow to give women what they want in video games. So far Bally US has no plans to introduce the game over here for two reasons — lack of demand and over-exploitation of Pacman.

"We have had expensive and exhaustive sales meetings with dealers but there was no interest in the game," said Bally US's managing director David Adams.

"It won't go down well in England because there have been so many rip-off games of the original Pacman. Ms Pacman must have been covered in one of them," he added. "Only the red bow is missing."

Now there are so many versions around that Ms Pacman will probably be lost in the crowd.

Another large manufacturer, Taito, is doing little to entice women to play video games. The firm's technical controller Johnathan Lister admitted that few women play video games in comparison to men but Taito was not doing anything to develop new games to attract female players.

The general opinion is that girls are less violent than boys by nature.

Lister said: "The majority of games are now looking at more humorous themes than the space battles and war-games that started off video games. It's the non-violent aspects that appeal to females."

Mike Shaw, associate editor of the US magazine Play-

mate agreed: "The introduction of cute games is aimed at increasing the play by women and manufacturers tried to see the response by producing games which are not very much based on violence."

He says judging by the comments from operators and arcade supervisors it has certainly worked in America.

David Adams says "Women seem to prefer the fun type of games, and the swing is towards more women in the arcades. It always has been a male stronghold but it's a natural progression that more women will be in the backbone of the industry."

"Women have got to design the games themselves, after all they know what they like," he added.

Dave Snook, editor of the trade paper Computer said: "It is rather aversive to the basic character to be female character to be aggressive and you can see a man's role in daily life, take meaning for instance."

Video games are also essentially competitive, and women, with several noted exceptions, in general are not as competitive as men.

Locations of video games are not always appealing to customers or conducive to women players and manufacturers admit that they have lost out on the market because of it.

Most video machines are installed in arcade centres which are often poorly

designed or they are put in corners of pubs which tend to be a male domain.

In America the leisure centres are often situated in shopping malls so it is normal for women to take their kids along for a few minutes when out doing the weekly food shop.

Both Bally and Taito agree that British arcades tend to be unattractive.

Taito has noticed a lot of machines springing up in individual shops and can see the sense of installing them in places like Woolworths or Marks and Spencer.

Yet David Snook, reckons that the sentiment associated with arcades is a myth.

"The arcades of London's West End and those of other large cities are like chalk and cheese," he said. "Most arcades are now leisure centres and are more up-market than they used to be. Now there are carpets, the places are kept clean and they are generally nice places to go."



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 Pison, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented 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 alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. 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 Squares, Doodle, Kim, 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, Silhouette, 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 all - for example, dollars to pounds.

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

Programs - Down Under, Submarines, Doodling with Graphics, The Invincible 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 - Martian Knock Out, Quarks, First 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, Spillans, 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 - Racetrack, Chase, Nim, Tower of Hanoi, Docking the Spaceship, 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 2).
Description - Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required - ZX81 + 16K RAM.
Price - £5.95.

Programs - What are Biorhythms? Your Biorhythms.
Description - When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Pison)
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 (Pison)
Hardware required - ZX81 + 16K RAM.
Price - £5.95.

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 (Pison)

Hardware required - ZX81 or ZX80 with 8K BASIC ROM and 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 imprisoned. To escape, you'll probably need the help of the Grand Sorcerer.

Cassette G13: Space Raiders and Bomber (Pison)

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 (Pison)

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 Sheriff'? Which playwright also played cricket for England?



Cassette E2: Fun to Learn series - Geography 1 (ICL)

Hardware required - ZX81 + 16K RAM.

Price - £5.95.

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 - £5.95.

Programs - Events in British History, British Monarchs. Description - From 1066 to 1661, 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 - £5.95.

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 - £5.95.

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 - £5.95.

Programs - Inventions before 1850, Inventions since 1850. Description - Who invented television? What was the 'dangerous Lister'?

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

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

Programs - Series A1-A5, Series B1-B5. Description - Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Pack (ICL)

Hardware required - ZX81 + 16K RAM. Price - £9.95.

Program - Collector's Pack, 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 - £9.95.

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: VU-CALC (Pelson)

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

Program - VU-CALC

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

Cassette B4: VU-FILE (Pelson)

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

Programs - VU-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.

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06	Super Programs 6	35	£4.95		09	Inventions 1	50	£9.95	
07	Super Programs 7	36	£4.95		10	Spelling 1	51	£9.95	
08	Super Programs 8	37	£4.95		11	Collector's Pack	52	£9.95	
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GAMES SAY

Space Invaders provides what seems like a perpetually randomized attack within a constantly moving, yet enclosed, scenario.

Delivery speed of the missiles and their run and the variety of directions (usually one — down-wards from which they come, plus the run of attacking space creatures, provides the challenge to the player's survival.

So strategies are available to a player. The first is predominantly defensive. The second is predominantly retaliatory. Only the elusive maneuver counts whose survival is concerned. The retaliatory counter attack is secondary. The limit to the number of retaliatory missiles dispatched at any time is a good reason for an essentially defensive posture as the preferred primary strategy.

Games like Space Invaders are addictive only to those people who believe that attack is the only way to win. But that's how you lose in games as in real life. The defensive, primary tactic is always the best as every Karate expert knows. The 'attack first' stance is addictive and usually fatal for those who believe in it despite all the evidence to the contrary.

Those who subscribe to the 'get them before they get me' principle generally lose at the earliest moment — some sooner than others. Those who subscribe to the defensive principle last longest.

Ending the missiles perfectly or relatively perfectly with return fire only when it is safe and effective allows the defensive player to last as long as the programme permits.

The game losing its addictive quality as soon as you have 'conquered' it to the point of playing almost indefinitely. Then it is just a question of how fast you can dodge and reduce the number of attackers from any temporary safe position. You can't win forever, no matter what. At best you can keep going until you tire, run out of time or until the machine breaks down.

These are valuable lessons for games and for life, providing they are properly understood. If you were to keep winning, the only defensive play available to the designers of Space Invader programs would be to speed up the program

"Get 'em before they get me", was the cautious reply of a Space Invaders devotee when questioned about his optimum strategy.

Another common answer is: "Shoot first and ask questions afterwards." Both are the sign of the loser or those who won't survive for long.

Winning in any game is largely

BY ARNOLD ARNOLD

a matter of survival and foresight. The winners are those who understand what is involved and those who last longest. "Winning" in any game is really a matter of outlook.

This and two following articles analyze popular computer, video and other games. Here I am going to describe the best winning strategies for Space Invaders as well as why they should be adopted.

In Space Invaders, as in card games, the facts (i.e. the Space Invaders' missiles) are randomized like a deck of cards. Players are meant to be kept perpetually guessing how best to survive and win.



In Space Invaders, the random or seemingly random program and supposedly random events delivery are designed to confuse the players. One also cannot by the shooting of the deck of cards, certainly be surprised whatsoever by greater confusion created by all players for one another. It is other words by bluffing and psychological play. Not by confusing a computer.

This article examines how best to apply a strategy. The two following articles will describe the part played by luck in games and offers a general reference to the chess problem.

and increase the number and randomization of the missiles up to the limits of the machine's capacity. Human reactive speeds and co-ordination are far more limited than those of the machine. It has nothing else on its mind. It can't be confused by any player. It also never needs to go to the toilet.

A most interesting Space Invaders program would be one for which the player could select and control the speed, randomization and intensity of the attack, increasing and accelerating missile delivery and randomization as soon as the challenge of any previous program is met successfully. Or designers could build a progressive series of more difficult games into the program, that you could only play when you have succeeded in less challenging ones. That would enhance the player's co-ordinative skills up to the limits of what is humanly possible. Those limits are known. Computer generated data, displayed on

a screen, assumes the characteristics of a continuous beam of light at 60 seconds per unit of display (i.e. per digital dot) as far as human eye-sight is concerned. At that point co-ordination dexterity, reaction and realization are of no further use. The little green men will get you every time from the start.

It all comes down to pitting your understanding — even more than your skill — against that of the designer and against a machine's capacity, more than allowing yourself to be tempted to blast the opposites first. The latter course makes for dead heroes. Defense, rather than attack, is the best and most important survival strategy. Never mind a few losses now and then. That doesn't give the defender any advantage in so far as winning is concerned. But he has an equal opportunity to force a draw. That is a game that goes on forever in so far as Space Invaders are concerned.

DOWN TO BASIC

HOW TO WIN THE LEAGUE

Having dealt with one-dimensional arrays (lists) last month, I will describe the use of two-dimensional arrays (tables) this month. The ideas involved are very similar — in the case of two-dimensional arrays tables of related values are processed, e.g. a football league table.

A table will consist of a number of rows and a number of columns. As with lists, the size of a table should be declared in a DIMension statement. The size of a table is specified by the number of rows and the number of columns.

20 DIM T(4,3)

The above DIMension statement would set up a table called T with 4 rows and 3 columns. You can visualise this as

	1	2	3
1			
2			
3			
4			

A single DIMension statement can be used to declare a number of arrays — one and two dimensional e.g.

20 DIM L(10),T(4,3)

would set up a list L of size 10 and a table T with 4 rows and 3 columns.

To refer to a particular value in a table, you must specify its position in the table — this is done by giving its row and column position. For example,

40 PRINT T(2,3)

would print the value in the 2nd row and 3rd column of the table T. To show you how to set up a table in your program, I will use the exam-

T						
NS						
1	New Town	1	0	2	0	0
2	Rovers	2	0	1	0	4
3	Supersteam	3	0	1	0	4
4	Local United	4	0	0	0	1

Fig 21

ple of setting up the following football league table.

	P	W	D	L	F	A	Pts
New Town	3	2	1	0	11	5	8
Rovers	3	1	1	0	4	3	3
Supersteam	3	1	0	1	4	3	3
Local United	3	0	0	3	1	12	0

For each team in the league, there are eight pieces of information to be stored — the team name and the seven associated values. It is not possible to mix character strings and numeric values in one array. I will therefore have a list of character strings for the team names, and a table of associated values.

10 DIM NS(4),T(4,7)

is used to declare a list NS of four character strings and a table T with four rows and seven columns (Fig 21).

Each position in list NS corresponds to a row of table T — and each row in T has seven columns.

The next problem is how to get the information in the football league table input to NS and T. Let's input the information row by row.

```
repeat for each row
  input team name
  repeat for each column (of T)
    input value
  and repeat column
and repeat row
```

Using variable R to represent the row number and variable C to represent the column number, this can be expanded into the BASIC statements:

```
30 FOR R=1 TO 4
40 INPUT NS(R)
50 FOR C=1 TO 7
60 INPUT T(R,C)
70 NEXT C
80 NEXT R
```

Having input the information in the correct order, the arrays NS and T would have the form as in Fig 21.

I have only dealt with what would be part of a program to set up the football league table. The remainder of the program might analyse the contents in some way — as it may simply print the table, with appropriate headings, in a format suitable for publication.

THE POLITICAL SURVEY . . .

As another example of the use of tables, consider the following example.

A political survey is to be carried out in the three cities — London, Belfast and Edinburgh. Each person interviewed is asked which political party they would vote for in the next election. Their answer is noted as one of: Conservative, Labour, Liberal-SDP, Other or Don't Know. A BASIC program is required to input the results of the survey and print a table showing the number of people in each of the cities supporting a particular political party.

A code number is assigned for each city and for each Party as follows:

Conservative	— 1
Labour	— 2
Liberal-SDP	— 3
Other	— 4
Don't Know	— 5
London	— 1
Belfast	— 2
Edinburgh	— 3

For each person interviewed, a pair of values will be input — code

DOWN TO BASIC

no. of Party, code no. of city. The data will be terminated by the pair of values -1, -1. A table will be set up with a row for each Party and a column for each city. As the data is input, each position in the table will contain the current total for the corresponding Party and city. For each pair of data values, "1" will be added to the appropriate position in the table.

Thus, if the pair of values 3,1 is input, then "1" will be added to the value in row 3, column 1 — adding 1 to the current total of people interviewed who support Labour and live in London. The table will continue to be updated in this way until all the data has been input.

```
10 REM POLITICAL SURVEY
20 DIM P(5),T(3)
30 REM SET UP LIST OF PARTIES
40 FOR I=1 TO 5
50 INPUT P(I)
60 NEXT I
70 REM INPUT SURVEY DATA
80 REM CODE NO. PARTY, CODE NO. CITY
90 REM TERMINATE WITH PAIR -1,-1
100 INPUT N,C
110 IF N=-1 THEN 140
120 LET T(N,C)=T(N,C)+1
130 GOTO 100
```



```
140 REM PRINT RESULTS
150 REM PRINT TABLE HEADINGS
160 PRINT "LONDON", "EDINBURGH"
170 REM PRINT TABLE TOTALS
180 FOR N=1 TO 5
190 REM PRINT PARTY
200 PRINT P(N),
```

```
210 FOR C=1 TO 3
220 PRINT T(N,C)
230 NEXT C
240 REM MOVE TO NEW LINE
250 PRINT
260 NEXT N
270 END
```

There are several ways in which this program could be improved although the basic outline is satisfactory. For one thing, messages should be printed to inform the user as to the necessary format of the data to be supplied — a list of Party names, followed by the pairs of data values.

The major problem would be the appearance of the table of results that would be printed — just how poor that would be will depend on the system used!

What is needed is a method for specifying exactly where values should be printed on a line of output.

Last month some premises crept into these pages and some lines of a program — under the heading Now Get Down to Work — went missing. Line 90 should have read LET S=0. LINE 110 IF A(I)=A(J)+1 THEN 180. Line 200 PRINT A(I).

ATARI BASIC

The peculiarities of Atari Basic feature in this month's language breakdown.

VARIABLES: The name of a string variable must be a single letter followed by \$.

The number of characters in a string variable must be declared as a DIM statement e.g. DIM M\$(5) declares a string of up to five characters.

Substrings can be specified e.g. M\$(2,4) refers to the substring of M consisting of the second to the fourth character.

ARRAYS: Can only have numerical arrays.

Arrays can be of variable size

```
20 INPUT N
```

```
30 DIM S(N)
```

The name of an array must be a single letter.

STATEMENTS: END statement is optional

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

The general form of the IF statement is:

```
< line no > : IF < condition > THEN < statement(s) >
```

The ON statement can be used to transfer to one of a list of lines nos. Depending upon the value of a given expression

```
< line no > : ON < expression > GOTO < list of line nos. >
```

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.

LEN returns the number of spaced bytes in the space reserved for a specified string variable e.g.

PRINT

STR\$ converts a numeric expression to a character string

TAN tangent

TOL converts a string to a numeric value plus ABS, ATM, COS, EXP, INT, LEN, LOG, RND, SIN, SQR, SGN, GRAPHICS: Colour graphics facility commands COLOR, SETCOLOR

GRAPHICS command to determine the number of rows and columns forming the "graphics grid" on the screen e.g. GRAPHICS 7 will give 700 columns and 50 rows.

It is an abbreviated form of the above command.

PLOT C, R plots a point in position column C, row R.

DRAWTO C, R draws a line from the last point plotted to position column C, row R.

SOUND: There is a sound system which can generate varying "notes" by use of SOUND.

HARDCORE

A GAMES PLAYER'S GUIDE TO THE NASCOM

NASCOM FAMILY

The Nascom family of microcomputers came into being five years ago and has since become one of the most popular hobbyist computers.

Despite the chequered past of its origin as manufacturers the Nascom name has survived and a third generation of the computer was brought out last year. Now the range consists of the Nascom 1, 2 and 3, each design being more sophisticated than the preceding one.

The Nascom 1 is based around the 280 chip and is the oldest machine of the range. With over 25,000 sold since its 1977 launch the majority of them are used for process control in industry, and in education as well as having a large following amongst the kit building fraternity. Its main assets are reliability and simplicity of design making it easy to use.

The standard machine has a memory-mapped screen and can handle 80x16 characters. All the conventional interfaces are available including input and output ports, a socket to link up a printer, and a cassette recorder interface. The keyboard contains 43 characters and is surrounded by a steel frame.

You can upgrade the Nascom 1 using the NMS 875 1 operating system which comes with the computer when you buy it. This package enables you to use software which was originally written for the more sophisticated Nascom 2. Memory capacity is limited at the basic level to 1K of static user memory.

On the graphics front you can add a small board which provides you with block graphics similar to those available on the Nascom 3. For upgrading further Nascom produces the Buffer Board which makes the Nascom 1 fully compatible with the NuBus.

This allows you to add the extra system boards including a variety of memory boards and input/output boards, thereby expanding your system.

Price is an all-important factor in choosing a computer and the Nascom 1 at costs £79. Nascom also produces a board level version which consists of built and tested boards without cases or power supplies. This is available for the Nascom 2 for £295.

The younger brother of the family is the Nascom 2 which was based on the design of the original machine, its superiority to the Nascom 1 lies in its extra on-board memory capacity and other additional facilities lacking in the Nascom 1.

It is based on the 280A/MC8800 8 bit microprocessor and runs at a faster speed than the Nascom 1. The board size is also the same as its predecessor being 8in x 10in. Built in memory capacity is 32K which is split up into the following sections. 1K video RAM which is used as a memory mapped video display, 1K work-

space RAM for programming requirements, 2K monitor NMS-875 1 which is the operating system supporting 22 commands and allows a total of 10 user accessible I/O operations including character input/output, system reset, relative sub-routine call, input a log and position cursor.

8K Microsoft BASIC is available for the Nascom 2 making it possible to convert programs with few modifications into Nascom BASIC. Nascom has added a number of features to Microsoft BASIC including on-screen line editing thereby simplifying program entry and modification. In an effort to make system modifications and machine code routines simpler Nascom has added the routines DCR and DCR2 which read or write 16 bit integers and complement the usual 8 bit PEEK and POKE commands.

Special routines have been incorporated into Nascom BASIC making sophisticated graphics easy to generate.

The remaining 1K RAM gives the user the option to use both ROM and RAM for additional flexibility.

A 57 character keyboard is the Nascom 2 standard, the extra keys being cursor control keys and another shift key. The machine can be linked up to a monitor or be plugged into a 19in television set, giving a 16 line x 48 character display.

Cassette recorder and printer input/output interfaces are incorporated into the design as well as a parallel input-out (PIB) controller which allows the connection of several peripherals without needing external logic.

The kit form Nascom 2 carries £275 with-in a user RAM, and £295 for the board level version.

Early 1982 saw the launch of the Nascom 3 in the year after Nascom microcomputers was bought out by Lucas Logic, the computer arm of the industrial giant Lucas. Essentially it is the same as the Nascom 2 but is supplied in cased form. The big selling of the Nascom family is aimed at educational, professional and business users and is the most sophisticated of the range. Now you can use either a cassette recorder or disc drives for loading software and there is a choice of operating systems available.

Two modules can be bought, either 1K or 32K static memory which can be expanded to 64 kilobytes. The Nascom 3 can be linked up to single or dual disc drives. If you want more than four drives you have to attach extra floppy disc controllers. These come in a case, complementing the Nascom 3 which you can plug into the computer.

Screen-size is 40 or 60 column 25 line display is available with high resolution colour graphics consisting of eight background and eight background colours. Double density two colour graphics are another feature, and you can select a character set and program your own

graphics characters.

Coming only in a cased version the Nascom 3 has a starting price of £999 excluding VAT.

All Nascom computers are available from the firm's nationwide dealer network. A list of dealers is obtainable from Lucas Logic, Nascom Microcomputers Division, Watton Road, Walsbrook Industrial Estate, Walsbrook CV38 3PL.

FUN AND GAMES

Software for the Nascom range is available for both business and entertainment applications.

Leeds Based Program Power is the principal software supplier for the Nascom computer and was set up to market solely Nascom compatible software. Since then it has branched into software for other machines, the Atari Atom and most recently the BBC Microcomputer.

Amongst the programs on sale from Program Power are games including versions of Lunar Lander, Star Trek, Alien Laboratory, Space Fighter, Chess, Pongplus and Crosses, Super Life, Backgammon, Sargon Chess, Chess, and Tetris.

Packages are also available for word processing and personal finance as well as programming aids like the lexicon, graph plotter, vocabulary tutor and Xal BASIC.

The price range goes from £3.95 right up to £29 which you will pay for the Xal Basic 1.1 machine code written program. The majority of Program Power's software is written for 1K RAM Nascom computers unless otherwise stated. Products are available mail order from Program Power, 5 Winstley Road, Leeds, LS7 2JA.

Nascom 2 owners are specially catered for by Future Software which only produces games programs.

There are more than a dozen games of a good standard on the Future catalogue.

Many of them are space games with



continued on page 127

[illegible]

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At *Neuroscience*'s website, the related language

ALGORITHM: A process or set of rules to carry out a task or solve a mathematical problem.

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

BYTE: A term to measure a number of bits (Binary digITS), usually there are eight bits in a byte.

CHARACTER STRING: A connected sequence of characters, words or other elements which are usually split by the \$ (dollar) sign.

CHARACTER SET: An agreed set of representations from which you can choose to denote or distinguish data.

COMPUTER PROGRAM a specified set of instructions which perform an operation or task for the computer.

COMPUTER LANGUAGE: A language is used when writing programs and is vital for making the computer perform operations. A language consists of commands, and computer instructions. There are different types of languages for computers, and different tasks.

CO-ORDINATES: The E and Y points used in plotting graphs.

CONCLAMT: A character or group of characters usually representing a value or standard which the computer uses to identify, locate or measure information used in decision-making.

COMMAND: In writing programs this word refers to an instruction with specifying an operation which the computer must perform.

DEDICATED CMP: A chip — microprocessor — which has been specifically

DISC DRIVE: A peripheral device into which you slot a floppy disc for loading.

FUNCTION: A special purpose or characteristic action in a program.

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

HIGH REPRODUCTION CAPACITY:
Graphics which can be reproduced in great detail or to a high degree of accuracy.

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

INTEGER: A number which does not contain a decimal point, i.e. a whole number.

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

LOOP: A BASIC function referring to the repeated execution of a series of instructions for a fixed number of times.

MACHINE CODE: The terms used to refer to symbols or numbers assigned to parts of a machine. It is the same as operation code which is the symbol telling the computer which operation to perform. When a game is written in machine code — sometimes known as assembly language — it speeds up the machine.

MAINFRAME COMPUTER: The jargon word used to describe a very large computer, which can store massive amounts of information.

ALIASPROCESSOR: Another name for a chip

MICRO COMPUTER: A tiny computer consisting of hardware and software. The main distinction from a mainframe

MINICOMPUTER: A small computer system which gives higher perfor-

ance rates than a microcomputer costs more, has a richer instruction set and a proliferation of high level languages and operating systems.

data Data or information which the computer emits, either in hardcopy

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