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N. Wales.



Arfon Micro



COMPUTER & VIDEO GAMES

No 6 APRIL 1982

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OUTWIT outwits human opponents in a fantasy world robotized by computers. Games moderated by computer are ripe for take-all in the U.K. In May we will give you a rundown on the so-called computer moderated games scene where you have to stay on the alert even when you're not playing!

WHILE Pacman games cropping up everywhere, we felt it was time we featured one ourselves. Meteor Storm, Earth Part II, Spiderman and Anti-Gravity Flyer also feature in an issue packed with the best games.

JUST how far can you expand a Sinclair's memory? Who produces the top games software for it? What peripherals are available? Our May Hardware section is given over to the possibilities of this unique machine.

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NEXT ISSUE ON SALE APRIL 16th



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MAILBAG

Do you have any views or comments on *Computer & Video Games*? If so we would love to hear from you. We will also do our best to find answers to any queries you may have or solve problems you might be experiencing with your computer. Please drop us a line at: *Computer & Video Games*, (EMAP, Service House, 9 Market Hill, London EC9J 5LB.



VIVE LE SINCRAIR

Dear Mr. Kilgus-Perros, I'll start by saying what a hell piece of material your mag is. Well thought-out, interesting, colorful, witty in places and highly entertaining in the last computer-packed page. Absolutely wizard and all that.

But may I outline one slight fault... so far you have only published small, rather tame 16 Sinclair ZXII games. I know the ZXII cannot be described as the greatest personal computer but give it some credit, please.

If it's not too much for your megalitic brain to manage, could you print an exciting, highly interesting and gratifying starring 16K Sinclair game which will be a credit to all ZXII owners and will prove to other more advanced computer owners that it's more than a child's toy.

Everyone knows the ZXII but I think other computer manufacturers should follow Sinclair's example and produce a basic, low-cost and compact machine which can be expanded to be more powerful through the addition of plug-ins, the memories, keyboards, sound systems etc. Peter Townsend
Widnes,
Kent.

CLUBBING TOGETHER

Dear Sir, We would be most obliged if you will let your readers know that a computer club has been started in the Northpost area, via your Mailbag pages.

The first meeting of the club was held at The White Horse for the 16K, Amstruc Board, Hartlepool.

on Friday, February 26. Mr. Harry Cuthbert is the acting chairman and Mr. David Jones the acting sec. Both can be contacted most evenings after 8.30pm on Hartlepool 74527 or 80001.

It is hoped that anyone who has an interest in computing will join the club, non-owners are also most welcome.
David R. V. Jones,
Hartlepool,
Cleveland.

IN BLACK AND WHITE

Dear Sir, I would be grateful if you could help me with some information. All the computer chess games advertised seem to work on boards and pieces are included.

Have you any knowledge of a straightforward chess computer i.e. to enter in the person like myself who already owns a chess board and pieces with a board and pieces only.
Ronald Whitehead,
Linsington,
Bedford.

Editor's reply: The only computerised chess game on the market which you can use your own chess board and pieces with is made by Ace of Wembley. The actual computer looks very like a pocket

calculator and the moves made are displayed on a small L.C.D. screen. You just position your pieces accordingly. It's official name is Electronic Electronic Chess and costs £29.95 from Ace distributors. For a full list of dealers contact Ace at 9 Fulham Road, Wembley Park, Middlesex.

GETTING IT TAPED

Dear Sir, I want to use a Sinclair pre-recorded tape on my Sharp M2-808 computer. As the Sinclair ZXIII's are single machines I thought it would accept it, but it wouldn't load.

Could you tell me if it is possible to load these cassettes on to my machine and what I should do to make it work?

I look forward to the next issue of your magazine and hope you don't forget the Sharp M2-808.
P. Allen,
Stockton Lane,
York.

Editor's reply: First the good news Mr. Allen, we will continue to feature the Sharp M2-808 in the magazine. Now the bad news. You can only use cassettes which contain programs specially written for the Sharp with an M2-808. There is no way to

convert your Sinclair tape to load, so I'm afraid you will have to either buy a Sharp games tape from a supplier or have a go at writing your own games.

CHEAP AND CHEERFUL

Dear Sir, I am in the process of purchasing a Sinclair ZXII and would like to know whether or not a cheaper 16K RAM is available for it when than the Sinclair one?

I would also like to know if 16K is the limit of the ZXII's memory? If not, I'd like some details please.

I own a JVC T.V. cassette video set and could you tell me if I can use it in conjunction with the ZXII for the T.V. and cassette facilities? I would also like to know if the ZXII can leave sound facilities.
V. Buchanan,
Dolph,
Scotland.

Editor's reply: There are a couple of firms who supply 16K RAM units for the Sinclair ZXII which cost less than Sinclair's own version. These are: Audio Computers of Southend-on-Sea which costs £25.99 by Eric of Peterfield, Hampshire which sells one for £24.95.

Expansion boards are available for the ZXII right up to 128K. Audio Computers is the firm selling that, and smaller memory boards: £22, £30, £42, £70, £88, £125.

I'm afraid that your JVC is not one of the cassette recorders Sinclair Research recommends. I suggest you write to Sinclair and they will give you a full list of ZXII compatible cassette recorders.

Alternatively, you could wait until we publish our next issue (May) when we will be featuring the ZXII in our Hardware pages giving details of peripherals available.



ZX 80/81 HARDWARE/SOFTWARE

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A full size keyboard for the 8081. The keyboard has all the 8081 functions on the keys, and will greatly increase your programming speed. It is fitted with push type keys as in larger computers.

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16K 81 SOFTWARE

As seen at the ZX Minifair.

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3D-3D LABYRINTH You have all seen 3D Labyrinth games, but this goes one stage beyond; you must manoeuvre within a cubic maze and contend with corridors which may go left/right/up/down. Full size 3D graphic representation. £3.95.

CENTPEDE. This is the first implementation of the popular arcade game on any micro anywhere. Never mind your invaders, etc., this is positively shining, the speed at which this runs makes ZX invaders look like a game of simple snap. £4.95.

Please add £1 p&p for all hardware. Software p&p free. Specify ZX80/81 on order.

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THE SEARCH FOR SPEED

Dear Sir,

Congratulations for a new, excellent and very different magazine. The series on writing Adventure type games is superb and found the HORN was the best program I've ever seen published for TRS-80.

I know you're aware of a software magazine, but as yours is the only way I buy regularly (gravel, gravel) I would like to ask a hardware question: I know the clock in the TRS-80 can be speeded up, but I'm not sure how and what components have to be bought. Could you tell me how or suggest where a kit can be bought? I want to switchable between old and new speeds for purposes of tape transfer. My set-up is TRS-80 Model I Level II 38K with cassette and Araloh. C. Bennett
Smith's-of-Orange,
Danvers.

Editor's reply: According to Martin Soble of Tandy Corporation's merchandising department, it is possible to increase the speed of the microprocessor in your computer itself but he does not recommend doing so. He told Computer and Video Games that a couple of small dealers sell kits to carry this out, but he liked it to doing a "hot rod" conversion on a car. It goes faster but means it cut more quickly.

So if you want your TRS-80 to last, take Martin Soble's advice, you will be better off in the long run.

NIBBLERS NIGGLE

Dear Sir,

Having tried out the Nibblers program in the first edition of Computer and Video Games, I found that I could not fire missiles or drop bombs on the Nibblers. I am new to computers and so would not know where to start

looking for the trick. My friend's father, who deals in computers, was also puzzled by this. I would be very pleased if you could assist me to solve the problem.
E. Bryant,
Moody,
York.

Paul Jay replies: There is, in fact, no fault in the Nibblers program. The trouble is that you have got an old PET.

Many of the memory locations have been changed since the original machine came out. The location that has been changed in this particular program is 131. When the machine looks at this part of memory, it can tell if a key is being pressed down. All you have to do to make the game work is to change the 131 which appears twice, to a 115. This will also be necessary if you want other PET programs to run on old machines. For example Dragon Dragger*.

THE RIGHT CONNECTIONS

Dear Sir,

I have recently acquired a VIC-20 and after hearing from a friend about a connection to fit a normal tape recorder to it, I decided not to buy the £40 plus, special tape recorder. I asked in the shop my friend told me about one that they sold they were expecting some in soon. Importantly I asked at another shop and they didn't know anything about it. Is the connection made by Commodore or by another firm?
Mervyn Ferguson
Merton-with-Soles,
Lancashire.

Editor's reply: A firm called Shack of Liverpool is in the process of bringing out an adaptor designed to link up a normal cassette recorder with the VIC-20, but has not yet brought it out.

But according to one of Commodore Business Machines's technical

experts the adaptor, which is expected to cost between £5 and £15, is only worthwhile if you have relatively small amounts of data to store if you can't afford the price of a Commodore recorder.

Commodore's expert did say that the quality of material stored using this adaptor would not be as good as a Commodore compatible because normal recorders record audio signals rather than NRZI signals — the method used to record computer signals. Commodore itself does not make an adaptor to convert a normal recorder for use with the VIC-20.

SYSTEMS ANALYSIS

Dear Sir,

As the proud owner of a 3201, I would greatly like to expand it in all directions. However, the proliferation of add-on, software and books too numerous to mention have reduced me to piddling luxury!

I would like to know how

far it is possible to enlarge the system capacity and capability. If the 3201 possibilities are limited — without major surgery! — then I would seriously have to consider another system. I was horrified to see no less than 40 Sinclair 3200R1's for sale on the transaction page of another magazine. Could it be that other ZX owners are losing heart? Help!

Who makes the 64K RAM slot-in mentioned in your January issue?
Chris Wilkes
Wainfield,
Middlesex.

Editor's reply: You can enlarge the 3201 up to 128K memory using a range of expansion boards. Audio Computers is the firm to contact at 47 Bournemouth Park Road, Southend-on-Sea.

Here is a list of prices:

18K	£20
32K	£24
64K	£29
128K	£110

Audio Computers will be happy to give you further details of goods available for the 3201 if you get in touch with them.



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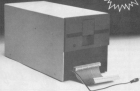


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If you do not have a dealer near you just write to us at the address below, or visit our website on any Cambridge (0223) 346200 and order directly.



Acorn Computers Ltd.,
Fulbourn Road,
Cherry Hinton, CAMBRIDGE

The disk operating system (DOS) decides the following commands used to control the storage of files on disk:-

- * CAT catalogue files on disk * LOAD load image of memory contents as file * SAVE save image of memory contents as file * DELETE delete file from disk * SPOOL store all printer characters on disk
- * EXEC read characters from disk as if from keyboard

The DOS also replaces the cassette operating system routines as used by BASIC to allow the use of the following commands in Atom BASIC:-

- LOAD load BASIC program from disk SAVE save BASIC program to disk FOUT open file for output
- FIN open file for input SPUT clear file EXT find extent of file FWT find value of pointer into file
- PUT put number to file SPUT put byte to file SPUT put string to file GET get number from file
- GET get byte from file SGET get string from file

These commands provide full random access of up to 5 disk files simultaneously.

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Available from all Acorn Dealers or direct from Acorn at £45.24 inc VAT and p.p. Credit card holders can ring (0223) 246200 and place their order direct.



Acorn Computers
Fulbourn Road,
Cherry Hinton, Cambridge



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NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS GAMES NEWS

KEEP THE ASSASSIN'S KNIFE AT BAY

Being the President of a small state can cause you a few problems. Often your country is on the brink of civil war or revolution.

But as the head of the state your job is to ensure the smooth running of political life and aim to achieve popularity for your people.

That's just what you have to do in *Dictator*, an adventure game for the ZX81 in 1K.

The object is to prevent your people revolting. At your disposal are the army and secret police who you can use to your advantage if the threat of a coup arises.

You must be vigilant because spies may infiltrate your close knit party. Assassination attempts are regular events.

To keep the people happy you have to make the right decisions



DIKTATOR

to maintain a secure economy. If you fail unless you make your ultimate downfall.

An eight page instruction booklet is supplied with the cassette giving full information.

A copy of *Dictator* can be bought from Day-Byte for £8.

DEADLY BLADES IN THE NIGHT

Deadly blades flash as you relive the duelling days of the eighteenth century in a darkened dungeon.

You must kill your opponent after searching him out in *Duel in the Dark*, a game for one or two players.

The screen is divided into a rectangle of squares which forms your battleground. It represents a dungeon which has two windows. But you can't see anything because it's dark outside — none too helpful.

The only good thing is that your opponent faces the same handicap — he can't see you either.

Objects litter the dungeon which are hazardous but also give you clues to your opponent's whereabouts.

Both of you are given a dagger and a knife as weapons in the two player version. If it's a

DUEL IN THE DARK

single player mode the computer takes the role of a bear seeking you out.

During play you discover information about the dungeon's layout — making notes of the location of windows, doors, objects and walls.

When the crunch comes you have three methods of doing away with your opponent. Either throw the knife at him, stab him with your dagger or grab him and grapple him down.

Duel in the Dark costs £10.00 from Beatrix based Molmores and is designed to run on a TRS-80 level 2.

FACING THE GALACTIC WAR FLEET

SPACE FIGHTER

Alone in deep, dark space you come face to face with a horribly hawkeyed and decidedly unfriendly galactic war fleet.

With the stars your only company your mission is to find and destroy five enemy fighter craft. These patrol different sectors of the sky and when they are within range you fire them up in your sights and blast them. Your ammunition consists of laser guns which instantly reduce the enemy ship to fragments of space dust.

The fighters are equipped with missiles and can return rapid fire at your ship so you have to avoid destruction.

Space Fighter is a re-visited version of the original game and now runs on a TRS-80 Colour Computer. Molmores, the supplier, claims the game needs less to colour graphics which make it more realistic.

You need graphics and 1K memory as well as £10.00 to get the game up and running.

HERE'S THE LATEST IN BRAINWARE

A band of evil aliens are waiting the universe for humans to die the decidedly unfriendly aim of taking out their brains and replacing them with microchips. What do you mean you know someone they found already?

Your task is to defend your ship from the aliens and escape the gravity beam which has locked your ship into the alien cruiser's flight path.

It is during a reconnaissance mission that your android friend spots the alien ship and warns you of their intentions.

Your adventure leads you

ADVENTURE C

through space into all sorts of hazards. You explore computer rooms, an endless pleasure room, penetrate force shields and fend off laser guns.

Adventure C makes full use of the Sinclair ZX81's 1K memory packing in as much as possible. Artic Computing in Hull is the supplier and will sell it for £5.

Artic Computing is establishing a series of adventure games which are written in House of Machine code for speed.

MICROTANIC'S TAPE TRIO

In the last issue of *Computer & Video Games*, the cassette for *Tank Raid*, *Six Keys of Targis* and *Tantra Adventure* were attributed to the Targis War Group (TWG).

In fact, these games are supplied and distributed for the Microtan 65 computer by Microtan Software of Butech in London. *Tantra Adventure* and *Tank Raid* are in 1K, and *The Six Keys of Targis* is 8K.



NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEW GAMES NEWS



GIVING THE CUBE A NEW DIMENSION

The most frustrating of puzzles Rubik's Cube is maintaining its popularity with the arrival of two computerized solutions.

A game to help you solve your cube on your screen without any of the thumb fumbling is now available for the Texas Instruments 99-4B computer.

Sticking to the original concept dreamed up by Rubik the game allows the player to simulate every possible rotation in order to solve the Cube. If you find it all too mind-blowing you can always save it on tape and pick up where you left off later after giving your aching brain a rest.

Another feature of the simulation enables the player to spin the cube to see the reverse sides.

But for those of you who can solve the Cube in 30 seconds flat, there's always the Quadebe.

The slower sounding Quadebe

RUBIK'S CUBE

cube has a forty-four grid so there are even more combinations to puzzle over.

To cope with the complexity the program opens special commands allowing up to 30 moves to be stored for scrolling or unscrolling whenever the user wishes.

Wolfe Force of Luton take the blame for any extra frustration this might cause you. And if you part with £5 you can take on the Quadebe.

THE GAMBLERS' GAME ON THE SMALL SCREEN

BACKGAMMON

The joys and frustrations of Backgammon come to the small screen with this computerized version.

The game, beloved by the gambling fraternity, is well suited to computerisation and makes a capable opponent.

There are six strategies to choose from and the computer soon latches on to your attempts to defeat it.

The makers, Future Software, claim the game has a fast response time as well as a high standard of play. When you make a move the computer brain automatically checks if it is valid.

If it's an illegal move the computer will tell you so.

A special feature of the game is a loading disc effect represented by a graphics demonstration. A full instruction sheet and rules of Backgammon come with the program, which is written for the Necrom and costs £5.95 from Future Software of Chislehurst.

For the uninitiated, Backgammon is a simple race game, with two players trying to be first to move into the home section and off the board. But counters left alone can be returned to the start by an alert opponent.



CASSETTE TWO

A BUMPER PACKAGE OF 10

A bumper package of games to get your brain into action comes in the shape of this tape for the ZX81.

There are 10 games; Orkido, Susan, Laser Boats, Word Mastermind, Rectangles, Crash, Roulette, Pantom, Penny Shoot and Gun Command.

Each of the games on the tape is explained in the accompanying leaflet plus loading instructions. You'll need a ZX81 machine to run the games tape which is simply called Cassette Two.

It's the second cartridge in this range produced by Michael Orwin of Willesden, London, and sells for £5. Copies can be obtained from him by mail order.

MEETING METEORS HEAD-ON

Cosmic Zap is one of the latest in a batch of Starzap's games for the Sharp M2804 computer.

You are fighting against time — 10 minutes to be precise — and your job is to survive an intense storm while destroying aliens at the same time.

Points are scored for each object you destroy and there is a

COSMIC ZAP

facility for the five top scorers to be put into the memory.

The asteroids can be deviously maneuvered. Without warning the aliens you think you are evading, fly into your flight path and so far transform into one

of the deadly asteroids.

Another feature of the game is the mother ship, which makes an appearance after 10 minutes of the game. The mother ship could be your saviour because it has a device which your ship can use for dodging purposes.

Cosmic Zap is on sale from London based Starzap for £5.95.

THE VIC NEEDS VIC REVEALED

THE DEFINITIVE REFERENCE
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FROM NICK HAMPSHIRE

Now available. Price £10.00 from Commodore dealers and bookshops. Nick Hampshire Publications, P.O. Box 13, Lysander Road, Yeovil, Somerset.

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS

GAMES NEWS

VICMEN

GHOST OF A CHANCE

VIC software is at last filtering through to owners of the long-sensored machine and Bug Byte has been quick with some games.

Kicking off the range is Vicman, the VIC version of the popular arcade game Pacman. Bug Byte says this game is a very good copy of the original with lots of little mazes and a "gleeper" who runs around the maze devouring dots as he goes.

Fruits appear in the maze when you smash a certain number of points and large flashing dots cause the mazes and gleeper to change colour. Sometimes the mazes are in a consumable state and it's then that they run away from the gleeper... but be careful, they may suddenly turn hot and turn in pursuit of you.

A HARD RAIN'S GONNA FALL

A daily rain of missiles is falling on your cities. You must save them from destruction.

The Atari Atom version of the popular arcade game Missile Command is included on the latest Atomsoft package.

You get three ground bases to form your defence sites. Aim your fire at a marker cross which you position on the screen using any key on the keyboard. Each letter and number key has a location mapped on to the marker cross corresponding to a memory site.

You are only given three lives so you must be careful manoeuvring your gleeper along the paths of the maze. If you run into a ghost, your life is lost as he gobbles you up.

When you set one of the ghosts a pair of floating eyes starts back to the centre of the screen. You can use either joystick or keyboard controls to run the game, depending on your own preference.

The screen has to be cleared of all the dots to earn a new one and a new trail to consume.

The colourful VIC is well suited to reproducing a good replica of this absorbing and addictive game.

Vicman runs on the unexpensive VIC and costs £7 from Bug Byte of Liverpool.



OUTPOST

Beware the Cruds!

The Cosmic Cruds are one of the most hostile species to be found in space — the Vogons — except without any literary pretensions.

You only have two types of weapon to call on to defend yourself when you come across them in Outpost.

They are a propulsion unit and

a meteor shield. Your square shaped ship has weak spots, particularly vulnerable to energy fire.

Two hits on the same side of the ship spell death. One hit prevents the propulsion unit rotating the ship to that position. If you overwork the unit it will overheat and stop working.

Outpost is difficult to operate because you have to use eight keys to control the action. But once you have mastered the technique it proves a demanding game.

It runs on an Apple II in 48K and is available from Rotwood based S&S Software for £16.95.

AND THE WORD WAS OOPS...

THE BIBLE

In the beginning was the word and the word was "oops"...

That is, the word according to The Bible of Automatic Cartography in its new game. Striking to the firm's humorous line in games tapes. The Bible takes you through 18 games programs on a journey along the well trodden path of the Old Testament. It starts off with a game entitled Genesis, and then moves on to Adam and Eve.

Later on in the tape you can relive Moses' experience on Mount Sinai and deliver the 10.

Copies are obtainable from Portsmouth based Automata and cost £3.95. It runs on a Sinclair Z801 in 1K.

MISSILE BASE

The cross will move to the appropriate spot that the depressed key represents. As you can guess it takes a while to work out and memorize exactly where the cross will land up.

You can also select the top or bottom area of the screen to your target area and can sweep them it will by pressing the

space bar. The enemy's fire will destroy your bases if you do not stop them in mid-flight.

Missile Base forms the major game in Games Pack 11 accompanying a version of Snooder and traditional dominos. Available from Atomsoft of Cambridge for £11.95.



TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES

VIDEO SCREEN

BEST SELLERS

THE MONSTER FROM OUTER SPACE

A bright red monster from space is still terrorizing Philips 67000 owners up and down the country, causing widespread frustration and havoc.

Running not on video screens is Space Monster, which was recently topping the sales figures for Philips. The game is a space invader spin-off, but with additions which demand quite quite different tactics from the player.

The space monster itself lurks at the top of the screen behind a bank of robots which form the main part of the contacted blob's attacking force. Each robot is equipped with a cannon from which he hurls down bombs and a shield which he can use for protection. It sounds quite impenetrable but the robot's weakness is that their shields must be laid to one side for them to fire.

A tank in your means of attack and defence. You have three reserves and three shields to



SAVE THIS POOR SOUL'S NECK

HANGMAN

Save a soul from transcending into the atmosphere simply by using your brain to unravel one word.

The game hangman which has long been a great favourite with schoolchildren has now been transferred to your video screen.

The game for the Interton 67000 follows that old guessing game popularized years ago. The computer selects a word which the player, or players, must try to guess.

Quick thinking is also important in this game, because you must guess the right word before the man on the gallows is hung. Each time you place a letter in the word incorrectly a section of a hanging platform and its scaffolding is added. Before you know it the entire frame of the scaffold has been erected in front of your eyes. The next stage is the completion of the victim's body itself.

Whenever you make a mistake in the formation of the word and link of the convict is added.

The game ends either when you have guessed the word correctly, in which case you emerge as the winner. Or, if you can't unravel the hidden word the poor unsuspecting victim meets a very unbrave and unpleasant death.

Hangman is written in a 6K ROM cartridge and is produced by Hamax for Interton. It is available through the firm's UK dealers ranging from Asda Supermarkets to high street specialist shops. Hangman's retail price is listed at £23.95.

side behind. Whenever the blob or his robots score a direct hit on the player's tank it turns into a little human creature skating to find refuge behind a shield. Each time it scuds another reserve tank one of the shield's deep-pools from the screen, leaving the player more open to enemy fire. If he is hit while tankless the game ends in victory for the Space Monster.

Space Monster is the closest Philips has come to a space invader's type game.

But it does have some innovations all of its own which make it attractive to would-be buyers.

THINGS THAT GO MUNCH IN THE NIGHT

Just as following the current trend of producing cartridges based on the most popular shade games.

The latest addition to be turned into video computer system form is 1981 success story, Pacman.



PACKMAN

Due out in distributors' shops in April, this version sticks closely to the original concept. You operate a circular mouth-opening creature which speeds along the paths of a maze, sometimes referred to as a house. Situated along the paths are small dots, each one representing points for the hungry Pacman to consume.

Other characters in the maze are ghost-like creatures which move out from a central square of the maze at regular intervals. These run around the corridors, sometimes chasing your jobster-man and sometimes with you in pursuit of them, if you have managed to set an enemy free.

Successfully chasing and munching a ghost, helps the player to score bonus points.

These are displayed on the screen where the action took place. And a fruit is displayed at the centre of the screen which can also be consumed for extra points.

With every cleared screen a new fruit from the series, which is worth more points, appears within the labyrinth.

There are three lives for your man to play with during the game, and as play progresses the number of ghosts increases, making your life more difficult. The game continues as long as you keep your lives without being devoured by the ghosts. When you clear the maze of all the dots, the screen flashes up a new one.

Available from U.K. distributor Igepress this top of the range cartridge costs £20.95.

CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES TV GAMES

VIDEO SCREEN

BAFFLED BY THE BLACK AND WHITES

BACKGAMMON, CHECKERS

Two traditional board game favorites have been given a new lease of life through the video medium.

Checkers and backgammon have been transferred to the television set via the Interton VC4000 Video Computer system, for enthusiasts who cannot always find human opponents to play against.

Both are easy boards for the computer to display and combine simple rules with plenty of scope for tactical play so the computer makes a worthwhile opponent, even if it will have a tendency to play safe.

Checkers or draughts, as it is commonly known, is played on a board and pieces and there is no deviation from the traditional rules. You can play either black or white — black goes first — and then try to out-think your computer opponent. As wary of the computer it'll appear to be offering up a sacrifice — it probably has something neatly planned for you.

As usual the opening strategy determines who ends up with the most kings and that is the player who will usually win the game.

Backgammon too keeps to the traditional rules but without the gambling element, it is not as skillful as the original. It will, however, help to sharpen up the player's skill at outmanoeuvring an opponent on the board. And it will teach beginners the folly of leaving an exposed piece in a vulnerable position.

For those of you who have never played the game, it involves moving counters around the board in the opposite direction to your opponent and trying to get yours home first — but if a counter is left alone it can be captured by your opponent and returned to start.

These cartridges are available from retailers in the U.K. from specialist dealers and some large department stores. The retail price is £19.95.



BURN UP THE CIRCUIT

Turbocharged cars are currently burning up the formula race tracks — and now you can catch up with these high-powered machines in this latest Activision game.

You are at the wheel of a highly tuned turbo race car lined up on the grid for a Grand Prix.

The circuit ahead is filled with numerous hazards which you must overcome with expert control of the Atari joystick. Apart from avoiding other vehicles with a set for all sticks. If you drive over them you're taking a risk and it could cause a multiple pit-stop.

Manoeuvring the car round the circuit is tricky, but only as there sharp bends to contend with, but you also have to drive your car over narrow bridges.

The race is run against the clock which means you must

GRAND PRIX

combine speed with safe driving to come out on top.

Grand Prix is produced by Activision for the Atari Video Computer System and has good graphics and sound effects making the game more realistic. It sells for the standard price of £19.95.

● Philips' new concept in video games combining a television adventure with an actual playing board is to be unveiled this month.

Great for the Kings, which featured in our March issue, is scheduled to be an Intellivision's sleep schedule in April. A price is still to be decided but it is likely to be more expensive than the standard Philips Videopac price (£24.95).

TAKE THE TRENCH TO DARTH'S STAR

STAR STRIKE

Relive the final conflict of Star Wars against the Empire's Death Star when failure means your planet's destruction.

Take the role of Luke Skywalker on his do-or-die mission to blow up Darth Vader's giant man-made planet, in Star Strike you have to guide your Star Cruiser through space, dodging enemy space fighters as you travel to the Death Star.

Missile vehicles past you and you must retaliate with the death laser guns positioned on your star cruiser. If you successfully navigate through the space hazards and reach the narrow trench, which you must fly along to destroy Darth Vader.

Expert flying skills are vital for success because the trench is lined with obstacles and filled with enemy fire. Use your photon torpedoes and maneuver your ship away from the attacking crossfire like laser peaks positioned on the walls of the trench.

Judge the distance from your ship to the trench carefully and when you approach the last few miles focus your sights on that single exhaust vent — the only weak spot in the trench.

If you've got an Intellivision, Star Strike is available from stockists now, the price is £19.95. Intellivision owners can also subscribe to a new newsletter produced by Advanced Consumer Electronics, which gives details of the latest cartridges and new developments planned for the Intellivision and Acornsoft MPU 8000.



AT LAST!



VIC SOFTWARE

VICMEN

A full feature version of the popular "Vicman" arcade game for the UNEXPANDED VIC. Screen activity in machine mode for fast action.

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VICGAMMON

Standard Backgammon game for the VIC with 24 expansion rapid computer responses. Instructions on how to play are included.

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More VIC software will be available in the near future. Write to: Phone 051 227 2800 for details. (Minimum ORDER £10.00) or 1st. Machine - phone 051 227 2800 for details.

Sinclair ZX81

NEW RELEASES

DICTATOR

Another great adventure game from Bug Byte for the ZX81. In this one, you are the president of a small state. The object of the game is to avoid revolution, secure international alliances, and maintain your popularity, while increasing the secret police and army, and maintaining a secure economy. This is a very complex simulation, utilizing the whole ZX81, and the cassette comes with a 3-page booklet giving full instructions and tips on how to survive.

Can you survive in the pressures of life as a dictator, and prevent yourself from spreading before it's too late? PRICE £9.99

CONSTELLATION

Turn your ZX81 into a telescope! This program will produce a simulation of the night sky as you choose points on earth at any time this century. You can gaze your "telescope" in any direction, focus it up, down, left and right, zoom in or pull out, and display the stars by magnitude or constellation. PRICE £9.99

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Acorn Atom FRUIT MACHINE



THE ACORN ATOM FRUIT MACHINE is a classic slot machine game. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom.

CHESS



THE ACORN ATOM CHESS is a classic chess game. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom.

747



THE ACORN ATOM 747 is a classic flight simulator. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom. It's a great game for the Acorn Atom.



GALAXIAN

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CHESS



Will a chess computer ever be able to take on a grandmaster and give him a challenging game? Well, maybe the masters of the game will become wary of the machines after reading the results of a fascinating experiment reported by grandmaster Raymond Keene in *Moscow at Marano* — his account of last year's world championship between Anatoly Karpov and Viktor Korchnoi.

After the match some of the positions from the sixteen games were put to Sci Sys Chess Champion Mark V, one of the strongest of the commercially available chess machines.

The results were impressive on a number of occasions the computer was able to improve on the play in the match. The following position occurred in game nine, with Korchnoi White.



Korchnoi has just played 41. Q-Nc3 and Karpov now replied 41... B-N3 and the game continued 42. Q-KR1 (desire to avoid mate on KN2). Q-Black: 43. K-R1. Q-White and white resigned later 44. K-R1. B-Q8 wins the queen. This win gave Karpov a 4-1 lead — draws did not count in the match.

It is hard to imagine that Black's play can be improved here, but is the diagrammed position Chess Champion Mark V, after about 38 seconds analysis, found the improvement 41... B-CB7!

This kind of move is difficult for a human player to perceive, since it pins Black's rook against his king, an action which tends to be avoided instinctively by strong players. In this case,

White again has to play 42. Q-KR1, to avoid checkmate and then 42... B-B3 wins White's queen, more quickly than by the line chosen by Karpov!

In the next position, Korchnoi — Black — with very few moves left to reach the time-control on move 40 had hastily moved his queen to Q4. Karpov now has 35 minutes to make his next move but — probably to keep up the pressure on Korchnoi — he replied instantly and played 40. N-B1 to save his threatened knight.



Korchnoi now played 40... B-B3 With an irresistible attack on White's king knight pawns.

Karpov played 41. B-B4 and adjourned the game until the next day, but resigned without reasoning — after Black's 42... BHKM: 42. N-K3. Q-B6: 43. N-B7. B-C7: 44. Q-Q4. Q-BPb5: 45. K-R1. Q-N4 mate is one likely continuation.

Karpov's blunder in the diagrammed position gave Korchnoi his first win of the match.

How did Mark V handle the position? After 38 seconds' analysis, it found the ten superior alternatives 40. N-K3! Now Black cannot take the knight without losing his queen and white threatens 41. N-B4 which would fork Black's queen, rook and bishop, attack the queen pawn and defend White's own king knight pawns.

These and other examples clearly impressed grandmaster Keene, not least because of Karpov's decisive and accurate play throughout almost all the match.

The same machine scored a further success in a challenge

contest arranged against grandmaster De John Nunn — an extremely strong chess-problem solver — at the end of a recent international tournament at Brighton. Man and machine were each set six difficult problems, selected by the vice-president of the Problem Commission of the International Chess Federation.

One of the problems was this prize-winning composition by the Soviet problemist L. Zogorajka, which appeared in 1971.

It is White to play and mate in four moves. Nunn was unable to find the solution to this extremely difficult problem, but the Mark V did so: in fact it found three solutions — an extremely embarrassing outcome since a problem is considered spoiled if there is more than one solution found.



As an indication of the complexity of this problem, the reader is invited to work out the analysis after the key move 1. B-K8!

For a computer to do this is impressive, but to find two other solutions was beyond the powers of the many problemists who have examined the position since then.

However, there is a considerable difference between analyzing a problem position and playing a game.

The Mark V's achievements should not be taken to suggest that a grandmaster program is imminent, but they do show that in some areas of the game computers are already capable of more effective deep analysis than humans.

By Max Brammer

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BRIDGE

K

Here's how the Fidelity Bridge Challenger dealt with a recent hand encountered during match-play.

Although the Mark II Challenger has the facility of generating its own random deals it seemed more sensible to try it out on an actual hand. This way you get a human comparison as well. This was the hand, dealt at love all:

North			
S	EQ987		
H	Q17		
D	Q107		
C	32		
West		East	
S	A5	S	110
H	A1094	H	K8
D	K53	D	A19862
C	EQ64	C	AJ3
South			
S	8432		
H	9532		
D	4		
C	10987		

Setting the Challenger aside for a moment, if you were a bridge player, in what contract would you like to play the East-West cards? Six Diamonds is undoubtedly the best spot.

It makes if the trumps are 2-2 or the Queen is singleton and there is the extra chance that even if a defender has started with a guarded Queen of diamonds he may have to follow to three rounds of clubs.

First Challenger was set to work with the instructions that it was playing a weak no-trump (13-15 points) and that there was no opposition bidding. Its action was:

West	East
1C	1D
1H	1S
3D	4NT
5H	6D
pass	

Not an all bad! The One Spade bid was "forth-out boring" in the best modern style and both halves of Challenger's split personality raised their hands well after that.

For a second run, East-West

BY ALAN HIRD

were instructed to play a strong no-trump 16-18 points. It shouldn't have made any difference to the final contract, but:

West	East
1NT	4C
4S	5C
5S	7D
pass	

The Four Clubs bid — and indeed the Five Clubs bid — were Gerner and on finding South with two Aces and two Kings North plunged on to the grand slam. It is perfectly true that if South had held DQ as well



on his other high cards he would have bid exactly the same and Seven Diamonds would have been a dud. As things stand, it is set on outrageous contract.

The next thing to try was a little senseless bidding. Suppose that over One Club North overcalls with One Spade. Should this affect things? Apparently it did for now the bidding went:

South	West	North	East
pass	1C	1S	3D
pass	5NT	pass	5NT
pass	pass	pass	

Let us be fair. The grand slam was not too wild, the small slam distinctly better, and nine tricks in no-trumps were simple. But the difference in valuation is intriguing.

What about the play of the cards? It was in this area that

Challenger Mark I had been at its weakest, tending to draw trumps or sometimes drawing them too enthusiastically.

It had never seemed to count tricks and refrained from taking finesses that were necessary. Perhaps over-zealous advertising had suggested that Challenger played the cards well. Both large stake money matches and legal action were threatened by its detraction and certainly the play had to be tightened up.

Even now these are problems. It is extremely difficult to lay down a set of axioms on how to play the play of a hand — there are so many variable factors.

On the deal we have been considering Challenger had no trouble at all in its Three no-trump contract. After the lead of a top spade, it cashed its nine top winners — albeit in a slightly odd order, but efficiently enough.

In the Seven Diamond contract, Challenger won the spade lead and, playing to the percentages, correctly played off DE and DA. But the Queen did not fall and the slam was doomed.

But when Six Diamonds was the final contract, things weren't so good. After taking the spade lead and trying the top trumps unsuccessfully, the normal play is to try the clubs, hoping to get the losing spade away before the defender with the Queen of diamonds can trump.

Any tournament player would see this immediately and would waste no time in trying it out. Not so Challenger, who rather weakly conceded a trump trick and so went one down without even trying the Clubs.

Perhaps he wanted to get started on the post-mortem and criticize his partner's bidding!

Incidentally, the best line of play doesn't work, but a finesse of D1 the second round of the suit would have done. Whatever Challenger's faults, he doesn't peek!

A

INNOVATIVE TRS 80-GENIE SOFTWARE

from the professionals

Defend!



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

Carrying on in the same tradition, Defend is a fast arcade type action game, complete with sound effects. Enemy spacecraft come at you fast and furiously. If you succeed in shooting them down before they get your ship, you must still get yourself through a minefield through a minefield (but at least they don't shoot at you and finally, if you manage unscathed, you must navigate a tunnel in order to get yourself completely out of danger. An exhilarating game and excellent graphics, personalisation of highest scores and points bonuses. One of its best features is the "ship" and immediate control the player has over the manoeuvrability of his ship which includes diagonal movement. Machine language, 48 coins, for speed. A master of tests, but we think it beats Invaders and Asteroids. Suitable for TRS-80 Models I and II and all Genie models.

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PRESTEL

Ever since Prestel started three years ago, games have been the single most popular thing on it. That's not what it was designed for, but games are a very good way of finding out about Prestel. There are now dozens of different games, ranging from short and simple ones to fairly complex ones.

Although Prestel runs on computers, there is a vital difference between it and even the smallest micro-computer. Prestel has no processing power. It cannot perform calculations, store variables or do clever things with the display — at least, not at the moment, but it's coming. What Prestel does have is simplicity, colour and routing. All games are therefore essentially games of chance.

The key point about Prestel is that it is a computerized information system that anyone can use. All you need is a numerical keypad, and with that you can control and drive the computer. You don't need to be an expert.

Colour is a very important element in Prestel — it gives it much greater impact than ordinary monochrome computer displays.

There are six colours, plus black and white. Three are the primary colours — red, blue and green. A colour T.V. screen is coated in thousands of phosphor dots which give out these colours.

If you mix the primaries, you get some surprising results — red and green together produce yellow. Blue and green become cyan — light blue — and red and blue is magenta. Mix all three primaries together to get white.

If that puzzles you, think what would happen if you could shine all the colours of the rainbow back through a prism. You would not get a muddy brown colour, but vivid white. It's the same on a T.V. screen.

Routing is the secret weapon in Prestel. Each page on a T.V. screen has an invisible "hook" side to it, with various bits of information on it.

The most important thing — after the page number — is a list



By Peter Linton

of other page numbers — up to 10 of them. Suppose you are on page 12345, and number three on the routing list is 7654321.

If you press three, the Prestel computer is programmed to search that list for number three, and pick out that new page.

Then it searches for that particular page among the 300,000 stored on every Prestel computer, and sends it back down the phone line to your set. The amazing thing is that all that takes only a fraction of a second. And it can be repeated as many times as you like. It is as if you had a filing cabinet from which you could extract a sheet of paper in an instant — and that sheet could call up further sheets just as fast.

This facility presents great opportunities and challenges for Prestel designers. Effectively it means that you must think in ten-dimensional terms.

Any page can lead to any of ten other pages, which in turn can lead to ten further pages, and so on, for ever. It is almost impossible to put that down on paper, which is only two-dimensional, and things like flowcharts are usually little help.

A Prestel designer therefore has to visualise a logical path

through a mass of information — and allow for all the alternatives.

It can get pretty mind-boggling at times, but it does provide a useful mechanism for games. It means you can provide a range of simple choices. All the player then has to do is to key the number of his choice, and this calls up the result — with a new set of choices.

A good example is a game called Superbike on 478211 (pictured above). You are racing an-world champion like racer Barry Sheene, and you have to make a constant series of choices, whether to overtake him on the inside or outside.

This routing structure is the basic mechanism of almost every Prestel game, and a look through the games index shows the ingenuity that's gone into devising variations.

By providing a steady series of choices, it can provide a large combination of different possibilities. The catch is that if you play the game again, you get the same choices. There is no randomising element.

Another catch with designing a Prestel game is that you need to provide for every conceivable possibility, otherwise some players are going to get stuck. That can involve large numbers of Prestel pages for games where there are many choices. Think, for instance, how many different variations there can be in Noughts and Crosses. On Prestel that requires several hundred pages!

Prestel games are not as "intelligent" as most micro-computer games. But there are dozens to try, and new ones being devised all the time. Now that you know how they work, you'll enjoy them even more!

ARCADE

KEEPING WARFARE IN PERSPECTIVE

TIPS ON BATTLE ZONE

Patience is not usually demanded of arcade players, who are happier feverishly pushing buttons to destroy as much as possible before the next missile with their name written on it, homes in.

Battle Zone is a unique game, where the player is encouraged to measure with the right spacing to hit back comes along.

The game simulates tank warfare giving a view from inside the tank. Tank controls are also faithfully duplicated with two levers which can be pushed into forward or reverse position simulating the two tanks of the tank.

Beginners quickly learn that pushing both levers forward sends their tank off in that direction, while pulling them back sends the machine into reverse. With one at full reverse and one at full forward the tank turns quickly on the spot.

But even with a good shooting eye this knowledge is not enough to help a player survive for long. As turret's pivot in your direction, the best tactic is to go off diagonally to escape.

This is achieved by pushing one lever hard forward and the other only halfway forward. The enemy's shells will fall just behind you. When you have gone right past the tank, check the radar to see the enemy's position behind you. Then reverse hard and it appears on the screen quite close up and turn on the spot. You will have two chances to get in a shot before the tank is in a position to fire at you again.

If you miss with both, then repeat the tactics. One danger is that you may run into the enemy as you reverse and then you will be helpless but the radar check should prevent this.

After 3,000 has been scored, the super tanks are unleashed, these turn much faster but the same tactics work, although you will only have time for one shot.

Among the other inhabitants of this machine is a flying saucer which flies swiftly along the back



of the plain. These are well worth hitting if they pass in front of you (5,000 points) but it can be lethal to chase them, even though they don't hit the back, as a tank may use this opportunity to creep up on you.

With the missiles, which fly towards you from the back of the screen, it is possible to increase your chance of hitting them by going into full reverse and waiting until they get up really close.

It is also possible to put an obstacle between you and the missile which will cause it to miss but it will come back to try again — be ready for it.

A good player uses the radar to place tanks as fast of them will maneuver behind you. Scoring 100,000 will give the player a 15-20 minute game but beginners should watch for games which offer extra tasks for your money, to learn on. Our thanks go to James Egan of Waterhouse, in Harlow, for the tips.

THE RECORD BREAKERS

Breaking new ground on arcade machines is turning into an endurance test as much as it is a test of skill.

This is proved by the fact that four students from Kent University are planning to spend eight days at the controls of an Asteroids machine to put their names in the record books.

David Birker, David Hill, Tony Thomas and Alan Tilling are the four whose endurance will be tested in shifts on the university's machine in Canterbury. As the issue goes to press the university's rag week will be taking place around the four of them as they attempt to return an unbeaten score of 100 million.

If their attempt succeeds it will leave the present world record for dead Alan, which manufacturers the Asteroids machines, monitors the world

record and it presently stands at 30,100,000, broken up in 50 hours by a New Yorker.

David Birker claims of four Kent players have previously been over the million mark: 'I have scored five million in a double game which lasted eight hours and we were left with 113 bases.'

'We will have no shortage of people willing to volunteer the attempt as we are being sponsored for the rag week charity and any money we make will be going to some noble sufferers.'

Are you record-breaking material? From our next issue we will publish some of the best scores we have heard of on popular arcade machines to give top scorers something to aim at. If you can beat our highest scores and are willing to prove it, please write and let us know.

THE ART OF ROCK BASHING

SPACE DUEL

order fire into smaller segments of themselves. Alien spacecraft will frequent the pathways between them and your craft is still equipped with shields to protect itself from rogue meteors.

But the most interesting feature of Space Duel is that two people can play at once. It is possible for both to take in the screen as enemies and go individually for a high score, or play as a team to knock out as many asteroids screens as possible between the two of you.

A further break with tradition is that the two spacecrafts can team up to give real fire power. A chain is tied between the two

and they move around the screen in tandem, firing independently, but moving as one.

This takes some getting used to and teamwork is very important when moving out of the way of an oncoming asteroid. One craft can pull the other out of harm's way, but if both try to go in different directions at once the meteors will come out on top.

The advantage is the increased fire power which can clear an asteroid out of harm's way very quickly.

When both craft are on the screen at once, a good player can help a beginner to get through as the game continues and both have lost the required number of lives.



ACTION

HERO WITH A YELLOW STREAK

AMIDAR

The Amidar may look like a caddy bug, but their touch is deadly.

The game which is named after these creatures combines the tediousness of arcade themes of maze chase and space capture.

In *Amidar*, you take the part of a gorilla, who swings around the screen on blue bars which are covered in white fruits. As he moves along the bars he clears them of white fruits. If all four sides of a square are cleared the center is lit in red and gradually the screen becomes a patchwork of red rectangles.

There are seven Amidars on the screen. One runs around the outside four corners and the other six move up and down always turning the nearest corner. These creatures are not as intelligent as the "Fuzorian" "ghosts" when it comes to hunting down their prey.

All the dots must be erased to clear the screen and start on the second area of the game. This time a framework of red lines comes up on the screen and the player is transferred into a paint roller. The Amidars, which resemble toy rats, still undertake their regular patrols of the screen.

The aim of this screen is to use your paintbrush to pick up a yellow streak at the bottom of a wall and extend it. With the Amidars moving like a herd as possible you first have to run the yellow around the border of the nearest rectangle, filling it in with a bright green and portaling the bonus score which the game previously featured.

From this start it is possible to fill in the entire screen, with the really big bonus scores waiting for you at the top.

It is important to keep a cool head as the Amidar are quite capable of turning away from you even when they seem to have you surrounded. Just keep a check on where the next corner comes up and be sure that they will turn down it.



EXPLORE THIS OH-SO LENGTHY TOMB

TUTANKHAMUN

The treasures of the Pharaoh's tomb is awesome — but so are the creatures that guard it!

The Earl of Carnarthen's expedition into the mysterious depths of King Tut's famous pyramid proved hazardous — but arcade players have to face even more terrors.

The explorer who leaves the video pyramid resembles a cartoon prospector character complete with a bushy white mustache and with tools strapped to his back.

The treasure hunter is also armed, which is just as well because he will have to face a horde of guardian creatures in this tomb.

This motley crew of monsters include a mummy and a cobra as well as some less applicable dungeon denizens. Their touch is deadly.

The labyrinth which leads to the treasure is long and tortuous.

LADYBIRD KNOCKS OFF THE SPOTS

LADYBIRD

Any gardener will tell you that ladybirds are a force for good on the countryside.

They are now also undertaking heroic feats in the arcade in a new maze game.

The player takes the part of the ladybird, which also gives its name to the machine, and sets off on a sprint consuming trip around the maze.

In this game the spots are few and far between and the pursuers are in the form of large blue beetles which try to corner your limping insect.

But you do have one big advantage over your adversaries, your ladybird can walk through the maze walls, as these are hinged doors which the creature can push open.

As one way opens another is inevitably closed as the door swings around in 90° to seal a different passage. The blue beetles cannot pass through the doors.

The good player will plan to block off the beetles completely, surrounding them within four doors and leaving them helpless.

These blue beetles appear rather slow and cumbersome and even a beginner has a chance of doing well against them. But these are later replaced by some faster pink beetles who track down the ladybirds much more swiftly.

An interesting game for the beginner but the controls for the ladybird are not designed for fluid movement which can result in frustration when they do not respond quickly enough.

The monsters hunt in a pack — some trying to get in behind you and others trying to draw your fire before looping into some half forgotten nooks.

Your explorer has a limited amount of ammunition in his weapon which occasionally needs replenishing. But his main deficiency is that he can only fire horizontally and it is real danger if he ever gets trapped in a vertical part of the maze.

To help him avoid this happening the top of the game screen offers a "radar" display of the whole maze. On this the monsters can be seen as white blobs, converging on you from the far end of the maze.

Although it doesn't help you much in dodging the advancing horriers, it does prepare you for their charge so you can ensure a long horizontal passage stands between you and them.

You have three lives to try and make it to the treasure but they are not nearly enough — especially since, you are returned to the beginning of the maze each time the monsters catch you.

The biggest danger among the first batch of creatures is the scorpions-like being which is invulnerable to your fire — or so he seems at first. In fact a sequence of three hits will make him turn away and rethink his avenue of attack.



The Sinclair ZX81 has a real poker face — it gives nothing away about its hand. No boards of sweat will leave on its keyboard if it's blurring on a luck high and you won't notice its RAM-pack trembling with excitement if it holds a full house. In draw poker, always the best players, the early part of the game is all mathematical odds and the final betting is all down to psychology. This program will hardly give the ZX81 a believable personality but it will help the uninitiated learn how to play poker hands and how much to gamble on them. The ZX81 deals out two poker hands, one to itself and one to its opponent, you. After a quick look at the pos-

sibilities of your hand, you must keep in how much money you are willing to gamble on drawing the right cards against the ZX81's hand. The ZX81 will always cover your bet and when give you odds if it thinks you have made a rash decision. Then after you have changed your hand in search of that elusive full-house, the ZX81 does the same and it's winner takes all. Not quite Chinatown Kid stuff but it will give a good understanding of the game and show why experienced gamblers never draw to an inside straight. After all everybody should know how to play poker, if only to help them understand why the west was as wild as it was.



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```

0040 LET C=9
0050 GOSUB 2000
1000 REM START THE HANDS
1010 FOR D=1 TO 2
1020 GOSUB 2000
1030 GOSUB 2070
1040 NEXT D
1050 GOTO 2145
2000 REM START HAND D
2010 FOR F=1 TO 1
2020 FOR T=1 TO 4
2030 IF INT(D*INT(1)+1.D) THEN GO5
GO 2000
2040 NEXT T
2050 NEXT F
2060 RETURN
2070 REM ANALYZE HAND D
2080 LET X(D)=0
2090 LET S=0
2100 FOR I=1 TO 5
2110 LET J(I)=INT (INT(D)/500)
2120 LET TEMP=INT(D)
2130 LET INT(D)-=INT (INT(D)/510)
2140 LET S=S+10*TEMP+INT(D)*10
2150 NEXT I
2160 FOR D=1 TO 5
2170 GOSUB (3000+C*100)
2180 IF X(D) > 0 THEN LET C=C
2190 NEXT C
2200 LET BS=STRE 0
2210 LET T(10)=JWAL GALEN 0(1)
2220 RETURN
2230 REM PRINT RESULTS
2240 LET V=0
2250 IF C=10 THEN LET C=0
2260 FOR D=1 TO 5
2270 IF X(D) > 0 THEN GOTO 2154
2280 LET TEMP=INT(D)
2290 INT(C)SUS 2000
2300 PRINT AT U,C,RE: "HIGH"
2310 GOTO 2180
2320 PRINT AT U,C,RE: X(D)
2330 LET V=0
2340 LET C=C
2350 NEXT D
2360 REM PRINT SCORE
2370 PRINT AT 15,0: "
2380 PRINT AT 15,0: "
2390 IF X(1) < X(2) OR Y(1) < Y(2)
AND X(1) < X(2) THEN GOTO 2000
2400 IF X(1) < X(2) OR Y(1) < Y(2)
AND X(1) < X(2) THEN GOTO 2000
2410 GOTO "DEAL - YOUR MONEY RE
"
2420
2430 LET BHT=INT-STAKE
2440 GOTO 2001
2450 GOTO 2000
2460 PRINT "YOU LOSE"
2470 LET WIN=STAKE*0.1X(2)
2480 LET BHT=BHT-WIN
2490 IF BHT < 0 THEN PRINT "YOU HA
"
2500 SUM OUT OF MONEY"
2510 IF BHT > 0 THEN STOP
2520 LET C=C*0.1X(2)
2530 GOTO 2000
2540 PRINT "YOU WIN"
2550 LET WIN=STAKE*0.1X(1)
2560 LET C=C*0.1X(1)
2570 LET BHT=BHT+WIN+STAKE
2580 POINT "L - STAKE" AT "0000
"
2590 "L - STAKE" AT "0000
"
2600 PRINT "YOU ARE L,BHT," IN
"
2610 PRINT "ENTER 5 FOR ANOTHER
"
2620
2630 INPUT 0
2640 IF 0 < 5 THEN STOP
2650 CLS
2660 GOTO 070
2670 REM SHUFF CARDS
2680 LET P=0
2690 LET TEMP=INT(D)
2700 LET INT(D)-=INT(1.D)
2710 LET INT(1.D)+TEMP
2720 RETURN
2730 REM STRAIGHT FLUSH
2740 GOSUB 2400
2750 IF X(D) > 0 THEN RETURN
2760 LET X(D)=0
2770 GOSUB 2000
2780 IF X(D) > 0 THEN RETURN
2790 LET X(D)=1
2800 LET G=10045

```

```

3100 RETURN
3200 FOR I=1 TO 5
3300 IF J(I)=J(I+1) AND J(I) < 10
J(I+1) AND J(I+1)=J(I+2) THEN GOT
0 2000
3400 NEXT I
3500 RETURN
3600 GOUP 1000
3700 LET G=1000+(I+1)*100+I*2
I=I+10
3800 RETURN
3900 REM FULL HOUSE
4000 GOUP 1000
4100 IF X(D) > 0 THEN RETURN
4200 LET X(D)=0
4300 GOUB 3700
4400 LET X(D)=0
4500 IF TEMP > 0 THEN LET X(D)=5
4600 IF TEMP > 0 THEN LET G=10045
4700 RETURN
4800 REM FLUSH
4900 FOR I=1 TO 4
5000 LET T(I)=0
5100 NEXT I
5200 LET S=0
5300 LET C=C
5400 FOR I=1 TO 5
5500 LET X(I)=INT(D)-J(I)*10
5600 LET T(I)=INT(D)-X(I)*10
5700 NEXT I

```



```

3400 FOR I=1 TO 4
3500 IF T(I) > 0 THEN LET X(D)=4
3600 IF T(I) > 0 THEN LET S=1
3700 NEXT I
3800 IF S=0 THEN LET G=10045
3900 IF S=1 THEN RETURN
4000 IF X(D) > 0 THEN LET S=S*0.1
S+1
4100 NEXT I
4200 RETURN
4300 REM STRAIGHT
4400 LET S=0
4500 IF J(1)+1=J(2)+1 AND J(2)+1
=J(3)+1 AND J(3)+1=J(4)+1 AND J(4)+1
=J(5)+1 THEN LET S=1
4600 IF J(1)+3=J(2)+3 AND J(2)+3
=J(3)+3 AND J(3)+3=J(4)+3 AND J(4)+3
=J(5)+3 THEN LET S=1
4700 IF J(1)+5=J(2)+5 AND J(2)+5
=J(3)+5 AND J(3)+5=J(4)+5 AND J(4)+5
=J(5)+5 THEN LET S=1
4800 IF S=1 THEN LET G=10045
4900 IF S=1 THEN LET G=10045

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adda-

```

3888 IF J11=14 AND J11=2 AND J
3913 AND J23=4 THEN LET T=100
3888 IF X10=5 THEN LET S=10000
3890 RETURN
3892 REM THREE
3894 FOR I=1 TO 3
3918 IF J11=J111 AND J11=J11
3919 THEN GO TO 3948
3920 GO TO 3948
3922 LET X10=6
3890 LET S=100*(I+1)*10+I*2
3890 RETURN
3900 REM 4 PAIRS
3901 LET TEMP=0
3910 FOR I=1 TO 4
3928 IF J11=J11=1 THEN LET TEN
3929 TEMP=41
3928 IF J11=J11=1 THEN LET C=C
+100*(I+1)=1
3930 NEXT I
3932 IF TEMP=2 THEN LET X10=7
3932 RETURN
3898 REM 1 PAIR
3899 LET C=C
3898 GO SUB 3788
3918 IF TEMP=1 THEN LET X10=8
3920 RETURN
3922 REM HIGH CARD
3923 LET X10=9
3930 LET C=C
3932 RETURN
4300 REM RETURN BANK
4318 LET POINT=TEMP/100
4320 LET S=TEMP-B*10
4322 LET N=STR$ B
4324 IF B=14 THEN LET N="ACE"
4326 IF B=13 THEN LET N="KING"
4328 IF B=12 THEN LET N="QUEEN"
4330 IF B=11 THEN LET N="JACK"
4332 RETURN
4334 REM COMPUTE CARDS TO CHANGE
4318 LET B=B
4328 FOR I=1 TO 5
4338 IF B(1):>0 THEN LET N=N+
+100
4340 NEXT I
4342 RETURN
4344 REM CHANGE CARDS IN
4346 LET N=STR$ B
4348 FOR I=1 TO LEN STR$ B
4358 IF B(1):>0 OR B(1):>1 T
HEN LET P=0
4360 NEXT I
4362 IF P=0 THEN RETURN
4364 FOR I=1 TO LEN STR$ B
4374 LET C=C+1
4384 LET MIT=C:GOTO 10+T
4394 LET TEMP=C:GOTO
4404 GO SUB 4088
4418 PRINT AT IVAL, (B(1)+0), 10
4428 PRINT AT IVAL, (B(1)+0), 10
4438 LET C=C-1
4440 NEXT I
4442 REM NEXT B
4444 REM NEXT S
4446 LET S1=STR$ S
4448 LET U=C
4450 FOR P=1 TO 1
4460 FOR T=1 TO LEN STR$ U-1
4470 IF B(1):>B(1+1) THEN GO SUB
4480
4482 NEXT T
4484 NEXT P
4486 LET S=VAL B(1) TO LEN STR$
S1
4490 RETURN
4492 REM SHIP NUMBERS
4494 LET P=0
4496 LET T=0
4498 LET N(1)=B(1+1)
4508 LET B(1+1)=B(1)
4518 RETURN

```

YOUR HAND-TWO PAIRS

PAIR	5 OF	HEARTS
PAIR	4 OF	CLUBS
PAIR	3 OF	DIAMONDS
	2 OF	SPADES
	2 OF	HEARTS

BY HAND-ACE HIGH

1	KING OF SPADES
2	ACE OF SPADES
3	5 OF HEARTS
4	4 OF HEARTS
5	JACK OF CLUBS

YOU WIN
 25 AT 0 TO 1 = 250 +
 25 STRA = 250
 YOU HAVE 500 IN CREDIT
 ENTER 8 FOR ANOTHER DEAL



STAR FIGHTER

MESSAGE TO STARFIGHTER

Your mission is to destroy enemy craft and bases in this sector.

Our intelligence service has been unable to obtain exact locations of these targets but your shipboard computer will aid you in the search. Your ship is armed with neutron missiles and phaser weapons. Beware of asteroid storms in your sector. GOOD LUCK.

OK space fans — the object of this game is to search and destroy targets positioned randomly around the galaxy — which in this case is represented on the screen of a 68 column PET.

The game uses the whole screen for the galaxy, which is pointed into position. This allows moves and actions to be displayed on and when they happen. A second screen displays the co-ordinates of targets, starfighter and starbases, plus the condition of shields, energy, weapons and the number of targets available. The starfighter which you pilot can stock up with weapons and refuel at a friendly starbase.

All major parts and sub-routines of the program are prefixed by REM statements describing their function. Other significant parts of the program are:

Line 115 — number of targets per sector. Line 125 — frequency of starbases. Line 142 — frequency of asteroid storms. Line 150 — locality of the targets, this increases as the number of targets decrease. Line 158 — frequency with which the targets move and attack. Line 520 — frequency with which new targets enter the current sector during combat. Lines 890-930 — prevent the program crashing by loading the commands in to a file.

RUINS ON A PET IN 6K

BY P. B. MORGAN

```
50 REM STARFLIGHTER
55 REM P. B. MORGAN, NORTHVILLE, 120031
90 GOSUB 5000
95 REM INITIALISE VARIABLES
100 CLR DIM S(35),A(35),E(2000),H=400,H=0
105 T1= "000000" : T2=
108 REM INITIALISE WITH SECTOR (S)
110 S=31 : GOSUB 450
115 FOR H=0 TO 36 : S=H : H=H-NEXT
116 FOR H=1 TO 36 : GOSUB 200 : H=H+1
119 C=INT(64*PI) : H=0 : S=INT(H/36) : H=H+1
120 T=C*36 : GOSUB 300
125 IF S=36 THEN GOTO 135
130 H=0 : GOSUB 350
135 H=H+1 : GOTO 125
140 PRINT "S:GOSUB 200"
141 REM WATER PLANET
142 S=H : H=0 : GOTO 130
144 T=C : GOSUB 400 : H=H+1 : GOTO 135
146 FOR H=1 TO 36 : S=H : H=H-NEXT
148 PRINT "S:GOSUB 200" : GOTO 135
150 REM BASES ATTACK
155 S=INT(PI) : H=0 : GOTO 135
160 H=H+1 : GOTO 155
170 GOSUB 500 : PRINT "CHARGES" : GOSUB 500
175 IF S=36 THEN GOTO 180
180 T=C : GOTO 240 : H=0 : GOTO 155
185 H=H+1 : GOTO 170
190 REM PRINT "THREE PHASES OUT OF PHASERS" : GOTO 150
200 PRINT "S:GOSUB 200" : H=0 : GOTO 155
210 T=C : GOSUB 600 : H=H+1 : GOTO 155
215 REM SELECT CONTROL (S)
220 GOSUB 800 : PRINT "ENERGY"; INT(E); "SHIELDS"; : GOSUB 900
225 H=H+1 : GOTO 155
230 GOTO 150
235 REM PHASER CONTROL (A)
240 GOSUB 800 : PRINT "ENERGY"; INT(E); "PHASERS"; : GOSUB 900
245 PH=IF EOF OR PC=0 GOTO 230
250 S=E-P : H=0 : GOTO 155
```

```

229 REM HELM CONTROL (1)
240 GOSUB 300:GOSUB 305:GOSUB 450
245 IF PEEK(X+C*48) GOTO 255
246 PRINT"MISSILE/FIGHTER DOCKED-REFUELED AND REARMED"
250 C=COSB:W=W+400:H=H+(C*25)+0:GOTO 255
255 IF PEEK(X+C*32) GOTO 240
256 POKE (X+36),32:(X+38):POKE X,97:GOTO 240
259 REM CO-ORDINATE SUBROUTINE
300 GOSUB 600:PRINT"CO-ORDINATES(X,Y)?":GOSUB 600:END
301 W=W+60:INT(X/100)+32390:IF X>32767 OR X<2880:GOTO 300
302 RETURN

```

```

303 REM DISTANCE SUBROUTINE
305 D=INT(SQR((X2-X1)^2+(Y2-Y1)^2):RETURN
310 D=ABS(X1-X2)+ABS(Y1-Y2):RETURN
339 REM SET-UP TARGETS SUBROUTINE
345 FOR H=0 TO 10:POKE S(X),32:POKE H,C
350 FOR H=0 TO 10:IF H=C THEN RETURN
360 GOSUB 700:NEXT

```

```

399 REM PHASER SUBROUTINE
400 IF C=C1 THEN RETURN
405 IF PEEK(S(X)+C*48) THEN RETURN
410 W=C*10:GOSUB 305:D=D+C:IF P/D<C:GOTO 415
415 T=T-T/C:P=P-P/C:GOSUB 600:RETURN
420 T=T-P/D:W=W-T/3:IF P<1:GOTO 425

```

```

421 GOSUB 750:POKE X,43
422 W=S(36):GOSUB 750:POKE X,97
425 IF W=0 THEN RETURN
430 GOSUB 750:POKE X,32:W=0
435 PRINT"MISSILE MISSION FAILED-STARFIGHTER DESTROYED":GOTO 1000
449 REM STARFIGHTER ENERGY SUBROUTINE
450 E=C-D:IF E<0:1 THEN RETURN
455 FOR Q=0 TO 20:PRINT"MISSILE ENERGY LEVEL:":REDUCE SHIELDS":NEXT
460 IF E=0 THEN RETURN
465 E=C-PRINT"MISSION FAILED-STARFIGHTER DESTROYED IN SPACE":GOTO 1000
499 REM POKE CURRENT SECTOR
500 FOR H=0 TO 35

```

```

510 IF S(H)=0 THEN NEXT
515 IF H<10 AND H<25 THEN POKE S(H),42
520 IF H<11 THEN POKE S(H),43
525 IF H<25 THEN POKE S(H),44
530 IF H<36 THEN POKE S(H),45
535 NEXT:RETURN

```

```

599 REM TARGET DESTROYED SUBROUTINE
600 D=5:GOSUB 750:POKE X,32:C=C-1:K=K+C:IF K=1:GOTO 595
605 IF C=C1 THEN RETURN
610 IF S(CS)=0:GOTO 620
615 D=2:W=S(35):GOSUB 750:POKE X,32:(X+35)+0
620 IF RND(1)>0.5 THEN RETURN
625 W=C+C:R=C:R=T+2*W:RETURN
670 PRINT"MISSION COMPLETE-ALL TARGETS DESTROYED":GOTO 1000

```

```

630 REM RANDOM POSITION SUBROUTINE
700 S(X)=S(X)+INT(RND(1)*256):RETURN
749 REM ANIMATE SUBROUTINE
750 FOR Q=0 TO 10:POKE X,86:POKE X,42:POKE X,91:NEXT:RETURN
800 PRINT"X"
829 REM OPEN GAME SUBROUTINE
900 OPEN 1:PRINT"X"
905 INPUT"DEPRESS Q#":Q# THEN 905
910 Q=VAL(Q):CLOSE 1:RETURN
999 REM SCORE & NEW GAME

```

```

1000 FOR Q=0 TO 2000:NEXT:GOSUB 2000
1002 TR=VAL(LEFT$(T1,4))+VAL(CRIGHT$(T1,2))/60
1004 PRINT"MOVIE SCORED":INT((S-S0)/K)*4*(30-TR)/"POINTS"
1005 PRINT"PRESS ANY KEY FOR ANOTHER GAME"
1010 GET Q# IF Q#="" THEN 1010
1015 GOTO 90
1099 REM SCRN SUBROUTINE (2)
1200 GOSUB 2000 PRINT"PRESS SPACE BAR OR 'I' FOR INSTRUCTIONS"
1205 GET Q# IF Q#="" GOTO 1200
1210 IF Q#="I" GOTO 1205

```

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```

1915 DOSUB 5000
1920 PRINT "C-1070 195"
2000 PRINT "3 STARFIGHTER STARDATE =:T34
2005 PRINT "ENERGY=0 INT(0) SHIELDS:INT(W*H) MISSILES"
2010 PRINT "TARGETS =CURRENT SECTOR =C TOTAL=X,Y,M"
2020 IF #C1 GOTO 2025
2025 H=35:DOSUB 3000
2030 PRINT "STARFIGHTER POSITION (X,Y) =:M
2035 IF #C25=0 GOTO 2060
2040 PRINT "MINIMUM PHASER ENERGY INT(W*H+0.9) RETURN
2045 H=#C25:DOSUB 300 H=35:DOSUB 3000
2050 PRINT "STARBASE POSITION (X,Y) RANGE=:D,M"
2055 D=100 IF C=0 THEN RETURN
2060 FOR N=0 TO C-1 DOSUB 3000 NEXT
2065 PRINT "MINIMUM PHASER ENERGY INT(W*H+0.9) RETURN
2070 H=#C25:DOSUB 300 D=100:DOSUB 3000
2075 PRINT "TARGET POSITION (X,Y) RANGE=:D
2080 IF D=0 THEN D=0
2085 RETURN
2090 INT(C*30)/(C*30-32400)/90=#X#D-32200 RETURN
2095 PRINT "STARFIGHTER-COMMANDS
2100 PRINT "1 HELM -
2105 PRINT " MOVES STARFIGHTER IN CURRENT SECTOR
2110 PRINT "2 SCAN -
2115 PRINT " GIVES CURRENT STATUS AND CO-ORDINATES
2120 PRINT "3 SHIELDS -
2125 PRINT " CREDITS OR CREDITS ENERGY IN MAIN BANK
2130 PRINT "4 PHASERS -
2135 PRINT " ENERGY NEAPON THE EFFECT IS DIVIDED
2140 PRINT " BETWEEN TARGETS IN CURRENT SECTOR
2145 PRINT " AND BY DISTANCE. THE RESULT IS TAKEN
2150 PRINT " FROM THE TARGET'S ENERGY BANK. WHY
2155 PRINT " TARGETS LEFT IN THE SECTOR ATTACK
2160 PRINT " USING THE SAME PROCEDURE
2165 PRINT " EACH TARGET'S PHASER ENERGY IS 240
2170 PRINT "5 NEW SECTOR
2175 PRINT " MOVES STARFIGHTER TO NEW SECTOR AND
2180 PRINT " CREDITS 51 FROM MAIN ENERGY BANK
2185 PRINT "6 NEUTRON MISSILES -
2190 PRINT " DESTROY BY A SINGLE SHOT. DIRECTION
2195 PRINT " OF HELM. RANDOMLY 30 TARGETS
2200 PRINT " LEFT IN THE SECTOR ATTACK AS IN 4
2205 PRINT "7
2210 PRINT "8 PRESS SPACE BAR
2215 GET # IF #=0 " COTO 2400
2220 PRINT "9 STARFIGHTER-NOTES/
2225 PRINT "A. THE GRID IS 20000,Y CO-ORDINATES RUN
2230 PRINT "B. IN HELM OR SCAN TARGETS ATTACK AND/
2235 PRINT "C. OR MOVE AT RANDOM
2240 PRINT "D. IN ATTACK TARGETS MOVE AND WHY ENTER
2245 PRINT " THE SECTOR AT RANDOM TARGETS LEFT
2250 PRINT " ALSO DESTROY STARBASES
2255 PRINT "E. ALL MOVES REDUCE ENERGY
2260 PRINT "F. TO REFUEL HELM ONTO STARBASE (ONCE
2265 PRINT " ONLY PER STARBASE)
2270 PRINT "G. ASTEROID STORMS REDUCE SHIELDS BY
2275 PRINT " AT LEAST 300 AND DAMAGE OR DESTROY
2280 PRINT " TARGETS AND STARBASES.
2285 PRINT "H. DISTANCE IS THE SUM OF X AND Y
2290 PRINT "I. STARFIGHTER: 0 TARGET: + STARBASE: @
2295 PRINT "J. SCORE IS A FUNCTION OF TIME & NUMBER
2300 PRINT " OF TARGETS LEFT. (STARDATE-TIME)
2305 PRINT "K
2310 GET # IF #=0 " COTO 2220
2315 PRINT "L PRESS SPACE BAR
2320 PRINT "M RETURN

```

READY.

KRIEGSPIEL

War gamers have long realized that computers would add a lot to their hobby.

When the risks of carefully painted warriors have been moved into their starting positions, the game player gets underway only through some peripatetic dice throwing and cerebral consideration of tables.

The microcomputer can make short work of these leaving the general free to concentrate on his tactics. And although the game is certainly not an pilgrimage, it does mean that war gamers without the necessary patience to spend time flogging up and decorating their armies.

Ron Potkin's *Kriegspiel* is based on a Second World War tank battle and has become an extremely popular game on the home. We'll have it in Rise to tell you a lot more about the game.

BY RON POTKIN

RUNS ON A TANDY TRS-80 IN 16K

Each must be oriented left or right to squares and oblongs on it.

Keyboard characters are analogic. When playing, one should be totally involved and lost in the war. The battle is really happening. I am afraid the letter "A" for army does not look too

delicious getting involved in the detailed programming, you should understand the overall operation of the program. There are four arrays which control all movement and attack, these are:

• Move screen, but the program and put the hex found in the screen. Each hex is numbered according to its first "zero" if

the battle will not be tied down to rolling dice and consulting charts. The TRS-80 has changed all that. That's the advantage. It determines when conflict should occur and the nature of the conflict.

It rolls the dice and makes all combat between opposing sides.

It is an impartial referee and it will not tolerate heavy breathing or the gasp of relief that moves a complete armour division across the Mediterranean.

Real hidden movements is possible. No longer does one need to write down on a piece of paper the current location of each hidden piece.

It was with these points in mind that I wrote *Kriegspiel*. While designing the game, I had to consider:

• The minimum size of hex, the shape of each piece, the necessity to be able to distinguish pieces on each side.

I finally determined that color tapes were required to build up a neat shape and meet all my requirements. After allowing for a loss of messages and spaces between the pieces, I had a board of about 120 hex. *Kriegspiel* is a 4-layer board, a different approach so that it is possible to have 500 hex.

I think you will enjoy the game. My son Leigh, and I have played it many times and have developed our own personal strategies. Inevitably, the scoring becomes particularly interesting and we play it over and over.

Kriegspiel is a further development of this game with more pieces, more fields, more hex, revealing a larger board and other features, but the same basic strategies apply.

I am not going to give any advice or tactics other than to urge you to study the rules or obtain a copy. Carefully learn the

position. The top row has hex number 4. The next is number 1 and so on up to 80 in steps of 8.

The second line runs from 84 to 120. Note that alternate rows are offset by four so that the lines fit together. The same format continues down to hex number 596 leaving the bottom line for messages. Let's look at a section of the screen using hex number 400 as an example. *Kriegspiel* 400. This entry number is given at the outset, if we know the direction. These numbers to move a piece from and hex to another. We could relocate them but it is faster to use "direction-goto" (like 2500). As an alternative a table of values could be used.

• Piece table "PC". This is 2 by 10 array and contains details of the 16 pieces on each side. The first column is the current hex number position on the screen. The second contains the type of piece—tank, infantry, engineer or capital. The other four columns contain combat points which will be described later, which a

About three years ago I bought several boxes of these small two-inch high plastic blocks. They represented the French and British from the Battle of Waterloo. In all these years I have been 800-900 pieces. The next three months were spent painting the detail on each piece using a magnifying glass, but after the first 100 I regret that my enthusiasm began to wane. There is no doubt that the sight of always numbered warriors lined up for battle is very appealing but I felt there had to be a better way.

All this occurred about 10 years before the birth of a son. I had played wargames for several years and although they were very interesting, there was a lack of reason because I felt that a general should be allowed to concentrate on the

piece is eliminated, column 1 is set to 0.

The board "BD": This is a 16 by 16 array, including the zero index and is an exact representation of the actual board. Each individual position is equal to one box on the screen. Each vacant position on the screen is set to zero on the board. An occupied position contains the index of that piece in the piece table. Positions occupied by mountains contain 3, 4, or 5 according to the type of mountain.

Character "PL": This is a 7 by 4 character string holding the shapes to be printed on the screen. The curved character is defined by means of its index in the second column of the piece table.

It will be apparent that, using the information in each of the arrays, we can easily move from one table to another. There is one missing link. This is the con-

2. Turns are determined by "I" in line 1000 which sets the variable I, to either 1 or 17 indicating the index of the first piece to be moved.

3. Sets the hex number FL, the number of moves "MV," and the character "PL" (line 1010, 1020).

4. Prompt for a decision by entering "PL" and "MV." (line 1030).

5. If the input is a number, check if valid and either move the piece or announce prompting line 1050-1110.

6. Decide during movement line 1050 for the winning condition.

7. Line 1070 checks "over crossing." If this is true, an extra movement factor is deducted.

8. Line 1130 checks one box in every direction using "Turns," looking for an opponent.

9. If surrounded in the coding in the Maze routine. Follow the direction starting line variables "D1," "D2," and "D3" in lines 1000, 1010, 1070, 1080, and 1090.

10. The "C," "S," and "F" commands are never to follow, but note that "C" jumps immediately to line 1300 whereas "F" carries out a full check of pieces that have not been prompted to check for possible attacks. Since this involves checking six boxes for every piece, it is a slow process and therefore, if it can be seen that no pieces are adjacent, it is better to use "C."

Let us take stock of what we have when we finally reach line 1300 — the start of the attack sequence.

1. The board index and piece table have been updated in respect to all movement.

2. Mountains will have been adjusted on the board and video when they have been eaten away by the opponent.

3. Columns 3, 4, 5, and 6 of the piece table contain information regarding attacks. Note that if column 4 is set to one the attack will be successful and column 5 containing 1 if it is clear that the defender is required by the piece.

4. The board index and piece table have been updated in respect to all movement.

5. Mountains will have been adjusted on the board and video when they have been eaten away by the opponent.

6. Columns 3, 4, 5, and 6 of the piece table contain information regarding attacks. Note that if column 4 is set to one the attack will be successful and column 5 containing 1 if it is clear that the defender is required by the piece.

7. The board index and piece table have been updated in respect to all movement.

8. Mountains will have been adjusted on the board and video when they have been eaten away by the opponent.

9. Columns 3, 4, 5, and 6 of the piece table contain information regarding attacks. Note that if column 4 is set to one the attack will be successful and column 5 containing 1 if it is clear that the defender is required by the piece.

10. The board index and piece table have been updated in respect to all movement.

11. Mountains will have been adjusted on the board and video when they have been eaten away by the opponent.

COMBAT SEQUENCE

Lines 1200 to 1250 are a prompting routine and sets all attacks. Note that the use of the flag "D1". This is set to one if an attack is found. If it is zero at line 1550, it means there are no attacks and the combat sequence is finished.

Lines 1600 to 1750 are more complex. They are concerned with determining which pieces are involved in each individual combat, whether the defender has support, whether the attack is across the river, and finally selecting a random value from the attack table.

A defender table "DR," is set up. This holds the index of the defender as it is found in the piece table (line 1620). The attacker is put in the attacker table "D" (line 1660-1680). We then go through the rest of the piece table searching for any other pieces attacking the same defender. These are held for the "D" table. At each column the attack letter "A1" is increased and increased again if the attacker is a land piece over crossing flag is "over" ED with "D1" and column 3 of the capabilities register so that piece cannot be involved in another attack.

Line 1700-1710 calculates the defender's factors and go to the subroutine at 4000-4200 to check if support.

Lines 1750-1800 calculate the attack rate and find the appropriate column in the attack table from which it selects a random result. If you are like me, you probably find typing the rates is tedious, so if you want to see the attack table, look at file 2010-20110. Now read through lines 4010-40410 which set up the outcome for each value in the table.

Note the use of the flag "WV" which indicates whether the attack is across the river. The zero state that the defence factor is qualified unless the defender is also being attacked on the same side of the river. Put simply, this means that if the river flag is set and both are set then the attack is across the river. Flag flag is not set then others are nullified and the defence is not doubted. This means it is very easily obtained by using the "and" instruction and what at first appears extremely complex is resolved in a single instruction!

Lines 1750 to 2000 carry out the results of the combat result "W" as follows:

1. Exchange:
The defender is automatically eliminated (line 24000), but a test must be made to check how many factors the attacker had (line 1700-1710). If they were less or equal to the defender's, then elimination is automatic. Otherwise the attacker is prompted for the pieces to be eliminated.

2. Attacker Eliminated:
This is automatic and if attacker has eliminated using the routine at line 2000.

3. Defender Eliminated:
This is automatic and the defender is eliminated using the routine at line 24000.

4. Defender Retreats:
The player is prompted for the direction of retreat and a check is made for legality. If there is no retreat then an "E" is typed and the piece is eliminated. The variable "D1" is a count of the number of pieces moved. It is assumed that the defender is now allowed to move next to an opponent.

5. Attacker Retreats:
This is essentially the same as "Defender Retreats" except of course that all attackers must retreat. The program now returns to line 1000 to look for further combat. It is back to the main routine via the return in line 1010.

The following is a list of the variables used in the program:

A1 — direction indicator
AD — index from keyboard
AD1 — defender support factors
AD2 — attack rate
AD3 — piece in adjacent box
AD4 — attack factors
AD5 — "D1" over 50%
AD6 — temporary variable
AD7 — temporary keyboard input
AD8 — piece index in adjacent box used during "check-out" of board
AD9 — piece in adjacent box used in determining attack again
AD10 — temporary variable
AD11 — defender's factor including support
AD12 — defender's factors
AD13 — attacker's factors
AD14 — used in exchange to ensure that enough attackers are removed

version from the hex number to the board coordinates which is stored into the DRD
C:\MSDOS\BIN
02-10-84 YJL

Version 1.0 is the hex editor.

Much of the program is concerned with the manipulation of these arrays. It is in motion by putting the initial hex position of each piece in each array and then moving through the piece table prompting for a decision on each piece in turn. Assuming the piece is on hex 400 and you give direction 6 the program calculates the board coordinates, checks that hex 397 is vacant and if it is, moves the piece.

Now we enter the six areas surrounding the new hex to see whether it is next to an opponent. The side has index 1 to 16; the other 17 to 32. So if piece 10 has the 10th hex to piece 24 (greater than 16), an attack 24-10; there are any further movement games.

The following is an outline of the movement sequence:

1. Line 100 controls the whole game. At the end of a player's turn, the program returns here and changes roles.

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ENGINEER

Have you ever had the urge to build a bridge but just couldn't find the time or place to construct one? If so, then this simulation is for you.

The object of this game is to successfully build a bridge from the ground up. You have been hired by the San Francisco Public Works Commission to rebuild the famous Golden Gate which was recently destroyed by a powerful invasion from space. You must connect the two blocks on the top of the screen. You do so by placing beams from the bottom until you can support the connecting beams across the top.

There are only a few rules, as you are your own boss. You must have the right end of the beams supported by either another beam or the rocky cliffs on the side. The only other item to be aware of is the ever-present inspector, who will walk up and down during construction. All he asks of you is that you lay beams below his feet only — so you can't drop one on his head.

The game itself is simple to play and win, so the challenge is in completing the entire work in as few days as possible. To play, all you need is an NEC Atari with one joystick, which goes into the leftmost slot.

VARIABLES

DA — days of construction so far.

X, Y — location of inspector.

M, W — location of pointer on screen.

```
10 GRAPHIC POSITION 12,0:7 *BRIDGE
BUILDING POSITION 14,14:7 *BY POSITION
14,14:7 *DANCE NUMBER*
20 FOR I=1 TO 1000:GOTO 4,4,4,7:G
20:7:17:17 * YOU ARE NOW AN OFFICIAL E
NGINEER!!! * YOUR MISSION IS TO BUI
LD A BRIDGE*
30:7 *CONNECTING THE TWO BLOCKS AT THE
TOP OF THE SCREEN. YOU DO SO BY
PLACING*
40:7 *BEAMS BELOW THE INSPECTOR'S FEET
* * * * * * * * * * * * * * * * * * * *
50:7 *WHERE YOU WISH TO PLACE THE BEAM
* * * * * * * * * * * * * * * * * * * *
60:7 *THE BEAM. TRY TO CONSTRUCT THE B
RIDGE * * * * * * * * * * * * * * * *
70:7:17:17:17:17 * * * * * * * * * * *
80:GOTO 4,4
100 GRAPHICS SUBROUTINE 2,0,0:PRINT 7:G
```

```
OTO 1,15,10:GOTO 4,15,0:G
TO 4,4,4
300:GOTO 2
400 FOR I=1 TO 70:PRINT 4,2:PRINT 4
440:PRINT 4,0:GOTO 5,0:PRINT 4,0:GOTO
5,4:PRINT 74,0:GOTO 74,0:PRINT 74,0:
GOTO 74,0
500:PRINT 0:GOTO 1:GOTO 1
600:PRINT 4,0:GOTO 1:GOTO 74,0:G
OTO 0:0:1,7
700:PRINT 0:PRINT 0:PRINT 0:PRINT 0:0
:0:0:0:0
800:IF 0=0 THEN 200
900:GOTO 100
1000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1100:GOTO 100
1200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1500:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
1900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2500:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
2900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3500:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
3900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4500:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
4800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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5000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
5100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
5200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
5300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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5900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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6700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
6900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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7800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
7900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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8600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
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8800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
8900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9100:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9200:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9300:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9400:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9500:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9600:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9700:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9800:PRINT 0:PRINT 0:PRINT 0:PRINT 0
9900:PRINT 0:PRINT 0:PRINT 0:PRINT 0
10000:PRINT 0:PRINT 0:PRINT 0:PRINT 0
```


LANDER

MOON

CONDITION RED! "Commander... the space shuttle's fuel tank is leaking. We have to make a forced landing on the lunar surface — and soon. The fuel is fast running out. What shall I tell the passengers? Commander..." You have the lives of the shuttle's passengers and crew in your hands as you orbit planets towards the moon'scape. Hundreds of barrels (and miles) from safety — will you save them?

Unlike most lunar lander games, Moon-Lander provides lateral thrust controls which accelerate the craft left and right rather than just moving it. Facilities are also provided for changing post-fuel capacity, vertical thrust, lateral thrust, and the strength of gravity.

You have four instrument readings and a video display of your landing. The instruments consist of two speed indicators — one vertical and one horizontal — a fuel gauge, and last, but not least, an altimeter.

Using these instruments you must land, with a vertical velocity of 15 metres/second or less, on a reasonably flat piece of ground.

The program is written in *Acorn Risc Basic* for a machine with a fully expanded lower text space. For those with other machines who may want to convert the program to run on their systems the shortened form of the statements is usually the first one or two letters of the relevant statement followed by a dot. Variables preceded by a % symbol are, unlike the convention used by most other Basic, real variables, and those without the % are integer variables. All GOTOs and GOSUBs in the program use labels for speed — in G. & program control to the section beginning with the label 'A' — in the given program this would be line 1080.

Returning to the program itself line 30 calls the instruction printing subroutine which, having printed the instructions, waits for the shift key to be pressed before returning control to the main program.

Lines 40 to 140 then input fuel capacity, gravity, etc and check for illegal inputs. The following lines, up to line 150 set the screen to graphics mode and draw the moon'scape — with two randomly positioned, random height peaks.

Line 160 prints out the instrumentation readings if 300 homes the cursor; lines 150 and 160 turn the moon'scape grey, and lines 170 and 180 place 80 short white pixels in random formation on the screen. The next two lines perform all the necessary initialization (height, fuel, etc) and then, at line 430 the main program loop starts. Lines 440 to 470 allow the effect of gravity and input the controls — the instrument readings are then updated by lines 480 to 550. Control is then transferred to the routine with label 'A' which starts at line 1080. This routine works out the new position of the lander and reports it accordingly.

The next three lines in the main loop (570 to 580) check to see if the craft has landed or gone out-of-control and, depending on the results of these tests, either loop lines to line 430 or continue to line 600.

Lines 600 to 700 then determine whether or not the ground on which you touched down was acceptably flat. Lines 710 to 1060 output the evaluation of your piloting abilities.

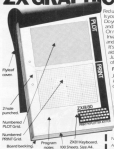
BY S. DRAPER

RUNS ON AN ACORN ATOM IN 12K

```
10000003.N40
2000#0000.L#0000
30000.1
400P.#12010010
500[H,"GRAVITY C1 TO 1000G
600F001000C010P,"BETWEEN 0 & 10."IG.0
700P.#10.FIN."THRUST 10-2000XT
800#0000000.F#02
900P00100000T000P,"BETWEEN 0 & 20."IG.h
1000P.#10.DR."FUEL CAPACITY (L-1000)0G
1100F010000000P,"BETWEEN 1 & 300"IG.L
1200P.#10.FIN."LATERAL THRUST 10-2000
1300F 100000 1000P,"BETWEEN 0 AND 2."IG.k
1400000.0
1500CLEAR0
1600000.Y#0.P#0.000000000.A.#00
17000000.0.DR#00.0
1800P.#0.R.#00
1900P100000.P0R000R0P#00R0P0G.1
2000P.#0.DR.#00000.0
2100T#0.R.#00
2200P100000.P0R000R0T#00R0T0G.0
230000 0000
2400F 000 0L00R#00.P
2500Y#0.00
2600P 0L00P#000 0L00T#0G.0
2700F 1000 Y#14
28000000.0
29000000.0
30000000.0
3000P000000
31000 0000
3200.R#00
33000#0000000.T#00000000.Y#00000Y#000
3400P.#0010L.T 0.F 0.V 0.L 0.V
3500.L#00000000000
3600T#0111200.L
3700.F#1000
3800#00000000.L.#010
3900P#000000000L200.10000
4000.
41002#00.0000000.00#L.T(A.R.#0001)
4200-1
43000
44000#00000
4500P#00000 (120.10000-00
4600P#00000 000000.0000000
4700P#00000 000000000.F00.000000T00P#0T0F P00.00
4800000100000.00/1000.00000000000000000
4900000000000.(00/0010.00002017).00000.00000=170
5000000100000.(0000000)
5100000000000/100.000000000000000000000000000000
5200000000000/00000000000000000000000000000000
5300000000000/00000000000000000000000000000000
5400000.000000000000000000000000000000000
```



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6000#0
6100F.1#00-K100102 TO 00-K100102#0
62000K [1+]=00/#0
63001F 00K1100 000K1.]
6400.
6500F.1#00-100102 TO 00-K100102#0
66001F0K [100-7001=].#00=1.#00=0/G.e
670000 0-00K11001
6800H.10#
6900F.1#00001F00K10=00#01
7000.
7100F.#02010010# YOUR TOUCH DOWN VELOCITY WAS"
7200#0
7300F.0Y" METRES PER SECOND WHICH "
7400#1
75001F000P."WAS LOVELY"/G.s
76001F0K11P."WAS A BIT ROUGH ON YOUR PASSENGERS."/G.e
77001F00K110P." MODERN LANDING CRAFT JUST CAN'T TAKE."/G.f
7800."IS SOMEWHAT HIGH."
7900F."I DON'T KNOW WHAT YOU THINK YOUR"
8000F."DIDHE. BUT YOU WON'T BE DOING IT"
8100F."ANY MORE - YOUR SHIP WAS JUST"
8200F."BEEN SPREAD LIBERALLY OVER 50"
8300F."SQUARE KILOMETERS OF MOON-"
8400F."SURFACE."
85001F000G.s
86001F000P." AND TO TOP IT ALL OFF, YOU"
8700F."DIDN'T EVEN MANAGE TO FIND A"
8800F."FLAT PIECE OF GROUND TO LAND ON!"
8900G.s
90001F000G.s
9100F." HOWEVER, YOU DIDN'T"/G."FIND A FLAT AREA TO LAND"
9200F."ON AND YOUR SHIP WAS DESTROYED"
9300F."ANYWAY."/G.s
94001F000G.s
9500F."HOWEVER, IN VIEW OF THE FACT"
9600F."THAT YOU CAME DOWN ON ROUGH"
9700F."GROUND I SHOULDN'T THINK THEY"
9800F."FELT MUCH SINCE YOUR LANDER WAS"
9900F."SHATTERED OVER A FAIRLY LARGE"
0000F."AREA."/G.s
01001F000G.s
0200F." IN RETROSPECT YOUR TOUCH"
0300F."DOWN VELOCITY WAS LARGELY "
0400F."APPROLENT SINCE YOU SUCCEEDED"
0500F."IN FINDING A MINATURE MOUNTAIN"
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 11400P1=55/2=88132/3/4512
 11501FP01441C,C
 11600H018=1P,0P1H
 11700L(1180=388(32103))
 11801P=84040414010,P1H=8C7C7C4C10
 11901P=1P0,P1H=P1H0
 12000C,C
 12101P=84040474010,P1H=8C7C7C7010
 12201P=1P0,P1H=P1H0
 12300C,C
 12401P=84067F4010,P1H=0
 12501P=1P0,P1H=P1H0
 12600C,C
 12600G00L,U
 12700P,#12#10#10,IN,"WOULD YOU LIKE ANOTHER GAME"
 12800H,#0,071-13
 12910P0="Y"Y,C,U
 13001P0="N" G,U
 13100P,"L" NOT VALID, PLEASE REED,"
 13200P,0=10000,WRIT,H,
 13300C,U
 13400P,#01"WH SHUCKS,...BYE"
 13500P,0=1010,WRIT,WRIT,L,"E",H,
 13600P,"E",
 13700P,#01,IN,"WITH PRESENT GRAVITY, THRUST,ETC"
 13800H,#0,10+1=13
 14100P0="Y"Y,C,U
 14201P0="Y"Y,C,U
 14300P,"L" NOT VALID, PLEASE REED,""IG,U
 14401FR,0400L,P
 14500Y=9A,R,14
 14600C,P
 14700P,#12#0#10" MOON = LINDER" #10
 14800P," THIS IS A MOON-LANDING"
 14900P,"SIMULATION IN WHICH YOU PILOT"
 15000P,"THE LANDING CRAFT,"
 15100P," IN ORDER TO SURVIVE THE "
 15200P,"LANDING YOU MUST LAND ON FLAT"
 15300P,"GROUND WITH A VERTICAL VELOCITY"
 15400P,"(V,V,) OF LESS THAN 11 METRES"
 15500P,"PER SECOND, TO DO THIS YOU HAVE"
 15600P,"THE FOLLOWING CONTROLS"
 15700P," 'SHIFT' -ACCELERATE LEFT,"
 15800P," 'REPT' -ACCELERATE RIGHT,"
 15900P," 'CTRL' -ACCELERATE UPWARDS,"
 16000G00L,U
 16100P,#12#10" ON THE DISPLAY AS WELL AS"
 16200P,"THE VEEDS OF YOUR LANDING ARE"
 16300P,"YOUR INSTRUMENT READINGS -"
 16400P,"VERTICAL VELOCITY=V.V, 0=VE UP,"
 16500P,"HORIZONTAL VELOCITY=H.V,"
 16600P,"0=VE RIGHT), ALTITUDE=ALT, AND"
 16700P,"FUEL=F,"
 16800P," ALL PARAMETERS ARE VARIABLE"
 16900P,"BY THE USER BUT NOTE - HIGHER"
 17000P,"THRUSTS MEAN MORE FUEL IS USED,"
 17100G00L,U,R,
 17200P,#01"PRESS 'SHIFT' TO CONTINUE,"
 17300DF#0001>127G,C
 17400,



Deep beneath the waves lurks a horribly newspapered submarine waiting for its prey — a convoy of cargo ships protected by launches, fast patrol boats and aircraft carriers.

The aim is score the highest number of points in one minute. You have an unlimited supply of missiles which are fired by pressing S. If O is pressed again before the first missile has reached its target it will self-destruct and a second will fire from the sub.

Bonus points are awarded for accuracy. The closer to the centre of the ship your missile lands the more points you score. I and F are used to move the sub left and right.

The highest score for this program so far is 1180. Can you beat it?

Notes on the program: S8=submarine; T8=cargo ship; E=2; C8=carrier; E-1; L8=launch; E=3; S8S=speedboat; E=4.

R: random number -1 or 1, which decides which direction T8 AND C8 move; G: height of the missile. It is used to stop the missile going over the scenery; D: random number, 1, 2 or 3, which decides the height of the ships up the screen and volume of sounds; E: changes for each ship and is used for scoring and printing of the sinking ships; Q: random number 1-10, which provides probability of ship appearing; L: gives the horizontal position of the missile; I: used as a delay to create radar sound.

```

5: POKE 36879,61
7: GOTO 2000:REM INTRODUCTION
10: PRINT "Q"
11: DEF FN RND(X)=INT (36879/X)*3:REM RANDOM NO.
12: H0=36877:VY=36878:CO=36879:REM WHITE NOISE,VOL. & SOUND
13: REM** BACKGROUND **
20: PRINT " "
30: PRINT " "
35: PRINT " "
45: PRINT " "
50: REM SUB & SHIPS
110: S8=" "
120: T8=" "
130: S8S=" "
140: C8=" "
150: L8=" "
155: IF0=1:THE0=0
157: REM SEND ON BOTTOM
160: PRINT " "
170: POKE 3185,257:POKE 36865,7
180: POKE 150,0:REM CLEAR KEYBOARD BUFFER
190: T18="000000"
270: GOTO 700
280: DFT 140:"8881888"THE0:90
285: DFC 0:THE0:90:REM MOVE MISSILE
290: GOTO 1800:REM MOVE SHIPS
292: POKE 30,0
295: PRINT "YOUR SCORE IS";C:PRINT "1000000:HEX CLR:GOTO 10
300: POKE 30,0:POKE 35147,1:GET#A:IF#A="0"THE0=0:REM TEST FOR FIRE
305: IF PEEK (285)=64:THE0=90
310: IF PEEK (280)=12:THE0=T+1:GOTO 500
320: IF PEEK (280)=13:THE0=T+1:GOTO 500
340: GOTO 500
400: REM MOVE SUB
500: IFT 0:THE0=T+1:GOTO 200
510: IFT 14:THE0=T-1:GOTO 200
520: PRINT " "
530: REM START MISSILE
600: IF PEEK (R)=93:THE0=POKEH,32
610: POKE 55,258:W=0:180=T:POKEH,90:POKEH+CO,1:CO=1:1=T+1:GOTO 1800
640: REM MOVE MISSILE
650: POKE 50,0:POKEH,32:R=W-32:CO=C+1
660: IFC 15:THE0=C:GOTO 1800
675: IF PEEK (R)=32:THE0=POKEH+CO,1:POKEH,93:GOTO 1800
680: GOTO 310:GOSUB 1500:CO=0:W=CO+(2560)
700: D=FN R (30):CO=PH R (18):REM D=VOL. & HGT.

```

SUB
ATT

```

710 B=INT(2*RHND(1)*90-1)*RDH DIRECTION OF SHIPS
715 GOSUB 200;POKEY,0
720 OH=ODT(750,750,750,750,000,000,000,000,000,000)
730 PRINTSPR:T(4)=0:R=0:POKEHD,152:GOTO1400
740 FORHD,310:R=2
750 IFR=1:THEHT(2)=0:PRINTH:GOTO1000
760 T(2)=1:4:PRINTTRC(14)*R:GOTO1000
800 E=1:POKEHD,230
810 IFB=1:THEHT(1)=0:PRINTCG:GOTO1000
820 T(1)=1:4:PRINTTRC(14)*C:GOTO1000
830 FORND,140:PRINTTRC(4)*LAW:T(2)=1:4:R=0:GOTO1000
900 PRINT"#####FORK=1TOD:PRINT:NEXT:RETURN:REN SETS THE HEIGHT
910 GOSUB 200:PRINTTRC(1)*"#####" :POKEY,15:REN EXPLOSION
920 FORO=250:T(2)STEP-1:POKEHD,X:HEXT:POKEHD,250
921 GOTO1510
922 REN :SHIND
923 FORO=1:T(2)STEP-.001:POKEY,X:HEXT
925 POKEY,2:POKE150,0
930 FORD=0,0:GOSUB 300:RETURN
940 REN MOVE SHIPS
1000 POKE200,7,0
1010 J=J+1:IFJ=10:THED=0:POKE300,7,200:REN FROM SOUND
1020 GOSUB 200
1030 OH=ODT(1000,1050,1110,1010)
1040 T(4)=T(4)+1
1050 IF T(4)>10:THEHD=SUB(500):GOTO700
1060 PRINTTRC(1):4)*SPR:GOTO300
1070 T(2)=T(2)+0
1085 IF T(2)=1:ORT(2)=1:THEHD=SUB(500):GOTO700
1090 PRINTTRC(1):2)*TR:GOTO300
1095 T(1)=T(1)+0
1095 IF T(1)=1:ORT(1)=1:THEHD=SUB(500):GOTO700
1100 PRINTTRC(1):0)*C4:GOTO300
1110 T(3)=T(3)+1
1120 IF T(3)=10:THEHD=SUB(500):GOTO700
1130 PRINTTRC(1):2)*LAW:GOTO300
1500 PRINT"
1505 PRINT" " :RETURN:REN CLEARS SHIPS FROM SCREEN
1510 GOSUB 200;GOSUB1500
1515 PRINT"#####" :REN :SHIND SHIP
1517 REN BONUS POINTS
1530 IF(1)<R)+3:THEHC=SC+(T(E)+6-T)*R:GOTO320
1535 SC=SC+(1-T)*E)*R:R:GOTO320
2000 PRINT"#####<=>>>>>SUB-ATTACK#####"
2005 PRINT"#####"
2010 PRINT" by STUART HALL. 11.00EVEY CLOSE."
2020 PRINT" SHIRKALL. CHESTERFIELD."
2030 PRINT" CORDS."
2040 FORO=1:T(2)0:HEXT
2050 PRINT" DESTROY AS MANY ENEMY SHIPS AS POSSIBLE IN 3000 MINUTE."
2060 R=1:GOTO10
2065 R=0
2070 PRINT" :C0:" = 20 POINTS"
2080 PRINT" :T0:" = 40 POINTS"
2090 PRINT" :LAW:" = 60 POINTS"
2100 PRINT" :SPR:" = 80 POINTS"
2110 PRINT" + BONUS POINTS!"
2120 FORO=1:T(2)0:HEXT
2130 PRINT" : CONTROL:"
2140 PRINT" : - MOVES LEFT"
2150 PRINT" :R - MOVES RIGHT"
2160 PRINT" :G - FIRES A MISSILE"
2170 PRINT" : PRESS A KEY TO START."
2180 POKE150,0
2170 GETR:IFR="":THEH=170
2180 GOTO10

```

BACK

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MANIPULATING YOUR DATA

An important part of designing a program is deciding exactly how data is to be represented and organized.

The same data may be represented and organized in many different ways, and a particular form will allow some operations to be performed more easily than others.

For example, arithmetic of any kind is very difficult with Roman numerals, but much easier with modern positional notation, and in positional notation the choice of base makes a difference to some operations.

The simplest and best known example is the way in which we can multiply or divide by 10 in base 10 by shifting the digits left or right relative to the decimal point, while in base 2 the same operations give a multiplication or division by 2.

A less familiar example is found in tests for divisibility. Some commonly used tests are that a number is divisible by 2 if its last digit is divisible by 2, divisible by 3 if the sum of its digits is divisible by 3, and divisible by 9 if the sum of its digits is divisible by 9. However, these tests rely on the number being written in base 10 and will not necessarily work if the number is written in any other base; for example 9 in base 3 is 100 and none of the tests works in this case.

Character sets in computers vary in the number of characters available, the graphics characters included, and the internal code used to represent the characters.

For many purposes it is not necessary for the programmer to know the internal code since high-level programming languages usually provide functions for converting from code to characters and vice versa.

In Basic the commonly used



functions are ASC ("a") or CODE ("a") which gives the code for the character a, and CHR\$(N) which gives the character corresponding to the code number N.

In some machines the same code gives different results according to how it is used; for example, on the PET PRINT CHR\$(8) and POKE 8, 8 where 8 is a letter on the screen, do not generally produce the same character.

In programming it is always best to use methods that do not depend on special features of the machine, as this will make your programs easily transportable.

The following program for converting numbers to hexadecimal (base 16) demonstrates a method that is often used for calculating the character code corresponding to the digits of a hexadecimal number.

```

100 PRINT "DECIMAL NUMBER":
110 INPUT N
200 LET M1 = N
210 LET H$ = ""
220 LET Q = INT (N/16)
230 LET D = N - 16*Q
240 LET A = D + 48
250 IF A > 57 THEN LET A = A + 7
260 LET H$ = CHR$(A) + H$
270 IF N1 < 16 THEN GOTO 300
280 LET N1 = Q
290 GOTO 230
300 PRINT N: "IN DECIMAL IS":
H$: "IN HEX"
310 GOTO 100
    
```

Lines 230 and 230 give D equal to the remainder after dividing N1 by 16; which is the value of the rightmost digit in the hexadecimal form. Lines 240 and 250 give A equal to the ASCII code for D.

In the ASCII code the digits 0 to 9 are coded as the numbers 48 to 57, and the letters A to Z are coded as 65 to 90; thus adding 48 to D gives the correct ASCII code if $D < 10$ ($-D < -8$), but if $10 < D < 15$ it is necessary to add another 7 to get the ASCII code for a letter from A to F.

This method is machine-dependent, as it makes use of specific ASCII codes, and while it will work on most home computers it will not work on all of them. The Sinclair machines, for example, do not use the ASCII codes. However, it is easy to convert the program so that it does not depend on the particular code used to represent the characters. It we add:

```

10 LET C$ = "0123456789ABCDEF"
240 LET H$ = MID$(C$, D+1, 1) + H$
    
```

and delete lines 230 and 250 the program will work on any machine with Microsoft Basic regardless of the character code used. It will still not work on a Sinclair 2000 as Sinclair BASIC does not have the MID\$ function. However, in Sinclair Basic line 240 can be replaced by

```
240 LET H$ = C$(D+1) + H$
```

DEFINING CODES . . .

What we are doing in the second method is, in effect, defining our own code so that the code used in the machine is irrelevant to the working of the program.

In most applications we have to define our own representation for the data because the machine does not provide exactly what we want.

As an example, consider the problems of representing playing cards in a program. Some home computers have graph symbols for the suits but others do not in the latter case we can

use the letters C,D,E,S, as easily remembered abbreviations.

A card-playing program will have to accept cards input from the keyboard, perform various operations on the cards, and display cards on the screen, and these three phases may require entirely different representations of the cards and hence require conversion between the different representations.

For example a card may be typed in as CA, held in the number 14 for calculations concerning the play, and displayed on the screen as a picture of the Ace of Clubs.

The programmer will have little choice in the input and output forms as these must be easily recognized by the user, but the internal form may be chosen in many ways differing in both representation and organization.

The choice of an internal form suitable for the operations that must be carried out can make a great difference to the ease or difficulty with which the program is designed and coded.

STORING CARDS . . .

One method of storing cards which simplifies many operations is to use a string array in which the array elements are the input forms and the array indices are used either as numeric codes for the cards or as pointers to another array giving numeric codes.

For example, we could define a string array P\$\$(2) with P\$(1) = "CA", P\$(2) = "CS", P\$(13) = "CK", P\$(14) = "DA", P\$(52) = "SC".

We can then use a simple routine to check that what the player has typed in is actually a valid card:

```
100 INPUT C$
110 LET I = 1
120 IF C$ = P$(I) THEN GOTO 200
130 LET I = I + 1
140 IF I < 53 THEN GOTO 120
150 PRINT "NOT A VALID CARD. TRY AGAIN"
160 GOTO 100
200 . . .
```

If the program begins by dealing the player's hand we must also check that the card he typed in was included in the hand he was dealt.

On exiting the above routine I points to the array element corresponding to the card typed in, which with P\$ as defined means that the cards are coded as CA=1, CS=2, etc.

This simple method of obtaining a numeric code may be all that is needed for some purposes. For example, to sort a hand we can simply sort the codes into ascending order and when we convert the codes to strings by looking up the P\$ array we will find all cards of the same suit together and in order from Ace low to King high.

Other orders can be obtained by defining P\$ differently. If we want the cards sorted into suits and in order from two low to Ace high we define P\$(1) = "C2", P\$(2) = "C3", P\$(12) = "CK", P\$(13) = "CA", P\$(14) = "D2", . . . ; if

we want the hand sorted with cards of the same rank together regardless of suit we define P\$(1) = "CA", . . . P\$(12) = "DA", P\$(13) = "SA", . . . P\$(49) = "CA", . . .

In many card games we will need to separate the suit and value of a card, and possibly perform some manipulations with the value.

If we store the cards in an array such as P\$ the suit can be found easily as S\$ = LEFT\$(P\$(I), 1) and a numeric code can be derived from this if necessary.

It is usually more complicated to deal with the rank or value of the cards; it is rare to find a card game that requires any operations on the suits other than ordering or testing for equality, and sometimes for colour. However, different card games require a wide range of operations to be carried out on the ranks or values of the cards and there are frequently special cases.

GAMES YOU CAN PLAY

If we look at a few games we can see some of the necessary operations and special cases that affect the suitable representations of the cards.

CRIBbage

Points are scored for cards in sequence, with 10, J,Q,K entering into sequences in that order, so it would appear that these cards can be given a value of 10, 11, 12, 13 respectively. However, points are also scored for combinations of cards totalling 15 and in this case 10, J, Q and K all count as 15. Thus we need a different representation for J, Q, K according to what we are doing.

POKER

A man of five cards may have an Ace as the high card or the low card, but cannot have an Ace in the middle. Thus A, 2, 3, 4, 5 and 10, J, Q, K, A count as runs, but J, Q, K, A, 2 does not. However, elsewhere in the game Ace is always high. Probably the easiest way of dealing with this anomaly is to include a special test for runs of the type A, 2, 3, 4, 5.

BLACK JACK

The aim of the game is to get

the highest total without going over 21, where 2 to 10 count as the spot value, J, Q, K count 10, and A may count as either 1 or 11 as the player wishes. In evaluating a hand it is necessary to allow for the two different values that may be assigned to an Ace.

BRIDGE

In the bidding the suits rank from low to high: Clubs, Diamonds, Hearts, Spades, No Trumps. In the play, however, these may be a trump suit, in which case a card of the trump suit ranks above cards of any other suit whenever it is played in a trick. To allow for this we need a valuation of the cards that may change from hand to hand.

Where we have a straightforward ordering of the cards in a suit, whether from Ace low to King high as in Cribbage, or from two low to Ace high as in Bridge, it is possible to calculate the rank of a card from its position in the P\$ array.

For example, using the third definition of P\$ above, LET R = INT(I/3) (I=3 * N) would give R the value 1 when I was 1, 2, 3 or 4 (i.e., for an Ace), 2 when I was 5, 6, 7 or 8 (i.e., a Deuce), etc.

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ULTIMATE ULTIMAX

In Las Vegas everybody's talking about the Ultimax. Commodore's new games machine. This \$199.95 system has a higher specification than the VIC 20, which is twice the price. We can expect it in Europe in the summer with a price tag of around £75.

The Ultimax is a programmable colour computer which connects directly to the TV. It has a main-frame keyboard, like the ZX81, and can be programmed in Basic. It uses both plug-in cartridges — not VIC 20 compatible — and cassettes, and uses some of the VIC 20 peripherals — like joysticks, paddles and light pens. It does not have any expansion ports, and is not planned to take any communication, disc or printer peripherals.

It has a polyphonic sound generator, and an overlay keyboard turns it into an electronic organ similar to Casio's early VL-Tones.

Commodore have signed an agreement with Galby to transfer some of their arcade games to VIC 20 and Ultimax cartridges. Ultimax has a resolution of about twice that of the VIC 20, with a 40 column by 25 row character screen.

The VIC 20 has some exciting new programs, including VIC Avenue, a copy of the original arcade game, Slots — which is a very realistic slot machine, Poker, Jupiter Lander, Super Alan, Midnight Drive and Magic Mouse.

An 8K memory expander and a cheap monitor (£100) have also been released for the VIC 20. It now has a big brother, the VIC 30 18 which has a 18K memory as standard. Also introduced is the Commodore 64, a 64K colour computer that looks just like the VIC 20, has a 40 column screen, runs all VIC peripherals and all Ultimax cartridges. This is priced at \$399 — say £200 when it eventually reaches the home market.

american DREAMS



ALL AT YOUR FINGERTIPS

The Texas Touch and Tell is a game based on the original Speak and Spell. This one is aimed at younger children, and instead of a keyboard, a series of overlay present pictures, letters, numbers and shapes.

The machine then asks the player to touch the appropriate drawing and responds accordingly. With the success of the Speak and Spell, and its other systems like the Little Professor, Texas Instruments is going all

out for the educational game market.

A new cheaper Speak and Spell — the Compact — has just been introduced and costs only \$49.

Texas Instruments have also introduced 36 new software packages for the 8080 computer. These include T4 Instructors, Car Wars, Adventure, March Man, Speak and Spell and Speak and Mark, lots of educational software, and business aids.

TIGER'S NEW GAME PLAN

One company that made its debut in 1983 was Tiger Electronic Toys. Their systems are just available in the UK.

They have introduced some hand held games which include a built-in clock. The models have coloured figures and the 1, 2, 3 displays use multi-coloured graphics. They also have sound effects.

Crusman involves getting a lo-

se crusman past a ravenous dinosaur which is between you and the goal. Just to make life interesting you also have to dodge random lightning bolts.

King Kong involves saving a lady held captive by a giant gorilla on top of the Empire State Building in Space Flight you defend your space fleet from the invaders.

Monster More has joystick control and full colour animation and involves avoiding a monster whilst getting to the centre. Finally, Dragon involves saving maidens from a tower while at the same time avoiding a fire breathing dragon.

Tiger also have a couple of educational games based around their A-Z-B talking learning computer. These cartridges are a series of subjects such as geography and grammar. They have also introduced a talking picture book which looks very similar to the Texas Instruments Touch and Tell.

NOW WATCH THIS SPACE

Several Consumer Electronics have looked around for some novel games to bring to the market. They have succeeded with a new range of wrist watch size games.

Arade Time has Hyperblast, Planet Raiders, Galaxy General and Cosmic Clash. Game Time has Ping Pong, Missile Strike, Alien Assault and Blast Away whilst Sports Time has Football, Basketball and Soccer. They also tell the time!

The腕watch 120 displays occupy an area of just 1" x 1".

Casio introduced a whole range of calculators that ring, tell fortunes, play games, tell the time... and even calculate! They included a calculator that sounds like ten different instruments, a calculator that is really a miniature player piano that can store up to 240 notes and then play them back automatically, one that has three different games, and one that simulates a booby ring.

The MC777 has three built in games in addition to the usual calculating facilities. The games include: Digipole, Digipole and Trackdown Digipole is quite difficult, and involves getting all nine squares filled up with a preset number, in a preset number of moves.

Each press of a key adds one to the randomly arranged sequence. Digipole is a slot machine game and Trackdown involves



Followed in the U.S. Game Spot's tubular arcade game Super Football. This game is based on American football.

Following lighted squares on the keyboard, Model 8888 has a built in boxing ring when the game is activated their boxers appear in the display area of the unit.

It is up to the user to knock out the contender by pressing various keys on the calculator. As both fighters exchange punches, the unit automatically keeps score.



PINBALL IS BACK IN STYLE

See me, feel me, touch me, hear me! ... demand the loud, flashy machines which have quietly found their way back to their traditional haunts in pubs and arcades. Pinball is back — brighter and louder than ever.

The video boom almost wiped out the domain of the amusement palaces — but behind the scenes the pinball industry were working out a way to beat Space Invaders and video machines at their own game.

Added to the microprocessor, a new generation of "pin" was born. And now you'll believe that pinball can talk! This challenge, encouragement and even lured the player using a wide vocabulary of electronic utterances.

Between the Crown Machine's electronic lines that berate you in, "Try me again" in the Midway's there are a host of the Midway's there are a variety of words and phrases the dedicated pinball player can wring from his favorite machine.

But how did pinball become Jack Computer and Video Games called the Midway headquarters of Bally Corp.

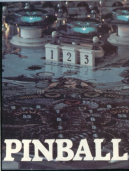


mental — one of the big three pinball manufacturers and distributors. There we talked to David Adams, managing director of Bally's operations in this country.

"The video boom gave pinball a shot in the arm," Adams told us. "It encouraged the evolution of the machines.

"It's here in the business 20 years and it's incredible the way they have developed. The new games are tremendous — quality wise and player-wise.

"Three years back, arcade managers were taking out their pinball machines and replacing



PINBALL

them with video games. Now there's a shift back to pinball.

One of the first machines Bally produced in their eight years in the video game industry was a device called Space Invader — and it produced sounds just like the video game of the same name.

"Kids got to a certain level on a video machine. Say they were 10,000 points every time on their favorite machine, and they kept on scoring 10,000 points. They got so used that they became bored with it.

"With pinball, no two games are the same. They could score 10,000 on one game and an embarrassingly low score the next time they play. They kept coming back to play again to beat the machine."

He adds that pinball designers now concentrate on building more features into machines to test the skills of the players.

Features like captive balls only released when targets are hit in the correct sequence, multi-level playfields and skill shots which end the players' scores scoring.

There are machines which end several balls relocking down the playfield at the player during a game — just to keep him on his toes.

With the same revamped sounds and lights and the skill features these new pinball machines are in good shape to give the video games tough competition in the arcade, claims Adams.

"Pinball is always going to have knockouts. It's not if at

all. There's always going to be pinball."

TARGETS TO TEST YOUR SKILL

The new neon-bright pinball machines have plenty of surprises in store for the uninitiated who step up to sample their delights.

Experienced players like to see ingenuity used in the design of the machines. Multiball features are a big draw — but tests of skill. In whatever form they appear on the playfield, are awarded if a pinball is going to be a winner.

Players also like to get clear instructions in the machines — about target sequences or bonus features and how they can get them. On some

machines you can simply bank the ball around the playfield and not know why lights are flashing or if you've collected bonus points.

Players face a real challenge if they step up to one of Bally's latest pinball creations called Centaur — it is replete with horror show black and white artwork — is packed with skill features.

Unique to the machine is a feature called captives multiball. What that means is that each player has to build up his own store of balls for multiball play, getting no advantage from the skills of a previous player.

The play centers around releasing captive balls. This is achieved by hitting a combination of targets with 10,000,000,000,000.

It is expected these release a captive ball, hit out of sequence they score up a number of possible captive multiballs in the machine's memory — to a maximum of five.

There can be release by shooting the right passageway when it's lit.

The Centaur also has one other interesting feature — a ball bank. When no-one has approached its controls for what it regards as an unduly long time it banks out five balls and waits three relocking around to one playfield — just to get a bit of attention.

If this elegant machine's flipper features are pressed when the game is over it speaks out — listing its skill features to anyone who will listen while colorful coded lights flash in unison.

Others in another Bally machine must be seen in the arcade. This has a novel three level playfield — with a mini-



field at its heart. This can only be reached by collecting Lakota "blue-eyes" on the upper levels.

It has two captive balls — on the top and second levels — which are released after targets are hit in the correct sequence. Once on the main-field players can score up to 150 thousand points on its bonus features.

Multiple Flippers feature an Italy's Medusa game which has a two-level playfield. It also has a useful shield post located between the lower flippers which — if you've built up enough bonus points — enables you to save a doomed ball with a touch of a button. It also laughs at you when you lose a ball — which can be very irritating!

THE BIG THREE TABLE TOPPERS

The big three pinball makers are all American — Bally, Gottlieb and Williams, with fourth, Stern taking some of the market. There is also a Spanish manufacturer — but their products are specifically for that country.

The biggest market for pinballs is — of course — in the USA. Germany and France are also pinball provinces as is Italy. In comparison, Britain is still a small market for the machine makers.

Bally — based in Chicago — has a large design team working on new themes and designs for its products.

Prototype designs are tested on site before the pinball factories swing into production of a new model. One of the new microprocessor models would cost the buyer around £1,000 — but second-hand models can be picked up for around £300. (Hint: electro-mechanical models can be found for less.

BLOW THE PINBALL GAME OF AGE

In its late 20s heyday, pinball was a really cheap machine with a few mil from parts and a couple of flippers, completed by one-dimensional artwork on the playfield and backglass.

Now it was full of electro-mechanical levers and switches — a real plumber's nightmare. These machines are now collectors' items and Bally often get requests for parts and spares for vintage machines from pinball enthusiasts.

Nowadays pinballs are controlled by a microprocessor



like the Medusa 6800 which manufacturers absolutely everything.

One of the most successful companies, Bally, claims it will be changing this microprocessor unit in order to cut down on the number of parts towards inside the machine. Artwork is now a big feature



of the pinball with elaborate designs decorating the backglass — the artwork on the machine's backboard — and playfield.

Bally produced a machine called Lost World with an Adventure Fantasy theme — and received orders for the backglass alone for people to hang on their walls. Some were stolen from exhibition stands.

"What will the future offer? Yet more mind-boggling playfields and sets of the player's skill. One of the newest machines, yet to be seen in arcades, is the Yeti."

This has a shooter lane which fires the ball out of an angle onto the lower playfield — if you are lucky or skilled enough it whips up a chain in the top level.

PLAYING ON THE SMALL SCREEN

Microprocessors have taken pinball out of the arcade and given it a second life.

Now that colour has become an integral part of so many home computers, the game can be brought to life in your own living room. It can still be an exhilarating game, although the action leaves little room for the feel of a bonzing machine beneath your outstretched fingers.

Computers do have certain advantages. However and Tandy has brought out an exciting innovation for its TRS-80 Colour Computer ver-

sion and, depending on the version of pinball, the player is given a different number of balls with which to bump up his score.

Pinball is also available on television game centres, although they are not the most popular of the range. Philips has a version for the G7000. ATE has a pinball game for the Astronix VDU 100, and Williams produces one for the Database games centre.

RASTER BLASTER DOWN TO ZERO

The T.L. White computer also has a pinball 'rasterblaster' similar to the family version giving a computerised game. This is called Zero Zap. You have to set up your own field positioning on 8 diamonds and choose to increase your chances of scoring points. This game differs from the original arcade game because you have to aim an arrow which you control at a target, either diamonds or coins, and fire. When you score a shot hit the diamonds change into coins, and the vice versa.

One of the best standard computerised pinball games is an American one on sale in the UK. It has the memorable name Raster Blaster and is available through Apple software dealers including Cyber and SDD Software of Richmond. Pat Salt of Zyner said: "It's really pretty good. Of the pinball machines I have played I think Raster Blaster is as good if not better than some in arcades."

"The flippers in arcade games haven't always worked when you want them to, or as quickly. With Raster Blaster they are very prompt and easy to control and handle."

Other computers are well-served, as well. Corsetti ranges in price from \$4.99 up to top-of-the-range ones with sophisticated sounds and graphics in the £18 range, are proving popular with software buyers, as the home market follows the arcade trend.



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DOWN TO BASIC DOWN TO EARTH

BY MOIRA MORRIS

VARIABLE VALUES . . .

There are many occasions when it is desirable to perform a calculation in a program without immediately printing the result. It may be that the value produced is only an intermediate value in some calculation, or, the value is to be stored for use later in the program — it would be wasteful to perform the calculation more than once.

The LET statement is used to allocate a value to a variable. The general format of the LET statement is:

```
<line no.> LET <variable> = <arith. expr.>
```

The operation of the LET statement can be described as follows: the arithmetic expression on the right of the "=" is evaluated; the resulting value is then assigned to the variable on the left of the "=".

Assume that a program has three variables A, B and C. At some point in the execution of the program A has the value 2, B has the value 5 and C has the value 3.5. If the next statement is:

```
80 LET S = A + B + C
```

then, after this statement has been executed, the value of variable S will be 10.5 and the values of A, B and C will be unchanged.

If the computer now executes:

```
90 LET A = A + 1
```

then the following sequence of events occurs:

the computer first looks up the current value of A and finds "2", this value will be copied into the part of the computer that performs arithmetic; it then adds an "1" to get the value "3" for the arithmetic expression. On examination of the variable name on the left of the "=" it stores the value "3" in A — thus

overwriting the old value of A with the new value.

The statement:

```
90 LET A = A + 1
```

therefore means, increment the value of A by 1.

Last month, I gave an example of a program to count the number of words with four letters that were typed in. In that program, I used a statement similar to the one above to increment the count each time a four-letter word is input.

Another common use of the LET statement to update the value of a variable, is the idea of maintaining a "running total" in a program. I will now look at an example of a program that uses this technique.

A football team wants a program to calculate their average crowd attendance in a season of 40 games. The outline of the program would be:

```
running total = 0
repeat 40 times
```

```
  get no. in crowd
  let running total = running
  total + no. in crowd
  end repeat
let average = running total/40
print results
```

In many versions of Basic, the first line is not essential since all variables are assigned the value "0" initially. When a variable is used as a count or a running total, a vital part of the logic of the program is that the variable should be initialised to "0" — it is a matter of convenience that most versions of Basic automatically perform the initialisation for us. Although the calculation of the average could be included in the Print statement, I shall put it in a separate LET statement so that the Print statement is less cumbersome.



AVOIDING MISTAKES

```
10 REM CALCULATE AVERAGE
20 REM CROWD ATTENDANCE
30 FOR I = 1 TO 40
40 INPUT N
50 LET T = T + N
60 NEXT I
70 LET A = T/40
80 PRINT "AVERAGE CROWD
ATTENDANCE ="A
90 END
```

Even this simple program could be extended. One improvement would be the use of printing messages to tell the user what the format of the data typed in should be. Examples of this were introduced last month. Another improvement would be the inclusion of data checks.

I am sure you are all well aware of how easy it is to make typing mistakes. A great problem in computing is the detection of such errors in the data. Some errors are very difficult to detect — for example, someone might type their age as "22" instead of "33" — however, others are easier to detect — for example, a person typing their age as "333" lies outside the possible range of values.

Let's assume in my previous example that the maximum crowd that the ground could hold is 20,000. Then the value of N should lie in the range 0 to 20,000. The section inside the FOR loop could be extended to

```
40 INPUT N
44 IF N < 0 THEN 54
48 IF N > 20000 THEN 54
50 LET T = T + N
```

```

32 GOTO 80
34 PRINT "ERROR - PLEASE
RETYPE"
36 GOTO 48

```

A further check is that N should be an integer value. This can be done using the function INT - INT(N) returns the integer part of N.

If N has an integer value, then INT(N) will equal N. I can therefore introduce one more statement in the loop:

```
42 IF N<>INT(N) THEN 54
```

For reasons of brevity, I am unable to include all these data checks in my sample programs.

COMMON USAGE

I have already used the functions INT and RND in the series. A number of commonly used functions are available in Basic as standard functions. This saves the programmer having to write his own programs for parts of programs to evaluate such functions. The standard functions provided will often depend upon the power of the version of Basic.

In the table, I have listed the most common standard functions and briefly described their use. As many of them are mathematical, I can only suggest that you ignore those you don't understand!

Whenever the function operates on a value - enclosed in brackets after the function name - that value may be given as a constant, a variable or an expression. For example:
 INT5 = RND*10
 LEN"CAT"

Note that brackets are not required after the function name on the Sinclair ZX81.

TABLE OF STANDARD FUNCTIONS



Function	Description	Example
INT	integer part	INT(3.2) = 3
ABS	absolute value	ABS -1) = 3
SIGN	the sign of a number	SIGN -2) = -1
SQR	square root	SQR4) = 2
LOG	natural logarithm	LOG(2) = 0.69315
EXP	exponential function	EXP(1) = 2.71828
SIN	sine (radians)	SIN(0.5) = 0.47942
COS	cosine (radians)	COS(0.5) = 0.87758
ATN	arctangent	ATN(1) = 0.78540
LEN	length of string	LEN"CAT") = 3
RND	pseudorandom number between 0 and 1	RND = 0.217073

However, you should include them in my programs you write. Don't assume that someone running your program won't make mistakes or deliberately try to sabotage your program!

The IF statement tests whether a specified condition is true. So far, the conditions have been simple in that they only involved one test. For example:

```

N=0
or N<>INT(N)

```

a specified range. In my example, I had an error condition if either N was less than 0 or N was greater than 32000. This required two IF statements - lines 44 and 45 of my program. It is possible to combine these into one IF statement:

```
45 IF N<0 OR N>32000 THEN 54
```

Thus, simple conditions can be combined using "OR" to form complex conditions. If any of the simple conditions are true, then the whole complex condition will be true and a jump will be made to the given statement.

It is also possible to check that a number of conditions are all true by combining them 'with 'AND' in a single IF statement.

```
115 IF M3 = "SMITH" AND
A = 20 THEN 200
```

could be used to identify persons with the name SMITH and age 20.

NEXT ISSUE SYSTEMS SUMMARY

When moving to a new computer system, or converting programs from one system to another, it is useful to have a summary of the main features of the version of Basic used.

In each future issue, I will provide a reference table for one particular system. The table will outline the main differences between standard Basic and the version used on that system. It is envisaged that most of the popular systems will be included. Next month, I will start by looking at the Sinclair ZX81.

NEXT ISSUE

COMPLEX CONDITIONS

It is possible to have more complex conditions that involve a combination of simple conditions. This is particularly useful when testing that a value lies in

Adventure

TO SCROLL OR NOT SCROLL

What is the best way to use the screen to display your adventure? Sooner or later in writing an adventure you must decide whether to use the conventional scrolling technique or a whole screen approach.

The disadvantage of scrolling becomes obvious when the player has to recall details of his location, which can soon become tiresome. As soon as the machine reply is decided it may be screened with a PRINT statement, and the program looped back to the INPUT line.

However, I prefer to clear the screen and redisplay the location details together with the machine's reply. In my opinion this gives a more polished appearance to the game, the player having more relevant information displayed at any one time.

It is also useful to display the

player's last command — if the computer's reply is a bit mysteriously he can check what it was responding to, or typing error maybe?

If the screen is cleared when INPUT is received, and PRINT statements executed on each piece of information to be displayed is available, the presentation will look very jerky, leaving the player in a state of nerves waiting for the whole thing to crash! This can be avoided if all the replies are assigned to variables and only when all are set in the screen cleared. All these variables can now be screened at once, providing a smooth change and giving the illusion of speed, since the screen is never really blank.

Using Q18 for the reply, the lines 3000 to 3050 described last month will look like:
3000 LET Q18 = "IMPOSSIBLE"
GOTO 100

Between lines 100 and 150 we will insert some IF statements later. Using Q18 and Q19 for the objects, display coding will now look like this:

```
100 REM start of main loop
150 LET Q18 = "" : LET Q19 = ""
    " " : LET Q20 = " I CAN SEE "
160 FOR I = 0 TO 3 : IF P(I) = LN
    THEN LET Q18 = Q18 + " " +
    " "
170 IF LEN(Q18) + LEN(Q19) >
    (no. of characters per line on
    the screen) THEN LET Q18 =
    Q18 + Q19 ELSE IF LEN(Q18)
    + LEN(Q19) < (no. of charact)
    THEN LET Q18 = Q18 +
    Q19
171 REM to prevent object lists
    wrapping round
180 (clear screen) PRINT L&LN
    IF LEN(Q18) = 12 THEN
    PRINT Q18 : IF LEN(Q19) > 0
    THEN PRINT Q19 : IF
    LEN(Q18) > 0 THEN PRINT
    Q19
190 PRINT "YOU TOLD ME TO":
    R18 : IF LEN(Q18) > 0 THEN
    PRINT Q18 : IF LEN(Q19) > 0
    THEN PRINT Q19
200 REM only print replies that
    exist
210 LET Q18 = "" : LET Q19 = ""
    : REM set replies to null for
    next time round
210 INPUT R18 : REM continue
    with next command
```

ENTER THE HELLFIRE DUNGEON

Many Adventures are trying to more faithfully recreate the fantasy role-playing Dungeons & Dragons game which originally started the computerized version.

Wizards Warrior is an example of the D&D style — very different from the plain language type of game but just as intriguing.

The version I played was supplied on cassette for TRS-80 (Model I only, the game also being available for Pal, Video Game and Apple machines, and on disc. The package is very impressive, and includes leading instructions for the particular machine, a command code prompt card, and a well produced and nicely illustrated booklet describing the background to the dungeons, monsters and treasures.

After loading the first program on the tape, — The Introquest — you are given gold coins and assigned varying degrees of the attributes

intelligence, initiative, strength, constitution, dexterity and age.

These all have a bearing on the outcome of future actions. You are now invited to bid for weaponry and armor which come in different shapes and sizes, and for slaves and allies.

This turns into a real learning session, with a very realistic simulation you will need your wits about you to obtain what you need at the lowest possible price. If you offer an inauspiciously low price, the chances are you will get an equally insulting reply!

When fully equipped you are asked which level of the dungeon you wish to enter. Data followed by a second program — The Dungeon Master — is automatically loaded, all previous data being preserved during this load.

You are now in the dungeon, your immediate environs being displayed graphically alongside such details

as bridges, wounds, room number. You must explore the dungeon, seeking out secret doors and traps, avoiding or killing monsters on route while collecting treasures.

This is where familiarity with the command codes is useful — being around the long and the Giant Red Ant or the Great Top will get you!

Should you be lucky enough to get your treasures back to the inn before Oles the Dwarf catches you, they can be exchanged for gold. You can then input your latest experienced level and attributes back into the Introquest program, and start all again towards another more difficult level.

Altogether a very deep game, and cleverly written, it should please Dungeons & Dragons fans and Adventure fans alike.

Many thanks to Allgray for the review tape, and to Mark Jenkins for including me into D&D, before I tackled this game!

Make the most of your Sinclair ZX Computer... Sinclair ZX software on cassette.

£3.⁹⁵ per cassette.

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs available on cassette.

Special low orderings are published to publish the most elegant of these on pre-recorded cassette. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-cassette volume.

Each cassette costs £3.95 (including VAT and p.p.h.) and comes complete with full instructions.

Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 - if fitted with a replacement 8K BASIC ROM.

Some of the most elaborate programs can be run only on a Sinclair ZX Personal Computer supported by a 16K-128K add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the descriptions of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available in ZX81 version as a drop-in replacement chip. With the exception of coloured graphics, all the advanced features of the ZX81 are now available on a ZX80 - including the ability to run most of the Sinclair ZX Software.

The ROM chip comes with a new keyboard layout, which can be switched on the existing keyboard in minutes, and a new operating manual.

16K-HYTE RAM pack

The 16K-HYTE RAM pack provides 16 times more memory in any computer module. Compatible with the ZX81 and the ZX80, it can be fitted to the program storage or expansion slot.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.



Cassette 1 - Games

For ZX81 (and ZX80 with 8K RAM) ROM

ORBIT - over space craft's mission to touch upon very valuable cargo that is orbit around a star.

SNIPER - you're surrounded by 400 the enemy. How quickly can you spot and shoot them when they appear?

MATHS101 - your workshop is crashing through space when you meet a rocket storm. How long can you hold the steady course?

LIFE - H.Cornery's Game of Life has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WORLDWACK - your aerial jetpack is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOALS - why is your team always? It's really counter but you control the strength of your shots.

Cassette 2 - Junior Education 7-11-year-olds

For ZX81 with 16K RAM pack ROM

CRASH - simple addition - with the added attraction of a car crash if you get a wrong.

MULTIPLY - long multiplication with three levels of difficulty. With answer's wrong the solution is explained.

TRAINS - multiplication train against the computer. The winner's train reaches the station first.

FRACIONS - fractions explained at three levels of difficulty. A two-operation test completes the program.

ADDITION - addition and subtraction with three levels of difficulty. Again, wrong answers are followed up by an explanation.

PELLING - with five levels of difficulty. Words are explained graphically and a meaning score is displayed.

SPELLING - up to 500 words over five levels of difficulty. You can choose the words yourself.

Cassette 3 - Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack ROM

THE 4-FILE FILE - simple program complete with telephone directory and address book. Changes, additions and deletion of up to 50 entries are easy.

MYTE TALK - a powerful, easy-to-use system for storing and



printing everyday information. Use it as a diary, a calendar, a reminder system, or a dictionary.

BANK ACCOUNT - a sophisticated financial recording system with comprehensive documentation. Use it to know to keep track of where the money goes, and to work for interest, departmental budgets, etc.

Cassette 4 - Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack ROM

LENNAR LANTERN - bring the laser module down from orbit you will land on this planet.

COMBAT - you're on a missile space mission. You have only 12 modules but the aliens have unlimited strength. Can you take 12 of them with you?

SPINNING - no parcel, just figure. Develop a pack of 10 memory balls. Last you dipch - change them before they topple you!

CODEBREAKER - the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MATHS101 - an answer to a Simon call, you're surrounded down the search into 345 cubic kilometers of sleep space. Can you find the answers before the life support system fails in 10 hours time!

MARKING - an answer to a Simon call, you're surrounded down the search into 345 cubic kilometers of sleep space. Can you find the answers before the life support system fails in 10 hours time!

MARKING - an answer to a Simon call, you're surrounded down the search into 345 cubic kilometers of sleep space. Can you find the answers before the life support system fails in 10 hours time!

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MARKING - an answer to a Simon call, you're surrounded down the search into 345 cubic kilometers of sleep space. Can you find the answers before the life support system fails in 10 hours time!

Cassette 5 - Junior Education 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS - test arithmetic with three levels of difficulty, and give your score out of 10.

NUMANC - test understanding of binary-decimal theory with a series of graphic examples.

WILLIAMS - 'yes' or 'no' answers from the computer in a series of 1000 random calculations.

WYRAM 80 - what's the average height of your class? The average abundance of your family? The average pocket money of your friends? The computer does it for you, and distinguishes MAJOR/MINOR.

BANKS - convert from decimal (base 10) to other bases of your choice in the range 2 to 6.

TEMP - Volcanos, temperatures - and their combinations.

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Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 25. The ZX81 reduces the 25 to 4!

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puter-



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

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

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ROMAN AROUND IN ANCIENT "BRIGHTON"

England has always been a difficult country to conquer but Julius Caesar was one of the few foreign leaders to do so.

During the governorship of Gaul he invaded Britain with 600 transports carrying an army of five legions and over 1,000 cavalry. Sharpshot of London has brought out a game which makes the player re-enact the strategy he employed to wage war against Britain.

If Sharpshot had split the name of the game correctly it would have added more credence to the "Caesar's Invasion of Britain", which ultimately turned out to be worth sticking with.

"Caesar's Invasion of Britain" (he didn't see high to start with) is an adventure game in which your job is to capture the stronghold of Camulodunum, a Celtic leader, and return safely to your ships.

At the beginning of the game you are given the option of

CAESAR'S INVASION OF BRITAIN

recruiting additional cohorts and cavalry and, more importantly, to hire scouts.

Scouts are vital to your operation because without them there is no way of discovering the lay of the land, and the enemy's whereabouts. That's where I made the first mistake.

You also have a money, deserti, or your purse which comes in handy for bribing potentially harmful tribes.

Food is also a vital necessity, without grain your troops will eventually starve unless you succeed in feeding or creating some bags.

While battling out the invasion in Britain

you also have to deal with Roman elections, sending agents armed with money to swing power your way.

The game was repetitive when I played it, I seemed to wander around the countryside being attacked by various barbarians, losing all my deserti and finally losing the vital battle.

It costs £2.95 from Sharpshot and runs on a 486 Sharp.



SOLAR STRATEGY

CHALLENGE ATTACK

This battle for control of a solar system relies on more than just reactions and a fast finger on the fire button.

The object of this dull but very addictive game is to colonize a solar system or free it from the Kinnis depending on your point of view. It is a difficult game to master and requires strategic thinking as well as tactical manoeuvres and rapid reflexes.

Control of your ship is via the keyboard, and requires quick thinking when under attack from Kinnis ships. You also control your Torps and Phasers from the

keyboard, and accuracy in aiming is most important.

It took me about 10 plays before I could hope to win a battle. After that I won about 70% of the time, but I have not yet conquered the whole solar system.

The display is nice, showing each planet in a distinctive way, and the scale has been well chosen to allow you to get lost, but not too often. Another nice feature is the ability to specify various parameters such as number of Kinnis ships in each attack, speed and effectiveness of Torps, and other vital items.

Zooming across up and down between ship and planet is an added complication which I enjoyed but it is tedious in the early stages.

Recommended to all committed space war enthusiasts with fast to spare!

Galactic Attack runs on a 486 Apple under OS/2 3.1 or Pascal, costs £17.99 and is available from Woodland Software.

A MISSION TO WARP YOUR MIND

THRESHOLD

If Galaxians and Space Invaders caused you headaches, Threshold will give you migraines.

It is one of the most computer games I have come across since green manes and winged creatures first few sets my screen.

Each time you successfully destroy one wave of invaders, a different breed of creature attacks.

You get five ships fully equipped with Delta class lasers to blast the aliens, but you must take care not to run out of fuel by firing too many missiles.

Also at your disposal is a hyper warp drive which slows down the alien action for a few seconds. But because of the power consumed during its use you can only activate it once.

The first analogue of alien

are bat like creatures. These are followed by Galaxian types which plummet in a familiar style dive towards your ship.

The third type of alien looks more like a member of the Rut family and swims across the screen above your ship.

Your five ships are lined up on the right hand side of the screen, and when play begins the engines start to rev up.

Over competition apart, the game boasts imaginative graphics and sound effects.

Because of the proliferation of aliens, points are quite easy to score and you also get bonus ships after reaching up 50,000 points, 100,000 points.

Well worth spending the £19.95 on Threshold for your Apple II (800). Richmond based S.S.O. Software is the supplier.

**TAKE A
SPIN DOWN
THE ALLEY****LENNIN**

Tenpin bowling must be one of the last sports which would seem suitable for computerization.

It says a lot for computer games designers that they have come up with a version which recreates the need for a good eye and judgement, and still manages to be entertaining.

The screen shows the tenpin lane from the viewpoint of the bowler, with the machinery, and the 10 pins that are to be knocked over in the distance.

The rules of tenpin bowling are simple, but for those not familiar with them, adequate instructions are included with the program.

A ball is rolled down an alley with the aid of the computer's two arrow keys and the space bar. Markings, a kind of the very open alley, assist in aiming the ball, and a spin can be given to the ball any time up to a reaching these markings. A game consists of 10 frames per person, you are allowed up to two balls per frame to knock down the 10 pins. The computer keeps your score, and displays this, together with any "strikes" or "spares" (knocking over all 10 pins with one or two balls respectively) at the end of the lane, to the left of the pins. To the right of the pins is shown a plan view of the pins remaining standing.

At the end of the game the scores for each player is shown and you have the option of taking part in another game.

There can be between 1 and 4 players and the game has the added effect of sound available through an amplifier.

As usual the Tandy graphics are a limiting factor with this simulation, though not as seriously in this game as in others, and should not spoil the enjoyment. A more serious problem is the fact that the primary user would find it difficult to take a backup copy of the program.

Distributor Molmors is to be praised in supporting its soft-



ware, or should I say Tenpin is available from Molmors for the Tandy T92-90, Models I and II and Tapes Series, Models I and II. The tape version costs £18.95 and the disc version, £14.95.

**AMAZING JOURNEY
THROUGH PREHISTORY**

Wandering around the fairground stonehenge, I heard a bunker noticing the crowd is roll-up and see the prehistoric monster.

I paid up and entered the tent, only to be enveloped in a grey mist which transported me back into the era of that mightiest of beasts, Tyrannosaurus Rex.

Exploring tentatively, I stopped at an intersection and looked around me. Then came the sound of approaching footsteps. I am, turning this way and that but there, looting above me, was the dreaded monster. The huge jaws opened to reveal his great teeth. I could just make out something inside, I started to read. "You have been unfortunately awarded 120 points and sentenced to roam the maze forever. If you wish to appeal, press 'stop' else press 'cont.'" I pressed cont.... I might get out this time.

3D Monster Maze, is the best game I have seen for the Sinclair ZX81.

The grey and black walls of the maze provide the 3D effect and the graphics make Tyrann-

3D MONSTER MAZE

nosaurus Rex look suitably frightening as it goes toward you. The maze corridors are constantly changing as you press the S, I or K keys to walk forward or turn the corners. There is a map out of the maze but I have only managed to find it twice. If you do manage to exit then your score is increased accordingly. It would be nice to have a high score facility isolated in the program, though.

The play can be speeded up or slowed down if you alter the listing slightly. Instructions on how to do this are included in the notes supplied with the cassette.

I have found myself wandering around the maze with the monster lying in wait, somewhere and not waiting to come get. It does give you a chance to find the exit, but it does take away some of the fun. This did not happen very often though. This program then can be highly recommended and is available for a 198 ZX81 from J. K. Gray Software on its games tape 4 and costs £5.95.

**SPADE AND
SHOVEL
WORK****ALLEN**

A monster infested maze is the playground for a defensive diggame.

The only way to survive in Allen is to dig holes at strategic spots in the labyrinth. When one of the killer red alien falls into your trap, you can finish him off by quickly filling it in.

Using the keyboard controls this game is easiest to play — joystick are better. The keys to operate your man are latched together so to move him up, down, left or right needs some getting used to.

It's impossible to get around this by using two fingers from each hand to manoeuvre the man about because you must work the 'I' and 'O' keys to activate the digging action with your left hand.

Points are scored by killing off the aliens, but it varies similarly, sometimes it could be 200, sometimes 300.

Allen requires concentration to work out the best places to dig your holes without becoming a monster! Don't dig holes which are too far apart. If you have a long way to move your man into position by the time you reach the hole containing the foulest monster it will be too late. He only remains vulnerable for a few seconds.

Not one of the most graphically exciting of games for the VIC-20 from Commodore but will keep you busy for a while. Price £11.95 from VIC software dealers.



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- * Gruesome border and rocks
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PLUS ZX Review

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IMAGES ON AN APPLE

The high-resolution graphics facilities of the Apple can be used to create and manipulate shapes. This can be done on any micro-computer with high-resolution graphics.

However, on the Apple, shapes can be represented and stored in a special way so that they may be drawn, erased and transformed more quickly than is possible with other macs. Animation using high-resolution images can be achieved much more realistically and impressively on the Apple than on any other machine.

The way in which images have to be stored when using the Apple appears rather awkward at first, but in fact it is no more difficult than any other way of

using the special features.

The facilities needed by a programmer to create graphic effects are all available, and the user who wants to do so can create his own graphics system.

The first diagram shows how a shape is represented, so that it can be stored and the special Applesoft commands can then be used to draw and transform it.

The simple bar shape shown in (a) is decomposed into simple vectors which all have the same length but which point north, south, east or west, as in (b). The vectors making up the shape are then "unwrapped" as in (c) and are then coded. The coding table is

shown in (d), and the order in which the vectors are coded and written down is shown in (e). The coded form of the shape is to be stored in eight-bit memory locations. Since the code for each vector has three binary digits, two codes can be stored in each location while the remaining pair of binary digits in each location are left zero as shown in (e). The resulting table of binary digits is given in (f).

In (g) this table has been translated to hexadecimal and given a header and an end marker, and this is the shape table which represents the bar shape. The shape table can be loaded into any convenient part of the memory where it will not be over-written, and the address at



Fig. 1

which it starts should be placed in the locations with hexadecimal addresses E8 and E9.

When a shape is stored in this way, the following commands can be used.

DRAW I AT X, Y draws shape number I in the shape table starting at the screen location in column X and row Y. **EDRAW I AT X, Y** similarly erases a shape.

ROT = M rotates a shape to be rotated clockwise according to the value of M. M = 0 gives no rotation, while M = 90 gives a rotation of 90 degrees. In this way, M gives the rotation in units of approximately six degrees. **SCALE = M** causes scaling. M = 1 gives reproduction at the original size; M = 2 doubles the size by doubling the length of each vector in the shape. The maximum value for M is 255.

With these commands, animation can be achieved by repeatedly establishing a position, drawing the shape and then erasing it.

Figure two was produced by the program:

```
10 HGR : HCOLOR = 3
20 FOR I = 1 TO 3
30 X = 50 : Y = 100
40 DRAW I AT X, Y
50 NEXT I
```

```
Figure 3 resulted from:
10 HGR : BCOLOR = 3
20 ROT = 0 : SCALE = 24
30 FOR I = 1 TO 3
40 X = 50 : Y = 70 - 15 * I
50 DRAW I AT X, Y
60 ROT = 64 - 9 * I : SCALE = 24 - 4 * I
70 NEXT I
```

Fig. 2



representing and storing an image and is seen instead.

If you want to achieve realistic animation, the effects that the Apple can give are amazing. No system which relies on Basic alone, possessing no comparable special features, gives anywhere near the same speed of execution.

Of course, if you are more interested in creating graphics than in looking at them, you may feel that the Apple makes it too easy by doing all the interesting work, but then you don't have to



gives in (d), and the order in which the vectors are coded and written down is shown in (e). The coded form of the shape is to be stored in eight-bit memory locations. Since the code for each vector has three binary digits, two codes can be stored in each location while the remaining pair of binary digits in each location are left zero as shown in (e). The resulting table of binary digits is given in (f).

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The shape table can be loaded into any convenient part of the memory where it will not be over-written, and the address at



Fig. 3

505 Missile Command - Multitask Destroyers destroyed city
 505 Missile Command - Cluster Missiles sighted
 505 Missile Command - Plasma Projectiles assault 505
 Missile Command - Satellite Bombs in range... 505 Missile
 Command - Mega Annihilator destroyed further city... 505

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The easocard is a versatile aid to those of you building your own circuits. Unlike other types of matrix boards it has been designed especially for the use of chips — but it can also be used for discrete components.

The easocard comes in various sizes and designs depending on the supplier and the use to which it is to be put. Some types allow for an edge connector and others for rack mounting. The most commonly used by hobbyists just has a double row of holes at each end of the board to allow pins to be inserted and wired to.

The tracks, which run on both sides of the board, are designed to accept chip holders of any standard size. You should be prepared, however, to buy special wire-wrap holders if you are using chips with more than 20 pins, as these will take up all of the solder pads on some of the boards. It is possible, in this case, to solder wires on to the pins of the holder to make connections on the underside of the board, but this is not recommended.

Most boards have a pair of power lines which are placed conveniently across the top and bottom of the card where the chips are designed to go. By a single short link to the chip the necessity of individual wiring is done away with. Be certain though to make these connections to each chip first as it is possible to mistake later wiring for these.

If I am using one of the easocards for a prototype circuit I lay it out in an orderly manner with chips evenly spaced across the board making it easy to see where I have already wired connections.

This, however, may not be possible with, say, a necessary board which is required to fit into a very restricted space but may, nonetheless, have a large number of chips of various sizes.

For a low density card the

method of wiring can either be by soldering single- or multi-stranded, insulated conductor or by wire-wrapping using the special cable.

In the case of high density boards the most satisfactory means of making connections is to wire-wrap, and sometimes it is the only practicable method. The idea behind this process is that with extended pins on the chip holders the wire can be wound around, either manually or by the use of a hand tool, to make the connections.

It means that the holders, which previously had to be



spaced, can now be placed almost on top of each other, thus making the size of card required for the design much smaller, saving space and money.

WRAPPING THINGS UP

There are, as I said, two slightly different methods of wire-wrapping. The first, and easier, is to take a very light gauge insulated wire, strip it and wind it around the base of the pin. Do not wind over the top of a previous solder as you may need to unwrap it if you have gone wrong. Even so you should wind the wire around a minimum of three times, so that if there are more than two connections to be made on the same pin there is enough space left.

There is a tool specifically designed for this purpose, looking very much like an inverted needle. There are, however, a number of different models so try these before picking one.

Using the wire-wrap tool makes light work of an often difficult job. The battery operated tool cuts the job time in half — if you know how to use it correctly.

The idea is to wrap an insulated wire around the pin at a very high speed but low torque. The square edges of the pin melt through the insulation and a cold forged weld is formed. This is a great improvement on the

soldered contact although the number of times you can remove the pins to remake it is limited.

As with the other methods, the first connections made should be the power lines. You can then be sure that it is a chip that has gone down and not just lack of power.

It is a good idea to form the power lines, as it is with data or address lines. That is to say, a single is taken from the power point on the card to the first pin, terminated, and then from that pin to the next, and so on and so forth across the board. Beware of over-loading the conductor if you are using too many chips, or high powered ones.

Designing your own circuits, building them and getting them to work can be very rewarding, but unless you have an idea of how to go about it you can be stumped very easily. By choosing the right method you can cut out a large amount of the hassle involved. Experience will tell you which way is best.

BY KEITH MOTT

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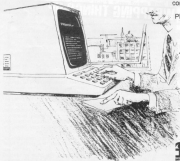
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MIND ROUTINES

Four thieves broke into a bank and stole a number of bags of coins.

They decided to lay low for a while and hide in a wood. In the middle of the night one growdy thief woke up and decided to take his share of the loot.

He divided the bags into four equal piles and found he had one bag left over. So he took this spare bag and one of the piles and hid them away for himself.

Each thief in turn awoke and decided to take his share — not knowing some had already been taken — and each in turn found one spare bag, which they also kept, when dividing into four

equal piles.

In the morning they all awoke and divided the loot into four equal piles. This time it went exactly. Nobody commented on the diminished piles because they were all guilty.

They all then went their separate ways picking up their hidden loot on the way. When the last man to awake in the night counted his loot he found he had a multiple of 10 bags.

What was the smallest number of bags they could have stolen?

David Simmons, of Colborne Way, Worcester Park, Surrey and Mrs M. Dickson from Grove Avenue, South Ebbw, are this month's champagne winners. Answers to March problems on page 5.

NEVERA

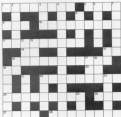
CROSSWORD

ACROSS

- Concerning advertisement just can't be edited (4, 4)
- Nudge in the PAM (4)
- In which B — B A — F says B all (3)
- Asking about quinine R.G. Compound (8)
- Star games (9)
- Headless feline print appearance (2)
- Energetic pursuit of tail-less mice (2)
- Programmed literature? (1, 5, 5)
- White power leaders in office computer equipment (2)
- Personal assertion in middle of time (2)
- Stray tabs confused laser output (3, 5)
- Beetled as a slave peripheral (9)
- Computers kit containing slalom equipment (3)
- Bridge player in a stew (4)
- Transposable output (8)

DOWN

- Debs or their opposite (5)
- SIN (2) + SIN(2) + COS (2) + = 2 (3)
- CSI on the police display (6, 7)
- Change an logical alternative connotation (5)



- Northern genre mixed up the driving force (8)
- Melny plugs (4)
- But mind print position (3)
- As up the anticipated advent (3)
- Programming language on the back of the disk (2)
- Allied Press paper contents (2)
- Wry amongst the deviations (3)
- Print measures in the deejay's slots (3)
- Restricted graphical view of a base on a spiral (5)
- Civil servant surrounds poetry such as ASCII and EBCDIC (5)
- Have a care about a Grand Prix (4)
- To know the reward from a fruit machine (5)
- Pined lady (3)

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CORE

AVAILABLE IN THE UK

SHARP PC 8111 The smallest computer in the Sharp range, Sharp classifies it as a pocket computer and it is programmable in Basic. It also has a cassette interface for loading and costs upwards of £85.

SINCLAIR There are two types of Sinclair's microcomputer available for under £100. Sinclair really brought the microcomputer into the home. The machines are ideal for learning the rudiments of computing but are limited graphically. The ZX80 has 1K of memory and is expandable up to 8K, but is no longer in production. The ZX81 sells for £49.95 for 1K in kit form or £59.95 ready assembled. The 16K RAM packs costs £89.95.

SORCERER The Exidy Sorcerer is a home computer with a cassette games following but it is one of the more expensive of the microcomputers, costing upwards of £795. Memory amount ranges from 48K to 592K and there is a plug-in ROM pack for extra capacity. One drive and visual display unit are an additional cost. Sorcerers can be obtained from a Comed firm, Liverpool or St. Ives.

TANDY TRS-80 Tandy's TRS-80 Model 1 is a machine which is often used for games and is well-supplied with software for both entertainment and business applications. Its memory capacity goes from 4K to 16K but there is an expansion unit available upgrading it to 64K, if you want the extra memory. The Model 1 is the cheapest of the Tandy range.

The Model 1 costs £399 but comes complete with a monitor to use as a VDU and a cassette. The Model III is an integral unit made up of a keyboard, 17" screen and two slots for 5 $\frac{1}{4}$ " discs. It costs from £599.

TANDY TRS-80 COLOUR COMPUTER Tandy's latest addition to its range of computers is the Extended Basic Micro Colour Computer for TRS-80 Colour Computer (to start). It is available with either 16 or 32K of memory and costs £449.

The actual computer unit consists of a keyboard which can be plugged into any television set. It is aimed at both business and games users and Tandy has bought out a variety of instant loading games program packages for the machine.

Joysticks needed to play some of the games are extra and cost £13.95 a pair. The colour computer can be obtained from Tandy stores nationwide.



TIENGA This computer has recently been re-launched by Texas Instruments. It consists of a separate keyboard with graphics facilities in full colour and slots plugs in to a U.K. television. Software available for it from Texas Instruments is mostly business and educational for the firm has recently introduced a bundle of games to run on the computer. It has 16K RAM and uses tapes, discs or plug-in games cartridges. You can buy one of these from Bedfordshire T.I. for £299 or from your local dealers.

VIC-20 The VIC is the much-publicised baby of the range of microcomputers from Commodore of Glasgow. At £185 it is one of the cheapest. Deliveries to dealers have just started. The VIC has full colour graphics on a colour TV, and there are joystick available. Although Commodore are plugging the business use of the machine it is tipped to be a hot games computer because of its colour graphics and low cost.

VIDEO GENIE The Genie is made by E.A.C.A. and is a popular games machine. It is compatible with the Tandy TRS-80 Model 1. With 16K to 64K RAM there are disc drives available. The basic unit costs from £265 and is available from Ilove Electronics of Marlock in Derbyshire.

GENIE II The replacement computer for the Video Genie is now available. The Genie II is an upgraded version of the Video Genie and has full upper and lower case, a machine language monitor, additional Genie, has a sound unit and is cassette based. It is being aimed at the serious hobbyist market and costs £225. A disc version is available, called the Genie II and sells for £260 for the unit, £799 for the expansion box needed, and £226 for each disc drive.

UK 101 This machine comes in either kit form or ready built with memory capacity of 4K to 64K (with an expansion board). It contains television and cassette interfaces so you don't need a U.K.I. The U.K. 101 is a popular computer for playing games and there is a lot of software around for it. The kit costs £149 for 4K, ready built it sells for £185.

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SOFTWARE GLOSSARY

A beginner's guide to plain jargon

ADVENTURE A type of game in which the player has to take a character role and retrieve a number of treasures or objects by a trial and error process giving instructions to the computer. The "hero" (or player) encounters a variety of hazards often taking the form of dangerous monsters, wizards and animals. Some adventure games are so complex that they take weeks, or months, to solve.

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

ARRAY A series of items (data or information) arranged to form a meaningful pattern.

ARROW KEYS The keys on a computer keyboard marked with arrows. Used for moving the cursor across, or up and down the V.D.U. screen.

ASSEMBLY LANGUAGE A language built up with memory codes designed to make programming easier.

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

BYTE A term to measure a number of bits (Binary digits), usually eight bits to a byte.

CAPACITOR An electronic component.

CHARACTER STRING A sequence of characters in a row.

CHIP A tiny piece of silicon which holds all the components that make up a microprocessor.

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

COMPUTER LANGUAGE Languages are used to make the computer perform operations. They consist of instructions or commands. There are different types of language for carrying out different tasks.

CONVERSATIONAL SCROLLING Data displayed on the screen, involving step-by-step communication between the user and the computer.

DEDICATED CHIP A chip (microprocessor) which has been specially programmed to perform a single or special group of applications, e.g. computer games. ICs are usually the means by which dedicated chips are developed.

DISC A magnetic storage device. It can be either a hard or floppy disc. Hard discs can usually store more information than floppy discs and are used with mainframe computers.

DISC DRIVE A unit which is connected to the computer, used for loading the information stored on discs into the computer.

DISC STORAGE The method of storing information on discs as opposed to cassettes.

DISCARD A type of printed circuit board suited to circuits with a large number of chips.

FLOATING POINT This is a notation used for the calculation of numbers in which the arithmetic point, binary or decimal, is movable but not necessarily the same for each number.

FUNCTION A special purpose or characteristic action.

GRAPHICS The name given to pictorial representation of data.

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

HIGH RESOLUTION GRAPHICS A method of using Basic commands to move a drawing head to any position on the screen and drawing a line between two specified points. This facility is available on several makes of microcomputer. These graphics can be recreated in greater detail and to a higher degree of accuracy.

INPUT Information (data) fed into a computer.

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

INTERACTIVE A word used to describe a system which is capable of real-time man-machine communications.

K Abbreviation for kilobytes.

KILobyte A measurement of memory capacity. 1024 bytes of memory. So K is equivalent to 8192 bytes.

LANGUAGE See "Computer Language".

L.C.D. (Liquid Crystal Display) A display containing liquid crystals which light up when electricity touches them. Used in calculators and watches.

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

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