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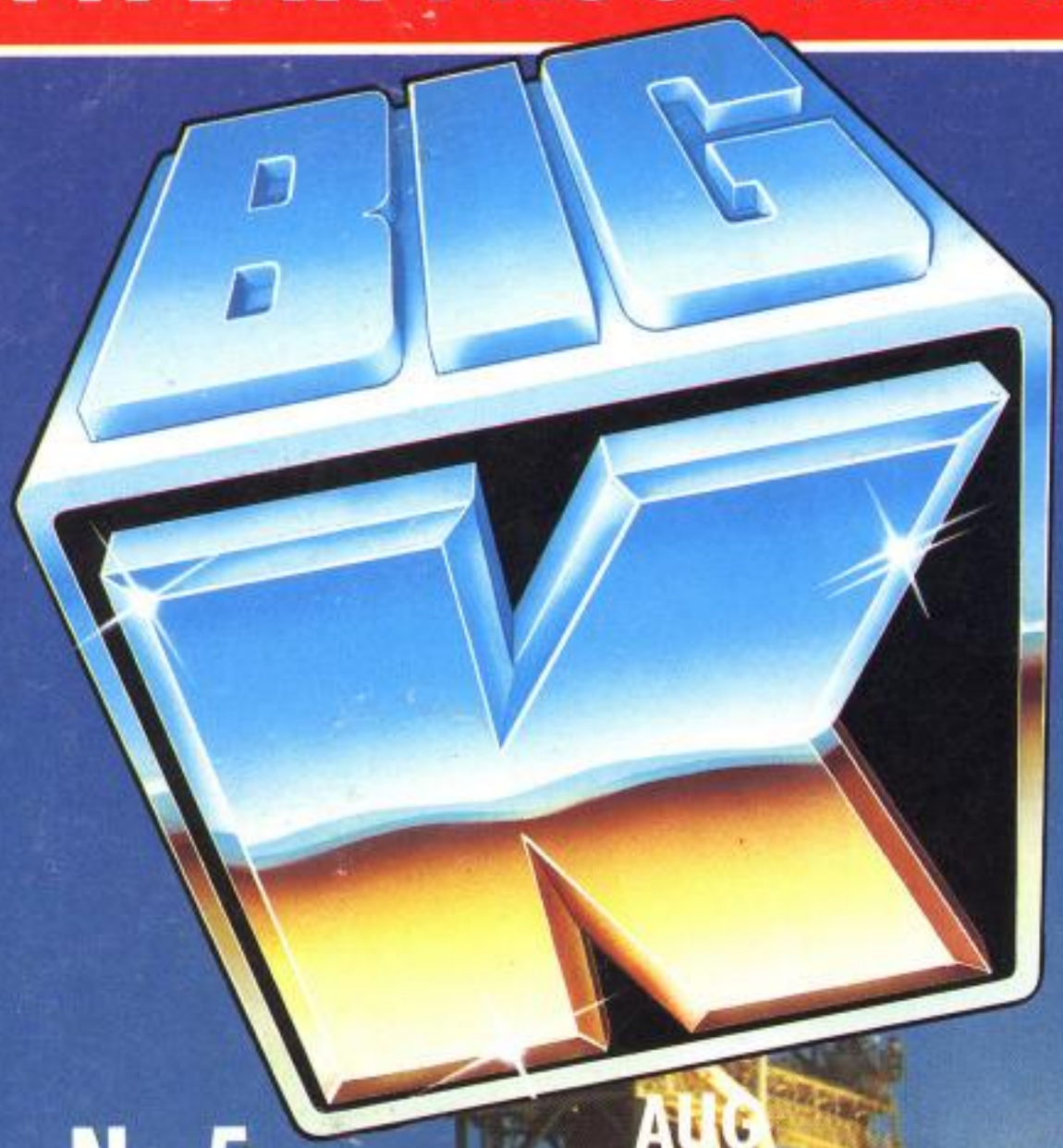

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BACK IN THE U.S.A.

The Chicago C.E.S. was a non-event (see p. 12). Oppressed by the failure of Adam and the IBM PC jr, and mesmerised by the dominance of the CBM 64, the Cousins are floundering. Perhaps decent games aren't so much a matter of technology as good design sense. So how come us Brits haven't yet broken through Over There? Maybe next year . . .

TONY TYLER

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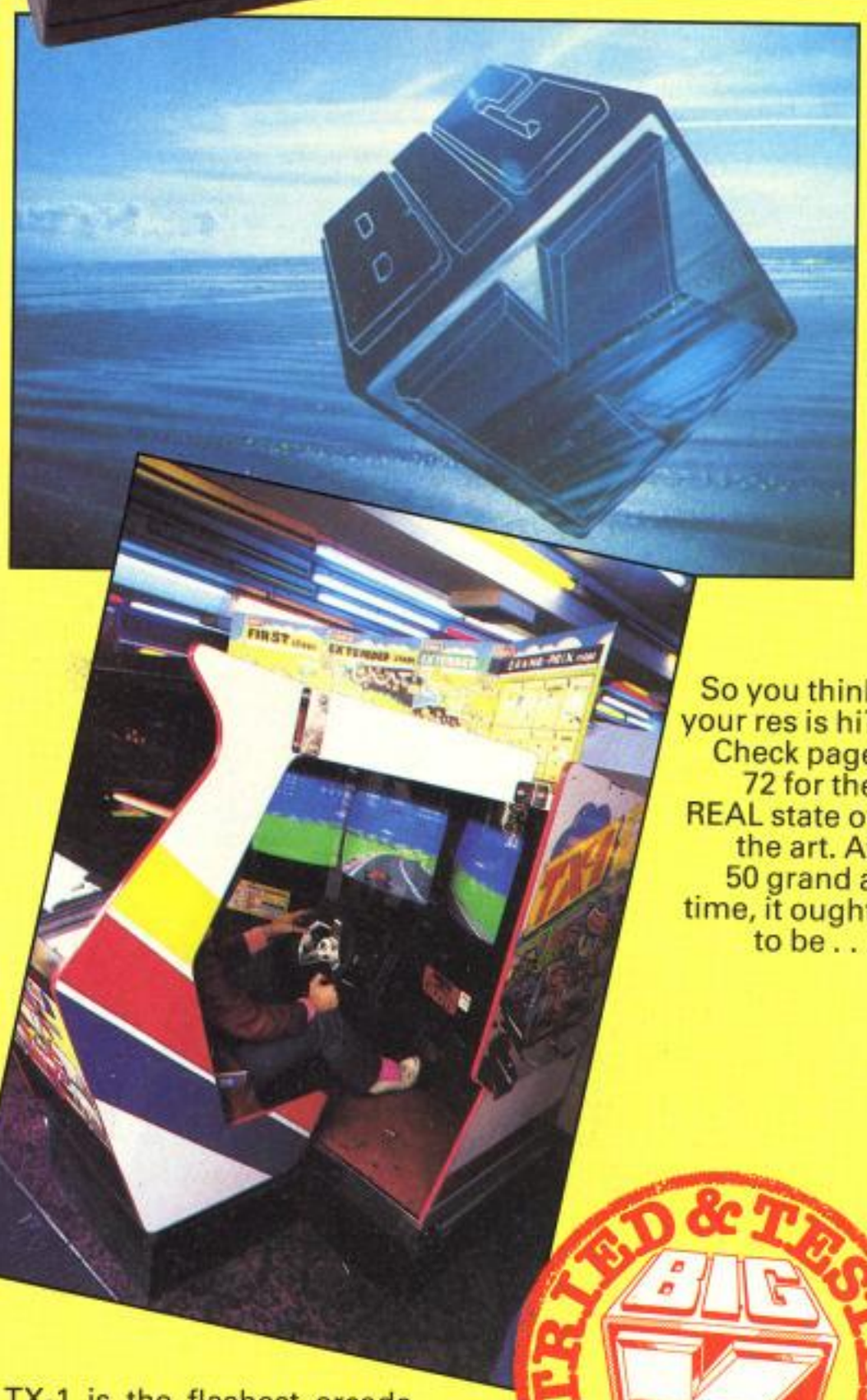

So you think your res is hi? Check page 72 for the REAL state of the art. At 50 grand a time, it ought to be . . .

TX-1 is the flashest arcade game yet (p. 88). Three simultaneous screens bring Le Mans pizazz to your home-town.

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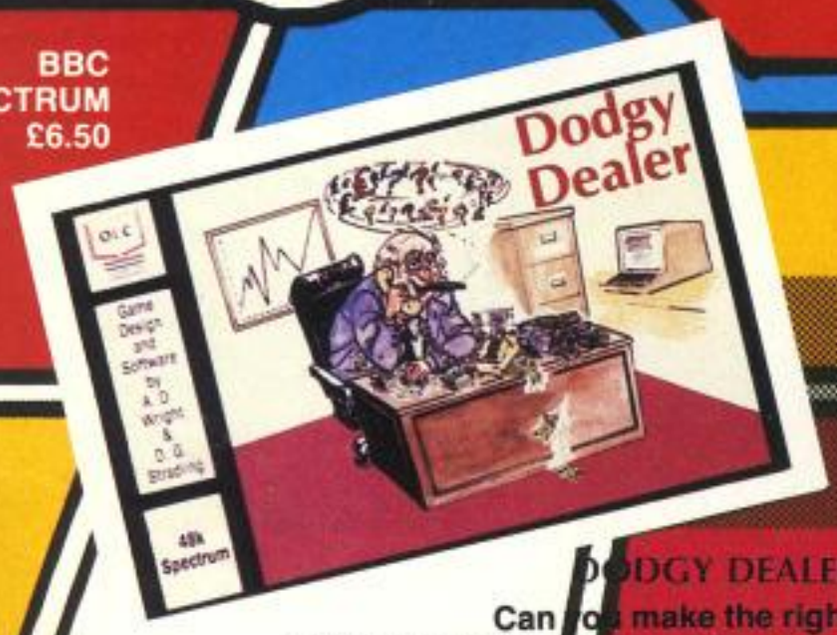

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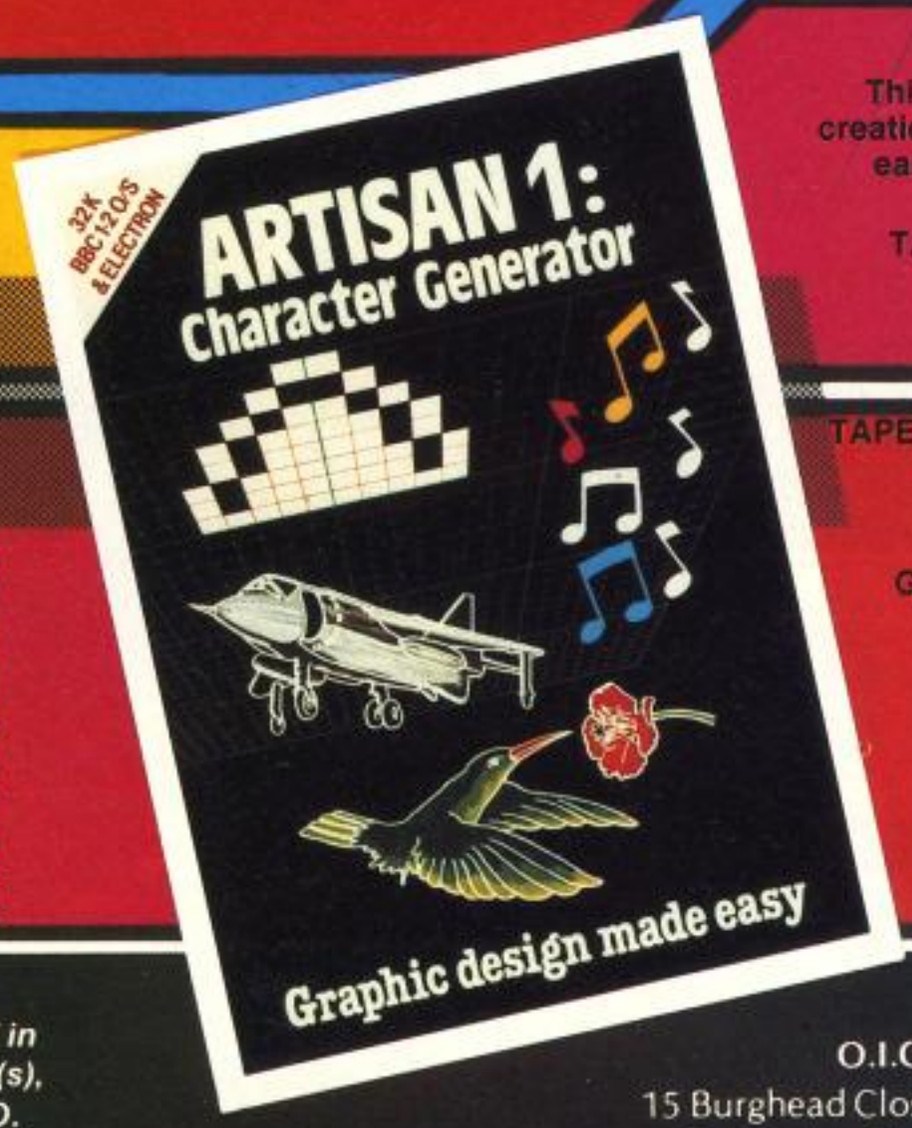

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OIC

YES, BUT WILL IT WORD PROCESS?

SEIKO ARE selling what must be the smallest, most portable computer in the world — but you can't play games on it. Yet. But you will when they bring out a larger electronic base-station early next year.

The Seiko Data 2000 is the first true computer-in-wristwatch, as opposed to just being a glorified calculator. It can hold 2,000 characters in a "notepad" memory — the equivalent of around a page of Big K. So far only data can be entered via an associated pocket keyboard — it can't be programmed. But for around £129.50 it's not bad! And when the next, larger base-station is available it will be possible to program with it in a very, very limited dialect of MBasic.

And the Seiko reps who have so far been using Data 2000 to keep their appointments, or important telephone numbers, or just keeping tabs on the numbers sold so far reckon that they have come up with a novel game using Data 2000 — trying to find that important detail in the recess of the Personal Data Bank's twin memory.

The four-line screen displays ten characters per line. A pocket notepad, out in the spring, will up this to a videogame-playing sized screen. And then Seiko will begin to sell portable games, a spokesman said, which are entered from the base-station and played wherever you want . . .

WULF AT THE DOOR

ULTIMATE HAVE done it again.

Following the success of *Atic Atac* and *Lunar Jetman*, the Ashby-based company, thought by some to be the pre-eminent games designers in the country, have launched *Sabre Wulf* as their follow-up. However the price has been increased from £5.50 to £9.95 to reflect 'increased development time'.

Sabre Wulf is the most brilliantly-coloured and polished offering from Ultimate to date. Set in a fantasy jungle, it follows the general Atic Atac format with high-speed moving, fast decision-making, crystal-clear animation and graphics, easy storyline, and all the overall finesse generally expected of Ultimate.

Advance orders indicate that by the time you read this, the game will have been in the national best-selling charts for some weeks.

DRAGON FAILS TO DRAG ON

DRAGON 32 OWNERS will continue to receive support and servicing for their machine into the foreseeable future — though it now seems likely that new software for the ill-fated Welsh machine will dry up before long.

The 6809-driven Dragon, whose crash six weeks ago had been widely predicted, failed because its initial lead in sales dried up once Acorn and Sinclair came properly on-line with the BBC and Spectrum computers. Hampered since then by its unusual processor, its lack of lower-case letters and other curiosa, the dragon nonetheless possessed an excellent BASIC and was widely liked by its estimated 150,000 users. However it never recovered its early promise and despite massive injections of cash went under in early June.

However Dragon peripheral and software makers like Compusense have promised to support the machine for as long as users desire them to. It is thought likely that while existing Dragon titles on other makers' catalogues will continue to be sold, new games for the machine are not now very likely to appear in great numbers.

(N.B.: BIG K will continue to print Dragon program listings for as long as we continue to receive them.)

HARDWARE WARS PART 89

WITH arrival of the long-awaited Amstrad Softspot are announcing a series of Amstrad games — among the first companies to do so.

The plot: Uncle Claude of Sincrum Research is threatening to increase the price of his electrical goods and workers' jobs are at stake. "ELECTRO FREDDIE" must push the goods onto the conveyor belt to be packed. You must crush the avuncular Claude with his own products whilst ducking his barrage of Spectrims and Oracs. Dead subtle, this stuff.

There are 11 levels, key option, moving force barrier and custard pies. This method of inter-rival vitriol chucking could run and run! Let's see if it causes a response from the beneficial patriarch. And let's see what flak the Amstrad gets back!

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YODELLING

He's certainly getting around, this Horace character. First time around he was feeding his face in a maze. Now he's off to the Alps for a spot of skiing. Where are we going to see him next? Wallaby hunting Down Under, maybe?

Anyway, back to the business in hand. Horace, before he hits the slope, has to buy his skis. They're in a hut on the other side of a busy road and they cost ten dollars — Horace starts off with forty. If he gets knocked down an ambulance comes and takes him away, but only if he can pay a ten dollar ambulance fee. Would they really leave him lying in a pool of blood in the road if he couldn't pay? (Too true they would.)

Then comes the skiing bit. Horace has to be guided down the Hannekon run avoiding the flags, trees and any other garbage left lying around until he gets to the finishing post, then he gets another slope.

One would think a visit to the ski slopes with Horace would be quite exciting. On the contrary it's rather dull. All it really means is guiding a blob around a vast expanse of white trying to miss things that get in the way. Perhaps the Dynamic Diggers could find him something more exciting next time around. — K.A.

Game: HORACE GOES SKIING
Maker: MELBOURNE HOUSE
Machine: COMMODORE 64
Format: cassette
Price: £5.95
Rating: K

DEEP SPACE

Frantic interstellar shoot 'em up distinguished by some superb large scale cartoon graphics. *Ad Astra*, or, 'To The Stars' is the dashing motto of the Deep Space Patrol, and as a new recuit it's your dubious honour to patrol the shipping lanes between the distant Way Stations that mark the borderlines of Terran space. Needless to say these shipping lanes literally crawl with hostile Xtros. There's the Pirate battle cruisers and their speedy droid scouts to contend with, the mammoth minelayers of Mongo (or whatever) and interminable clouds of lethal space debris to avoid. It's a good job there's a joysticks option as my digits just couldn't take the pace. Space debris precedes each wave. Huge cratered globes spin towards you with dazzling smoothness. You can only hold your breath and dodge as they fly past — only to rocket straight into the eager maw of the alien force. The animation throughout is superb and I was particularly impressed by the mammoth minelayers. (Even if they caught me every time.) Still it's almost worth it for the megablast that ensues. I've yet to make a Way Station but I'm sure that when I get there it'll look grand. Of course such animation has its price. The action takes place over a static background and to sparse musical accompaniment. Still it's cheap for what you get. Space Cadets should enlist immediately! — S.K.

Game: AD ASTRA
Maker: GARGOYLE GAMES
Machine: SPECTRUM 48K
Format: cassette
Price: £5.95
Rating: KKK

MEAN REDS

A sort of horizontal Pac-Man dressed up in its own mythology: you're a member of the great starfaring race of Intergalactic Cheese-snufflers, marooned in a maze beyond the furthest reaches of space and time . . . that sort of thing.

Basically, you're in a Pac-Man style labyrinth, gobbling up the old dots on the ground and occasionally chancing upon a special one that allows you a limited time to gobble up the Red Meanies that are chasing you. But whereas in *Pac-Man* you're looking down on the maze, here you peer along its corridors. Nice for the hurtling effect as you hit a long stretch. Horrible when a Red Meanie suddenly looms, enormous, up in front of you. As you can't tell where you're going (and probably won't even have a clue until you've slogged away at it for a couple of months) it's bloody difficult either to chase said red things or even deduce where they are in relation to you when you hear the warning beep that indicates a hostile prescence nearby. Oh yeah, there are also things called Blue Loonies that also loom up, set off the alarm etc, but they're perfectly harmless and are presumably only there to give the novice a nasty turn.

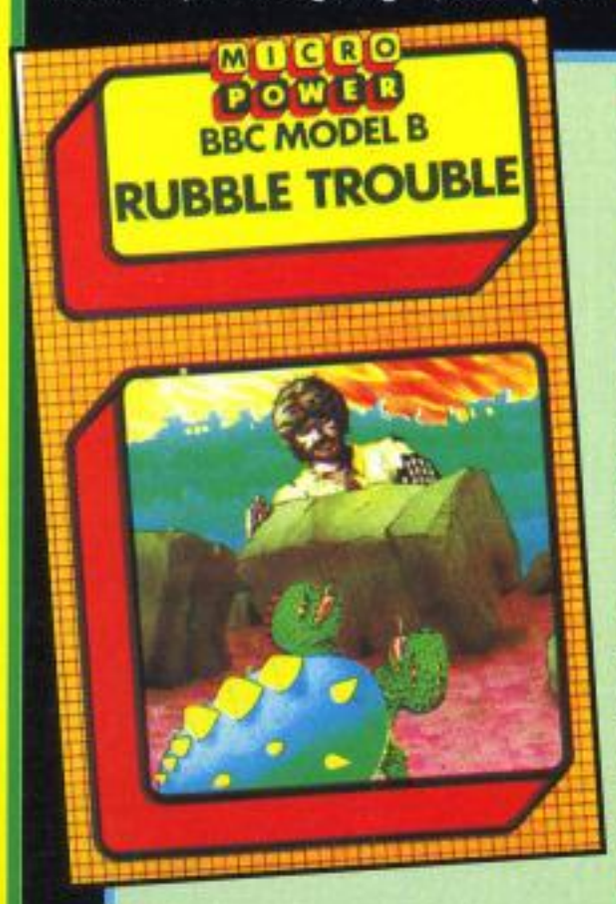
In all, a novel variation on a classic theme, but not quite novel enough to make it a big success. — D.R.

Game: RED MEANIES
Maker: SALAMANDER
Machine: DRAGON 32
Format: cassette
Price: £7.95
Rating: KK

TROMS MEET MORT

Cripes! This is absolutely bad, man. Imagine *Tron* without effects. Tom without Jerry and *Gridrunner* without grids. Imagine being sentenced to life in an arena of relentless peril, illuminated only by the flames from a central inferno and the flash of laser fire. Imagine heavy duty warfare. Imagine there's no people . . . About the screen sparkle The Bits. With your trusty Bitsearcher (fashioned after the battle cruiser from Tron, hence the awkward title) you must hoover 'em up one by one and deposit them into the central furnace. Sharing the arena are the Bytesheets, great walls of noise that grind up and down the screen, and around the edge skate the deadly Nibbles who pump poisonous pixels stage centre. All must be avoided. As you move through the screens the Bytesheets become more furious and the Pixel shower more intense. Its a visual nightmare that requires fearsome coordination. A simple idea true enough, but the game just won't quit. Like I said: It's bad, man. — S.K.

Game: TROM
Maker: DK'TRONICS
Machine: SPECTRUM 48K
Format: cassette
Price: £5.95
Rating: KKK



PROGRAMMER ON THE RUN

This is another variation on the old sliding block game, but with a sting in the tail. You know the kind of thing, shove rocks around the screen trying to flatten beasties. Trouble is if you miss the beasty the rock bounces off the first thing it comes across and gives you a nasty slap in the gob. Not a pretty sight. Course you can dodge out of the way.

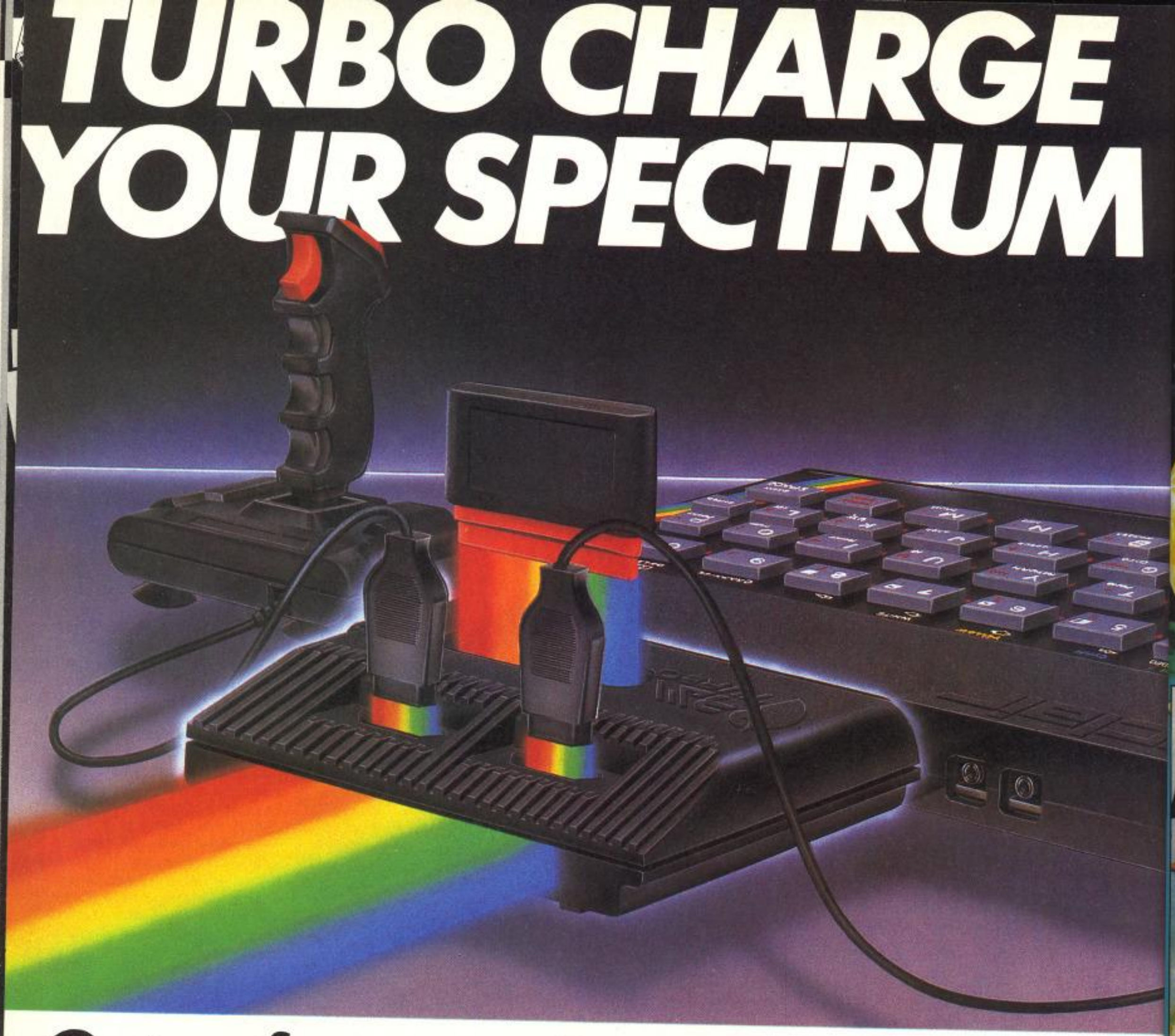
Confused? Let uncle explain. The year is 2003, the setting the aftermath of a nuclear holocaust in a maze of rocks, where the sole survivors are Krackats (who dreams up these names?) These little nasties have developed a taste for human flesh (flesh'n'chips?), so the idea is to give them a good pounding with a rock. But I like I said, watch out for the rebound, it's a killer.

Then there's the other screens. The first is fairly straightforward, sort of what you see is what you get. But the second and third are something else. Number two is the 'Hayfield' where the whole screen is filled with rocks. You have to guess which ones are real. Then come the hidden rocks. Finding a way around a maze you can't find presents certain problems. Need I elaborate?

Rubble Trouble is good, probably the best I've seen for the BBC. Well worth an investment. — K.A.

Game: RUBBLE TROUBLE
Maker: MICRO POWER
Machine: BBC MODEL B
Format: cassette
Price: £7.95
Rating: KK

TURBO CHARGE YOUR SPECTRUM



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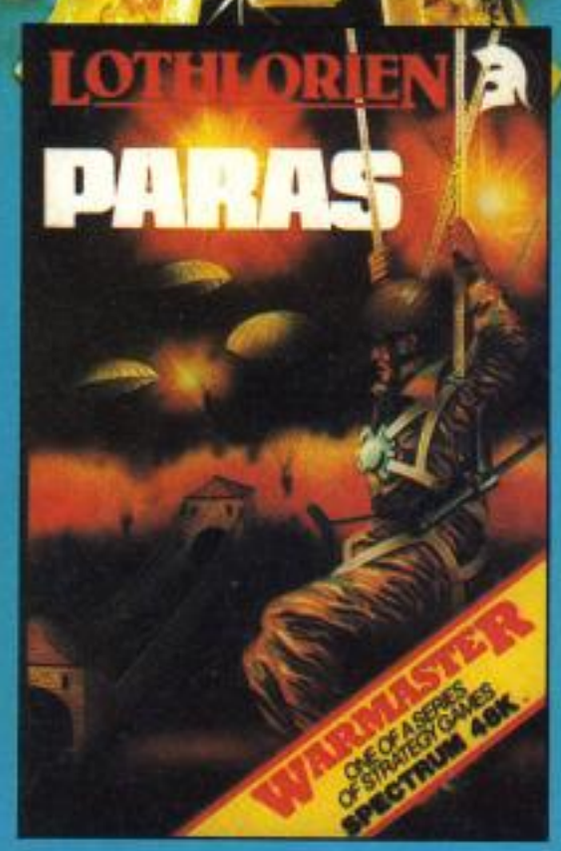

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Dramatic all-graphics campaign. Your hand-picked force has dropped behind enemy lines to capture a strategic river crossing. Two versions of the game with ten levels of play.

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Spectrum 48K	**£5.95**
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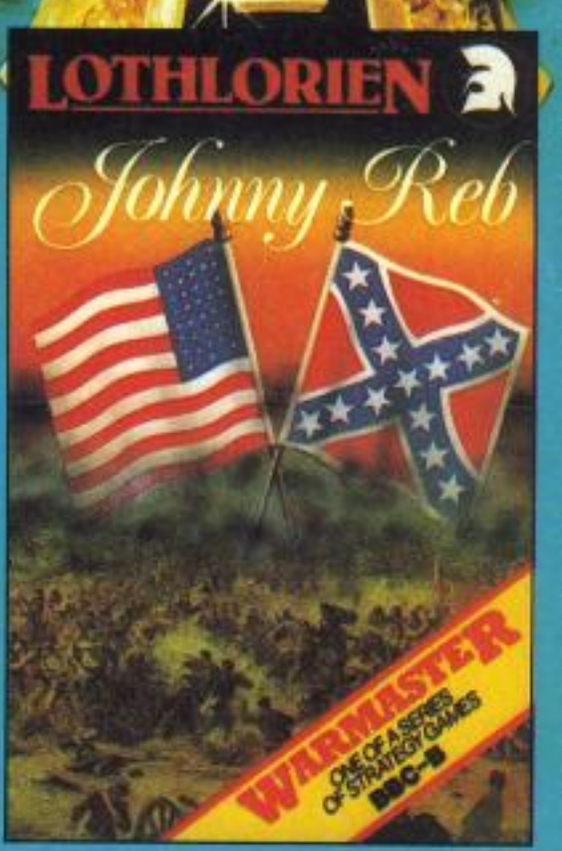

JOHNNY REB

There's still plenty of fight left in the Confederate South as each side selects forces to manoeuvre on a full-graphics battlefield. Play against the computer or challenge a friend.

Spectrum 48K	**£5.50**
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Access

Roger, Golf Zulu Turn left...er...

First thing that happens is you crash a lot of aircraft and kill a lot of people. Sounds good, huh? Well all you aspiring homicidal maniacs out there better think again. The object of the exercise is to land the aircraft safely and NOT kill the people. Of course if you've got a real vicious streak you can have great fun directing all the traffic to the middle of the screen then sit back and watch the resulting carnage. That's if you can get the hang of it first. Believe me, it ain't easy.

Heathrow is a simulator. Not a flight simulator, but an air traffic control simulator. First there's the instructions to plough through. Complicated? Imagine a four year old learning machine code.

The game takes you through seven levels, from total none-brain air traffic controller to super ultra zippo air traffic controller, with a demonstration somewhere in the middle. When you start getting competent (maybe three years from now) you can start covering things like Vortex Spacing (Eh?), and emergency procedures. this is a faithful simulation of the problems facing an air traffic controller and it would come as no surprise to learn that there's a room full of nervous wrecks somewhere in Heathrow with a label on the door, 'Ex-air traffic controllers'. — **K.A.**

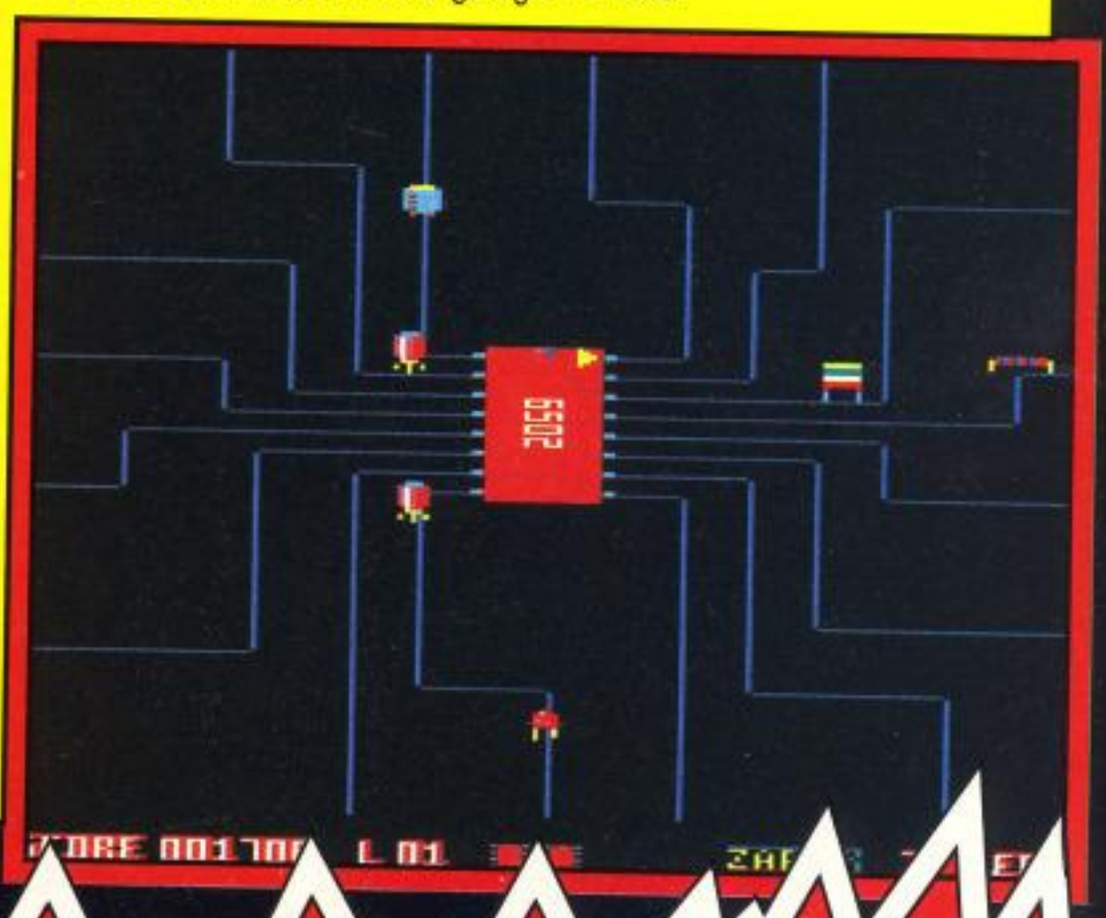
Game: HEATHROW AIR TRAFFIC CONTROL
Maker: HEWSON CONSULTANTS
Machine: BBC MODEL B, ELECTRON, SPECTRUM 48K
Format: cassette
Price: £7.95
Rating: KK

TRANSISTORS REVENGE

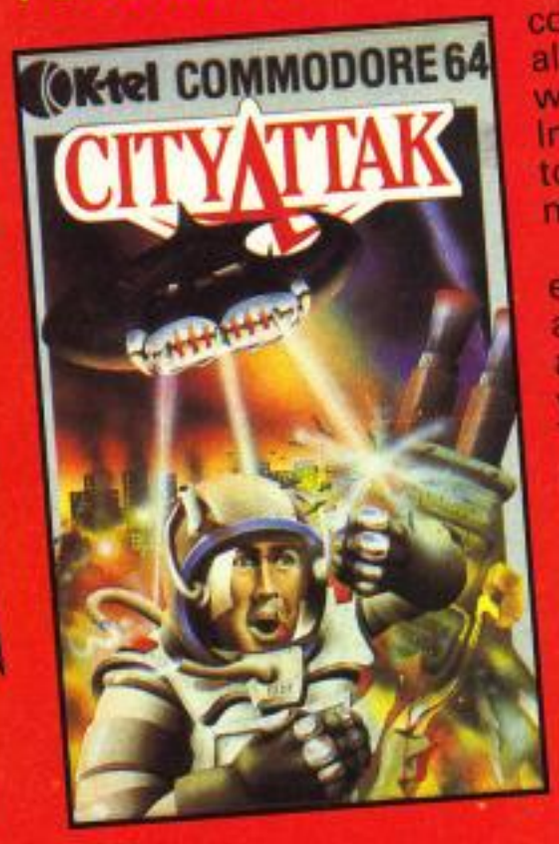
Game: TRANSISTORS REVENGE
Maker: SOFTSPOT
Machine: BBC MODEL B
Format: cassette
Price: £6.95
Rating: KK

'Your computer is revolting' I was informed by the instructions. I was offended. Dog-ends apart, it seemed clean enough. Reading on, things became clearer. It seems that there's a massive power struggle going on inside the computer. The CPU has been abusing its position of power and the lesser components are rebelling. they come steaming down the circuit tracks with malicious intent. You move a fire pointer from pin to pin giving the unruly components the old one-two before they get too close. If they reach the chip it's Zapsville. As time goes by word gets round that there's a shoot-out at the O.K. 6502. You get bombarded by more and faster components and the going gets pretty tough. In later pages the circuit tracks form more complicated shapes and you've got your work cut out just trying to see where they come from.

Transistors Revenge is fast and furious. Nice, smooth presentation and enough action to keep you permanently on your toes. If you imagine *Space Invaders* tied in a few knots and then shoved into a tumble drier you'll have a pretty fair idea of what's going on. — **K.A.**



FIREBALL FURIOSO FOOLISHNESS



Cityattack is hot stuff. Its full panaorama lies across several screens, and the graphics are smooth and classy. Panning from left to right we have "Mission Control" — a looming launch-pad-cum-official building. Then there's Everytown's "Roxie" cinema; a City Hall replete with statue: and, of course, an Arcade. Yes, folks, all's calm in Cutesville until a warning sounds — "The Invaders are coming!" Time to sail the screens and once more a-blagging go.

Now, if you're going to exhale a super-silly-ass sigh and presume that this is just another invaders clone — you're very wrong, pal. There's lotsa surprises in store. First lesson: oply the foolhardy will attempt to attack these invaders from the front. Sneak past them at ground level — initially mandatory attack pattern — and get 'em from the rear. Then, just as you get stuck into Saving the City, a dirty great multicoloured fire-ball appears and spits its path across the screen. (I could tell you how to conquer the fire-ball — but I won't. Aha!) Then there are sudden ground attacks from the odd squad, which are heralded by a bizarre scampering noise.

Talking of sound, that's also used creatively on this game. I don't just mean that the fire-ball really sounds like it's burning, but the game is kind of rhythmic. It all adds to the excitement of the game.

There are 14 levels of play, though only superheroes, crooks and liars have got through them all to discover . . . Hey presto! It's back to square one! There's enough meat to keep you trying! A truly intelligent piece of programming. — **N.X.**

Game: CITYATTAK
Maker: K-TEL
Machine: COMMODORE 64
Format: cassette
Price: £6.95
Rating: KKK

K = Could Be Better
KK = Could Be Worse
KKK = Unsurpassable

CHIPS FOR EVERYTHING

Two strategy games from the same stable, one drearily mathematical, one moderately exciting. The 64 isn't a very good micro for strategic pastimes — how to put the graphic capabilities to use? — but *Red Alert* at least uses what it can in pictorial terms.

One to four users can tussle to raise capital, hire underworld stooges, evade police snoopers and gather up useful trifles like flamethrowers for, eventually, an assault on a missile base (a rocket is launched as the glorious climax of the affair). In fact, the nub of the game is raising loot, done mostly at a casino fruit machine or a perverted card table which the computer usually wins at. The rest is played out like a series of episodes from low budget espionage movies: mysterious assignations at Clapham Junction, trips to Moscow (huh?) and harrassment by the feds which results in many a bundle of secret papers disappearing down a lavatory bowl. A cynical assessment would be 'gambling game with knobs on', but it's engaging enough in a modest way.

Wheeler Dealer is an unfortunate stiff from screen one. Up to 16 can play (when was the last time you had 16 crowded round your micro?) at a pointless scenario where gearboxes, tyres, engines, monopolies, bank balances, industry troubles and general inertia jostle politely for attention. The graphics are of ZX81 standard, the 'action' wouldn't leave a tortoise breathless and the most pressing issue isn't staying in business, it's staying awake. Avoid. — **R.C.**

Game: WHEELER DEALER
Maker: MR CHIP
Machine: COMMODORE 64
Format: cassette
Price: £5.50
Rating: None

Game: RED ALERT
Maker: MR CHIP
Machine: COMMODORE 64
Format: cassette
Price: £5.50
Rating: K

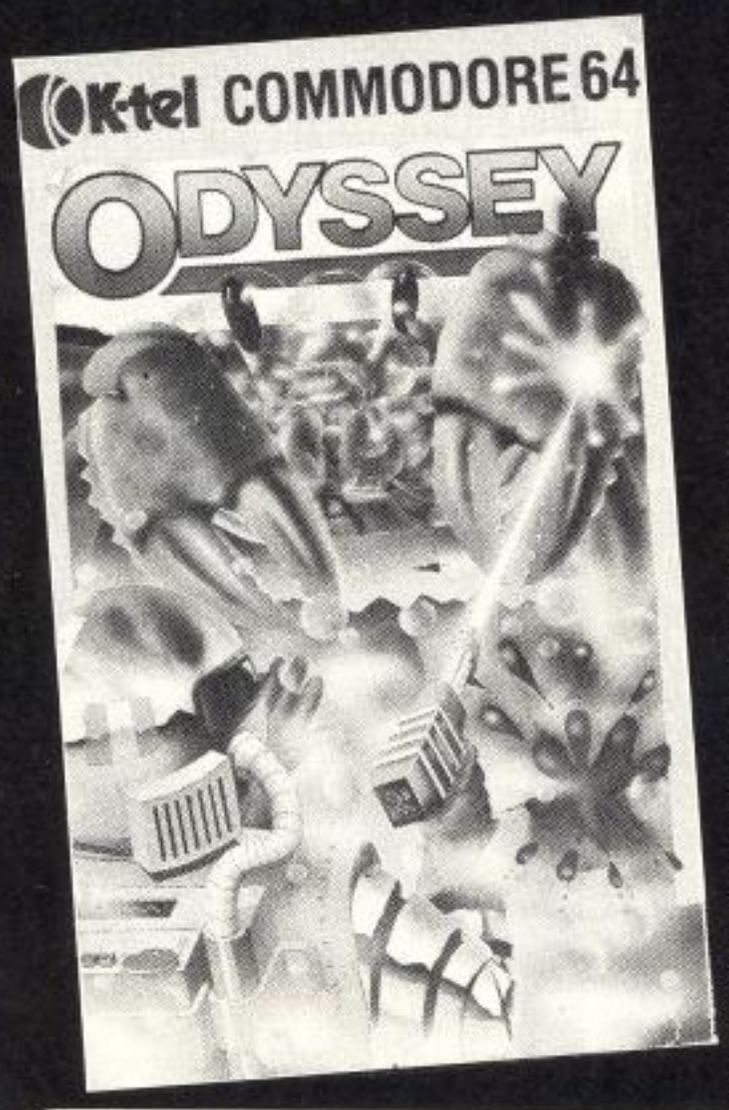
HIM TOOK HIM CHANCES MEK HIM MONEY — SEEN?

They're a witty lot, Task Set — this one is subtitled 'Super Digital Mix'. I couldn't recognise the tunes Rankin' Rodney skanks around the screen to but it's a merry enough accompaniment to his misadventures. A joystick pilots him from the centre of each of 20 screen, onto multicoloured conveyor belts and from there into four sectors which each house a particular instrument (a change in the tune comes when Rodney picks one of them up). Once he's got all four back to the centre — having dodged lethal crotchets and patches of discord — it's on to the next screen.

Personally, my peepers were feeling frazzled after 20 minutes: the key to hopping the moving belts is getting on to the right colour dots, and the display is ablaze with fluorescence. RR isn't a very clear piece of animation and sometimes the fellow is almost invisible — besides which the controls don't seem too responsive in shifting him. Never got beyond the first few screens so I can't tell if there's any drastic change later on, though I will say that this is much harder than-TS's other newie, *Super Pipeline*. Very lively, but I & I will have to practice like roots man to be top dread, seen? — **R.C.**

Game: JAMMIN'
Maker: TASK SET
Machine: COMMODORE 64
Format: cassette
Price: £6.90
Rating: K

76 JELLY TOTS LED THE BIG PARADE



In the first game I got three lives. The second very generously coughed up seven without giving any real indication of why. Such minor inconsistencies aside the game was good. Don't think — just shoot: fast and from the hip. Move slower than a cat with its tail on fire and you're dead. Don't even worry about where, you'll hit something.

The first screen is a variation on Space Invaders. ***Weird but definitely menacing objects with an uncanny resemblance to Jelly Tots parade across the top of the screen dropping bombs. A 'Robo Crab' patrols the bottom half of the screen. When Guardian Pests start to form a pincer movement from the side desparation turns to sheer panic.***

Clear screen one and the scene changes. An egg wanders around the screen with four Robo Crabs circling it. You need five consecutive hits on the egg without being hit by a stun bomb. Not easy. Just when you're getting a taste for blood, probably green, you notice that your score is falling fast. Panic rises proportionally.

Odyssey ***seems to be a cassette full of just about every alien-zapping game known to man and alien alike. there are five screens, each one vastly different from the rest. I must confess to being confused about how many lvies I had. Sometimes it was three and in other games I counted as many as seven, but in spite of this it definitely works. I only hope I can explain away all these dead aliens to the cleaners.*** — **K.A.**

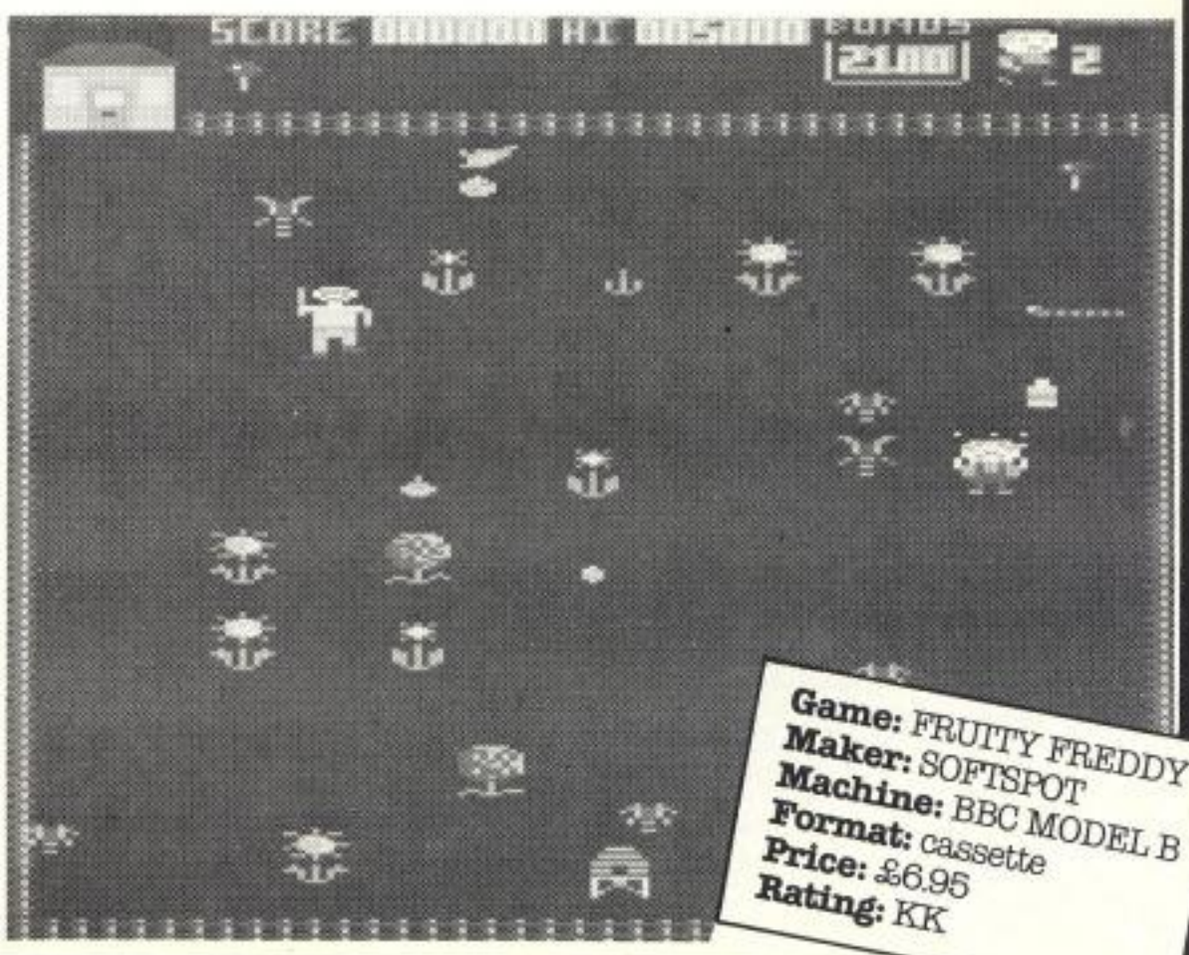
Game: ODYSSEY
Maker: K-TEL
Machine: COMMODORE 64
Format: cassette
Price: £6.95
Rating: KK

NICK THE FRUIT. AVOID THE SPARROW.

Honesty is the best policy, or that's what they teach in the Boy Scouts. Fruity Freddy wasn't in the Boy Scouts. A quick butchers over the fence for the all clear and it's straight into Mr Meano's garden after the fruit. We all know that scrumping is a risky business but Mr Meano's garden is like cuddling sharks. First of all there's the killer bees swarming out of the bee-hive, then the Crazy Crimson Catapillar zips across the garden trying to make dead Freddies. Tread on a seed before it's fully grown and Mr Meano storms out of his house throwing mega-wobblies fit to bust.

Then there's the sparrow. Since there's no way to be discreet about this let's be blunt. It dumps on Freddy. To you and I a sparrow dump means a mild case of embarrassment and an urgent need of a handkerchief, but as far as Freddy's concerned it might as well be an elephant. He staggers about in a daze and then drops dead.

All in all Freddy does a lot of dying. It's a challenging game and once you get the hang of it it's great fun. — **K.A.**



Game: FRUITY FREDDY
Maker: SOFTSPOT
Machine: BBC MODEL B
Format: cassette
Price: £6.95
Rating: KK

K = Could Be Better
KK = Could Be Worse
KKK = Unsurpassable

So there was I, sailing the high seas, splicing the odd main-brace and shivering a timber here and there, when up walks Long John Silver with a real neato plan with a pretty heavy cash return.

This is a fairly standard adventure game but what gives it a good position in the Adventure Game Hall of Fame is its wit and a clever use of sound. The cassette loading is accompanied by a sea shanty which is retained for later use in the game. As you approach the seashore you hear the sound of surf and seagulls (they really do sound like seagulls). Limited but clever use is made of the Mode 7 graphics and the description of locations is interesting. A major frustration with some adventure games is the same old response when you pick up an object or give the computer an instruction it can't understand. Not with Flint's Gold. *It has a library of interesting responses.*

While it couldn't hold a place with the world's adventure classics, it could well find a secure position in the games cupboard. **— K.A.**

Game: FLINT'S GOLD
Maker: MICROGRAPH
Machine: BBC MODEL B
Format: cassette/disc
Price: £6.95 (cassette)
£6.95 (disc)
Rating: KK

But Where is Wayne Fontana?

Adventure fan Paul Styles wrote this puzzler with the Quill, and Gilsoft were so impressed that they marketed it! Being a 'fan' rather than a 'professional' author, perhaps Paul has kept his tongue firmly planted in his cheek as this adventure's descriptions and responses show a splendid sense of humour.

It all started in the office where I spend my "ordinary humdrum existence", furnished with just a telephone, a desk diary and (Aha!) a quill pen. Suddenly the phone rang! I answered the insistent purr to a listing voice which declared (à la Max Boyce) "Croeso y Cymru". The room span, my world vanished . . . and I recovered consciousness inside a closed cell in the huge complex of Mindbender. Alone, unarmed, I had to seek out and destroy the terrible threat.

Paul has ignored some of the Quill's visual presentation (viz. highlighted directions and objects) in favour of the plainer Artic-style, and made singular but effective use of sound.

Not the most difficult of adventures so far, but an excellent introduction for novice adventurers: even seasoned veterans should find enough to keep them entertained. Anyway, I must get back to the kitchens and that food . . . **— T.S.**

Game: MINDBENDER
Maker: GILSOFT
Machine: SPECTRUM 48K
Format: cassette
Price: £5.95
Rating: KK

```
?GIVE RUM
You can't have your sealegs yet shipmate
I don't follow your drift.
?DRINK RUM
The world spins and you drop and break
the bottle.
?GET GLASS
No can do.
?S
You are on the NORTH-SOUTH Jetty.To the
WEST is a gangplank up to a black ship.
Evil looking sailors watch from the Gun
ports.
?S
You are on the NORTH-SOUTH Jetty with
sea on both sides.
?S
You are in the street leading EAST and
WEST.The entrance to the Jetty is NORTH.

?E
You are in the street.To the EAST is the
entrance to a shop. The road leads WEST
and SOUTH.
?
```

CUSPINS COUSINS

Time to don the lycra catsuit of your choice and rescue the world again! This time the wotton beastly devils have besieged the very Zodiac itself (egad!) And scattered all of the beastly signs willy-nilly in a maze.

So, superhero (mug), it's all up to you to travel the tortuous maze, scupper the caddish demons within, bag the signs of the Zodiac and bring 'em all back home. Jolly good show, what?

A great quasi-adventure game. The action is smooth, and the graphics simple and effective. Once you've marched your sign-seeking doppelganger through every nook and cranny of the maze, you can begin to make grand martial plans about the best possible route to take. As you progress, the demons multiply (wouldn't ya just know it?) When you've collected all twelve signs, they reappear in the final screen. It becomes your task to pick 'em up and guide 'em into the central chamber. Sadly, 'tis at this point that I get snuffed. Hence I cannot recount an ending — but my guess is that you'll have a lot of fun finding out. Go to it! **— N.X.**

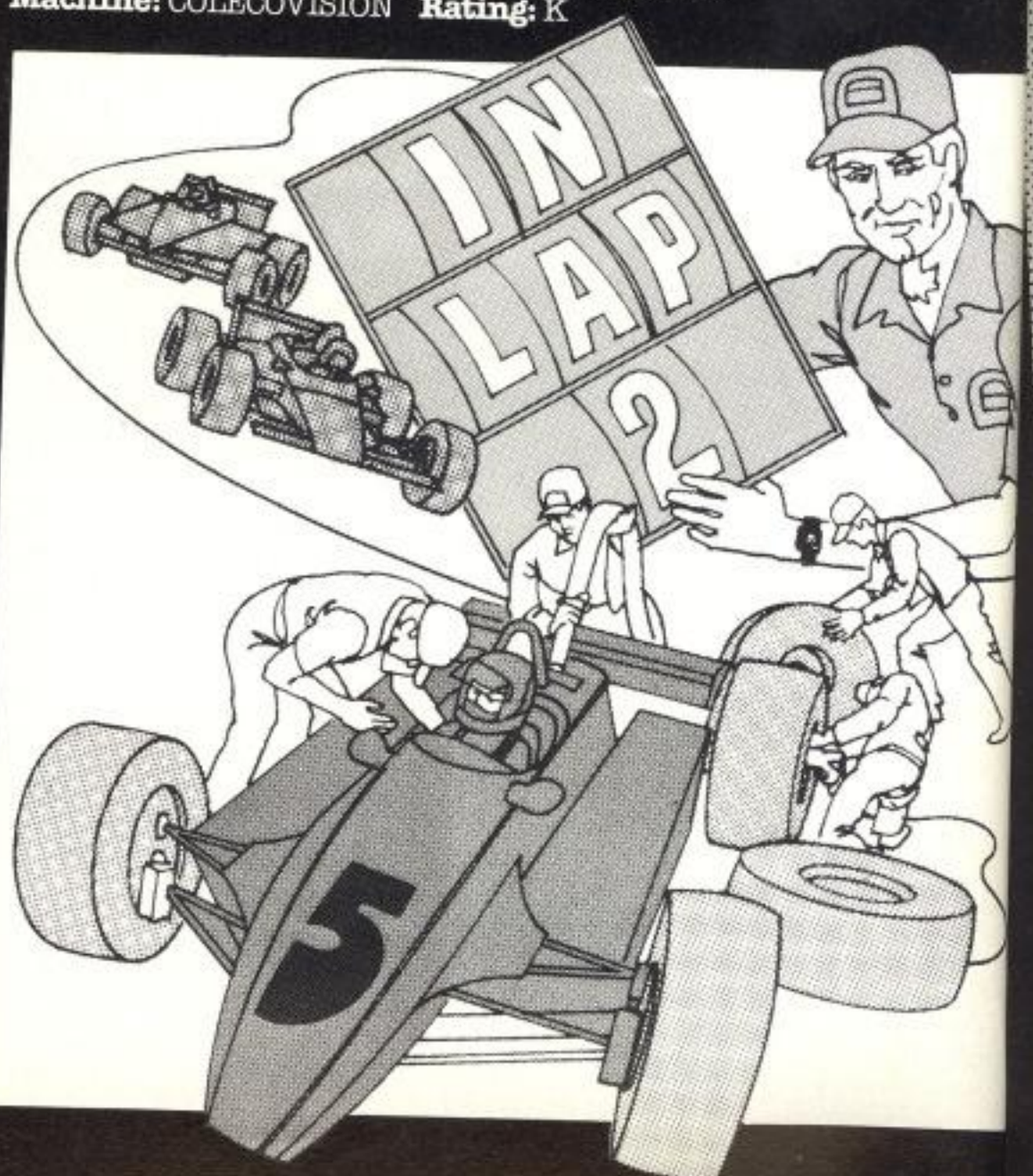
Game: ZODIAC
Maker: ANIROG
Machine: COMMODORE 64
Format: cassette
Price: £7.95
Rating: KK

Quite, Henderson — the spare wheel!

EPYX ARE deservedly well-known in the US for a series of superb action adventures and strategy games, mainly targeted on Apple and Atari to date. Pit Stop *represents their plunge into Coleco-land.*

If they hope to compete with Coleco's own Turbo Driver *— let alone the peerless and as yet unsurpassed* Pole Position *— they've got another think coming. The actual race-car sequences are less detailed and less convincing, while the Pit Stop routine — on which Epyx have pinned their hopes in a desire to find a new lick — rapidly grows tedious. You can win or lose a race in the pits, sure; you can also blow it with an ill-judged ROM that adds nothing to what already exists on the market. Coleco and Atari can sleep tight.* **— T.T.**

Game: PIT STOP
Maker: EPYX
Machine: COLECOVISION
Format: ROM
Price: £29 (approx)
Rating: K



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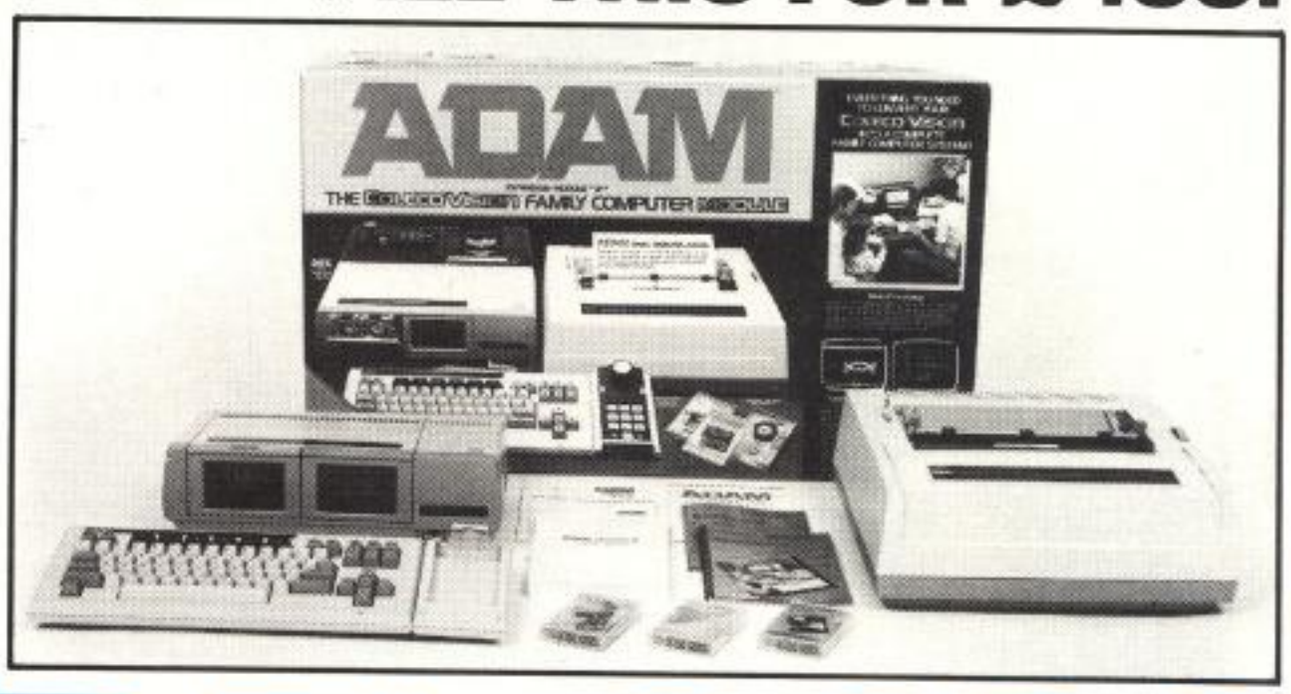

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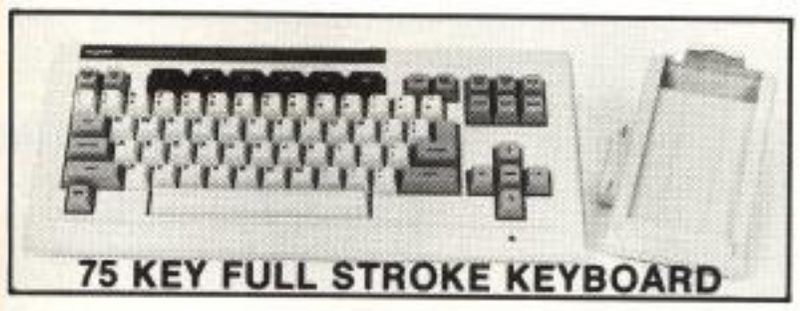
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If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.*

MEMORY CONSOLE/DATA DRIVE: *The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accomodate a second optional digital data drive.

FULL STROKE KEYBOARD: The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

LETTER QUALITY PRINTER: The Smart Writer letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typestyles are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's Smart Writer word processing program or as a stand alone electronic typewriter.

BUILT-IN WORD PROCESSOR: Adam comes with Smart Writer word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

COMPATIBILITY WITH COLECOVISION: By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

WHAT IS COLECOVISION: Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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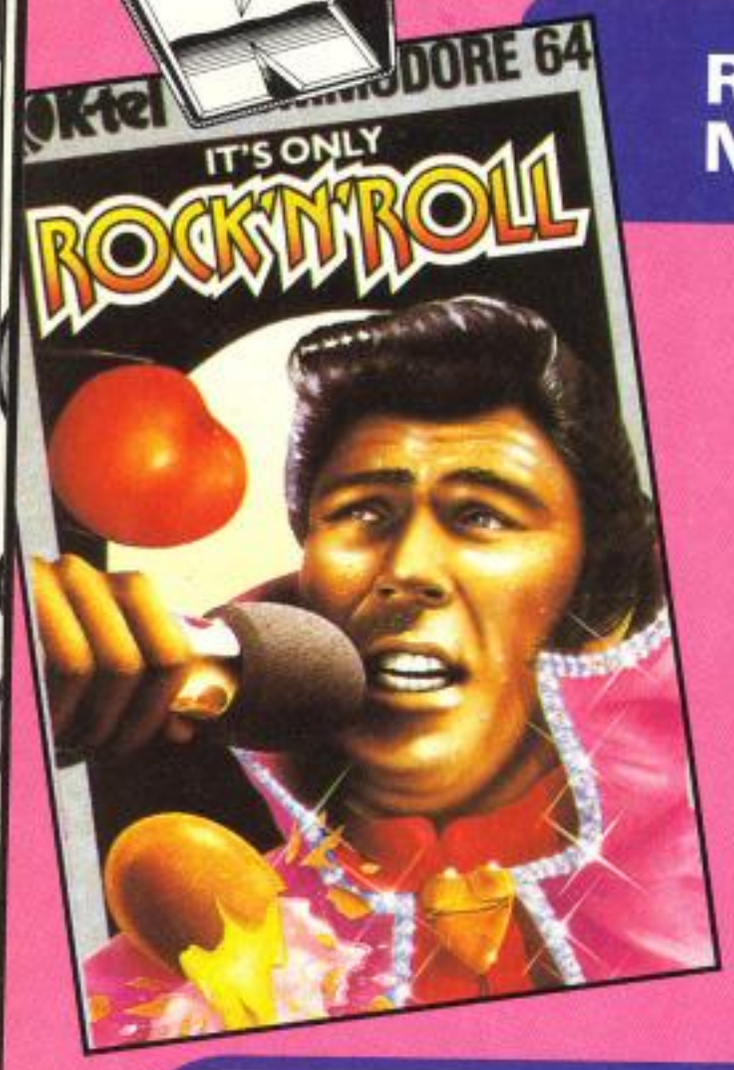


ROCK 'N' ROLL WILL NEVER DIE (WRONG!)

So ya wanna be a rock star? Step right this way, but be careful. The music biz is full of sharks and the public is fickle.

A while ago K-tel came up with a game, on Spectrum, which gives you the opportunity of stardom. Now it's on CBM-64 — a wise move.

The game takes the form of multiple choice questions on the action you might wish to take. Options like going on a tour, choosing a manager, etc. are presented on the screen and you have to decide on the best course of action for your group.

If you decide to write a song the computer takes on the task for you. It has to be said that computers are not great composers. Lines like "Do you want a wimp, dooh wop a bop dooh" are hardly Lennon & McCartney stuff.

Playing a concert or going on a tour gives you the chance to view highlights with music. Again the aural battering that can result is likely to make you go into retirement but as I said, computers lack imagination in a big way. — K.A.

Game: IT'S ONLY ROCK'N'ROLL
Maker: K-TEL
Machine: COMMODORE 64
Format: cassette
Price: £6.95
Rating: K

SHORT-ARSE

This is the first adventure I've seen that compares even in the slightest with a Dungeons and Dragons session.

Obviously written by a fan of *Gygax*, it's all about this nasty dwarf, Arfa (ah-ha), who's nicked some of the local king's jewels. Understandably, the king is less than chuffed, and proceeds to hire the local hero (ah-ha) to get after the miniature miscreant.

Like most adventures, it's kept to the traditional mould . . . jewels, heroes, kings, etc. The input parser is better than adequate, allowing more than two-word orders.

The packaging is real neat; a little pamphlet comes with it full of nice piccies and scene-setters.

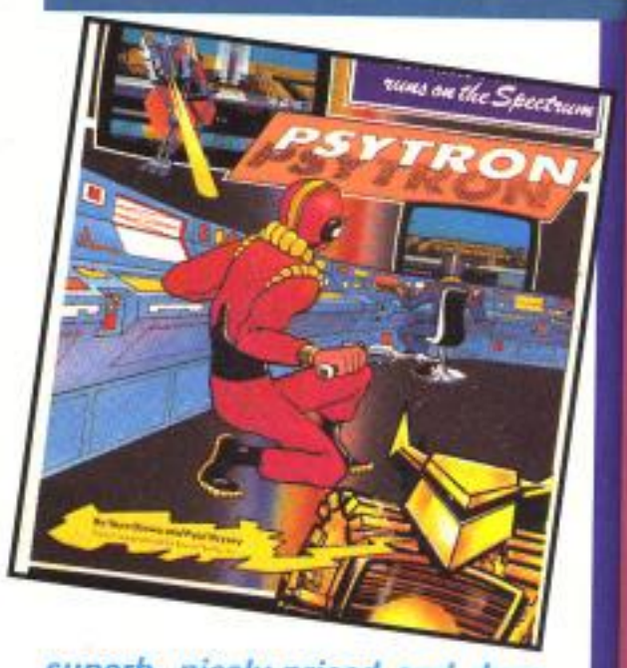
Cleverly constructed (and fairly long), my only moan is that it's too easy to crook. — A.G.

YES, IT'S A STEP FORWARD

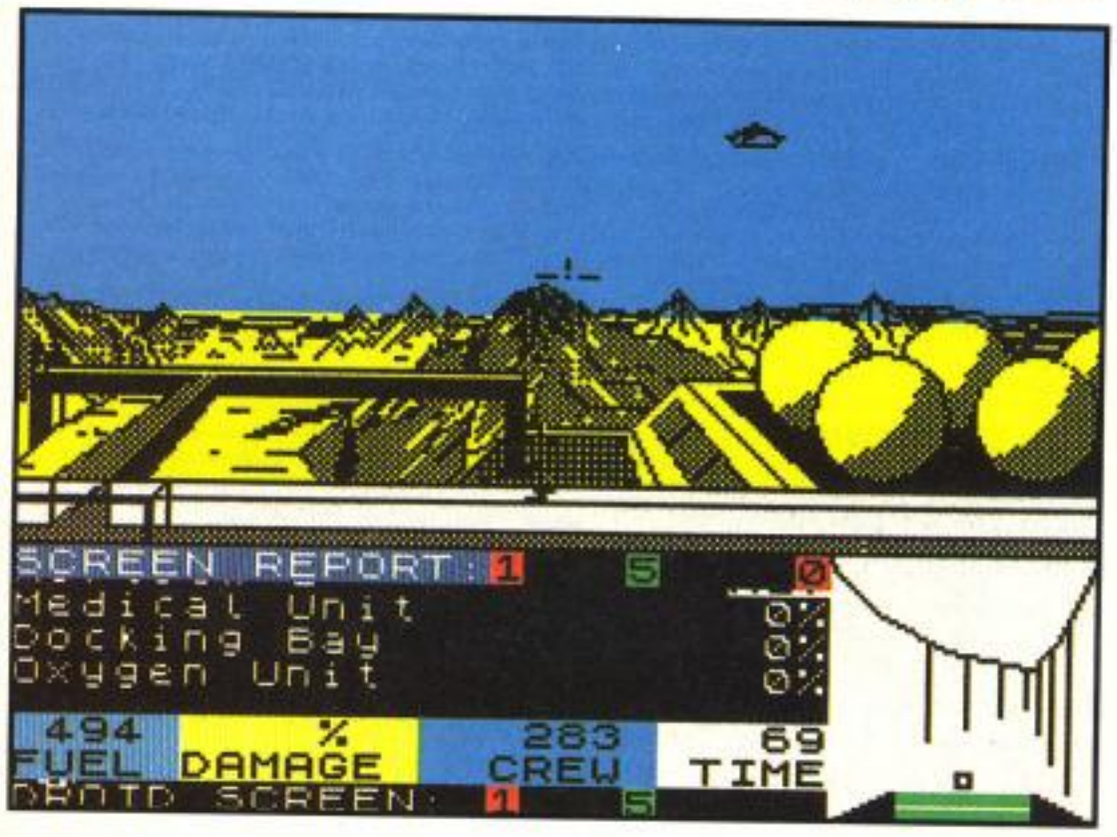
A slick, complex and damnably difficult turnaround in which you, dear hacker, become the computer. Become the mighty Psytron computer, that is, the system in sole charge of the vast and intricate Betula 5 installation. You remain ever vigilant for intruders, of which, needless to say, there are many. You pursue flying saucers across a panorama of ten screens, chase inset-like alien saboteurs along narrow tunnels, trying to hit them before they knock off an airlock or blow a hole in the pleasure dome or something. When they do cause damage, you have to assess it, allocate resources to effect repairs and generally juggle supplies to keep the whole place going.

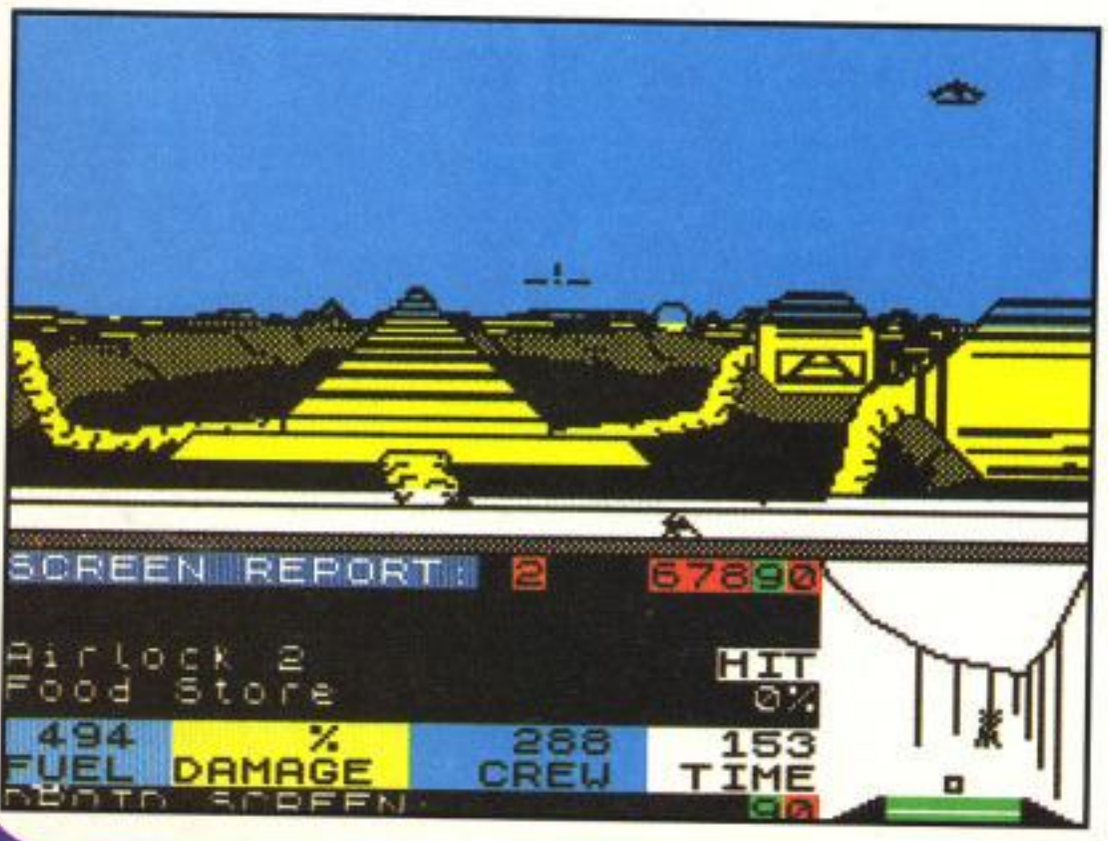
As I said, damnably difficult. So difficult that if you manage to keep the place going for over an hour at the final level, you stand to win yourself a QL. To do that, you have to know the thing inside out, match the strategy of a military tactician with the coordination of a concert pianist and probably have a fair bit of luck as well. For myself, despite much beavering away into the night, I've only managed to master Level 1 (chasing the saboteurs). Popping off the saucers before they zap the power plant or knock out the fuel dump (Level 2) is, as yet, beyond me.

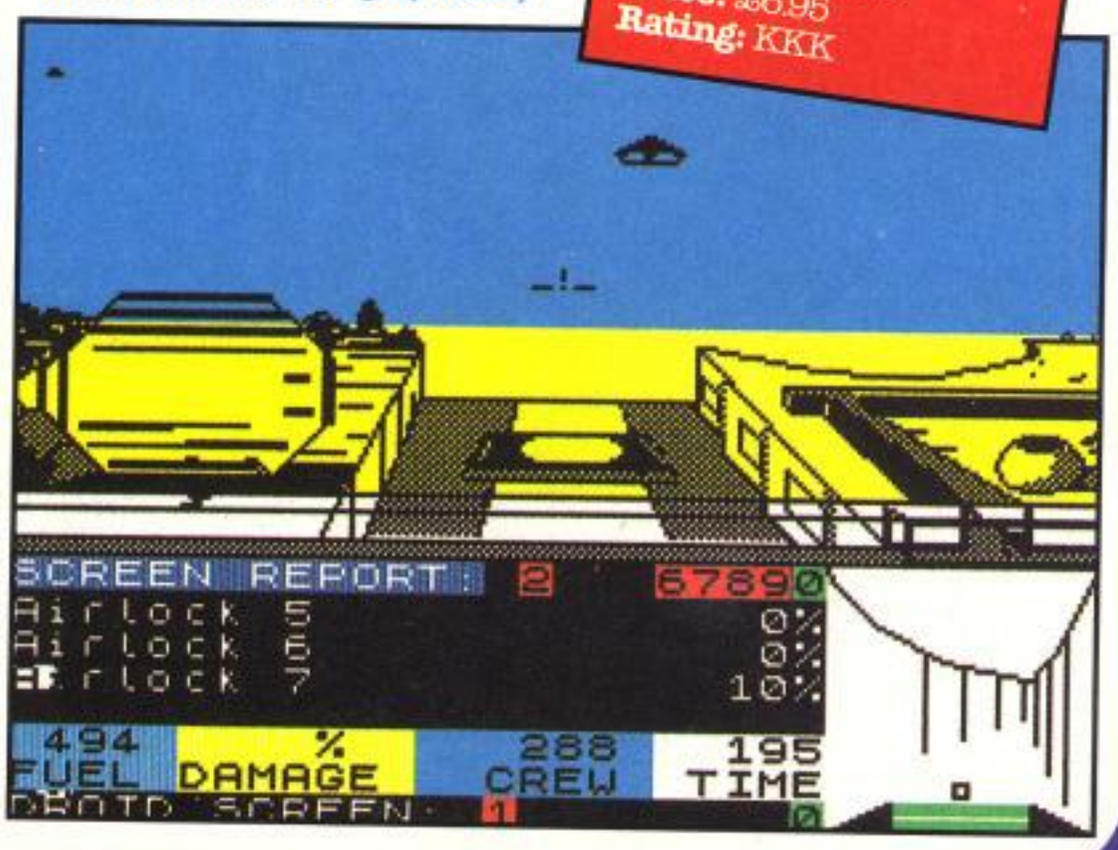
All of which, I suppose, augurs well. Psytron is certainly not the kind of game you master, exhaust and discard in a couple of afternoons. It's graphically superb, nicely-priced and does seem to match Beyond's claim to provide "challenging software". My only quibble is that the initial training levels could be a bit more encouraging. But then, I'm lazy. — D.R.



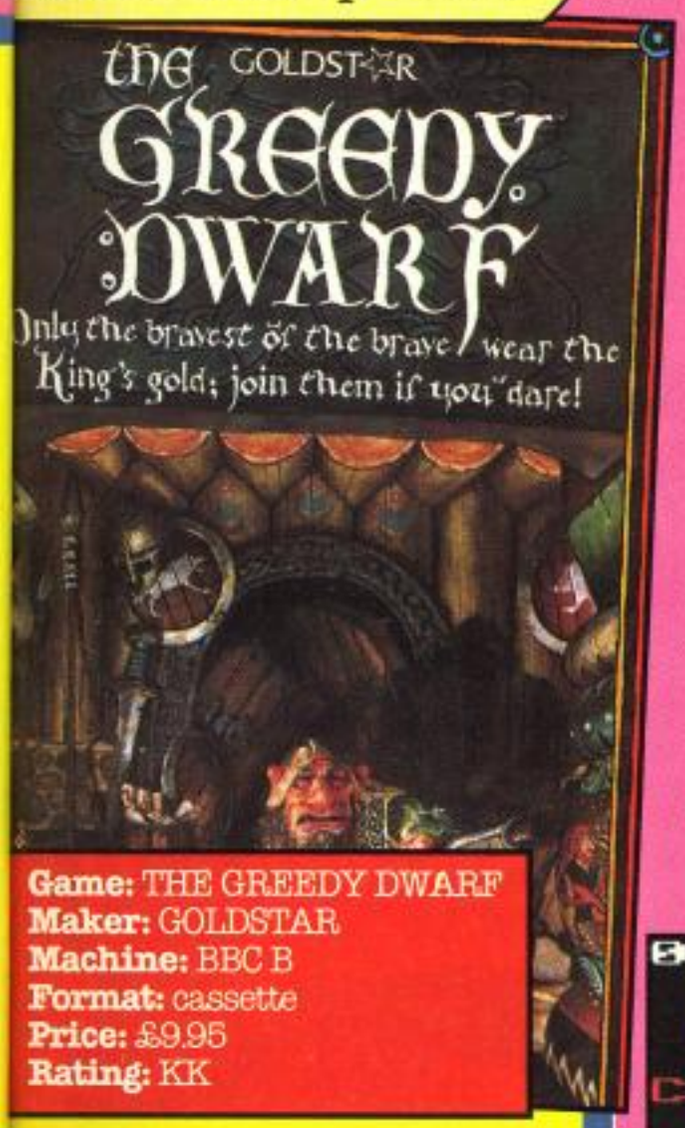
Game: PSYTRON
Maker: BEYOND
Machine: SPECTRUM 48
Format: cassette
Price: £6.95
Rating: KKK







K = Could Be Better
KK = Could Be Worse
KKK = Unsurpassable



Game: THE GREEDY DWARF
Maker: GOLDSTAR
Machine: BBC B
Format: cassette
Price: £9.95
Rating: KK

Space Swarm

Unremarkable fistful of shoot 'em ups that require patience rather than skill. Apparently I've to tackle an oncoming onslaught of alien craft single handed, the rest of the planet having evidently gone to lunch. Sound familiar?

Space Swarm is rather unconventional in that although it offers five different screens you don't have to clear any of them to make any progress. But this is a

rather pointless twist. All the attack waves terminate after a set time regardless of how you're doing. Consequently there's no real challenge or point to the game.

Visually it's okay with the likes of the Galags and Sky Skaters being colourfully rendered, but the sound is a little coarse. I played it with indifference. Not so much hopeless as half-baked I'd say. — **S.K.**

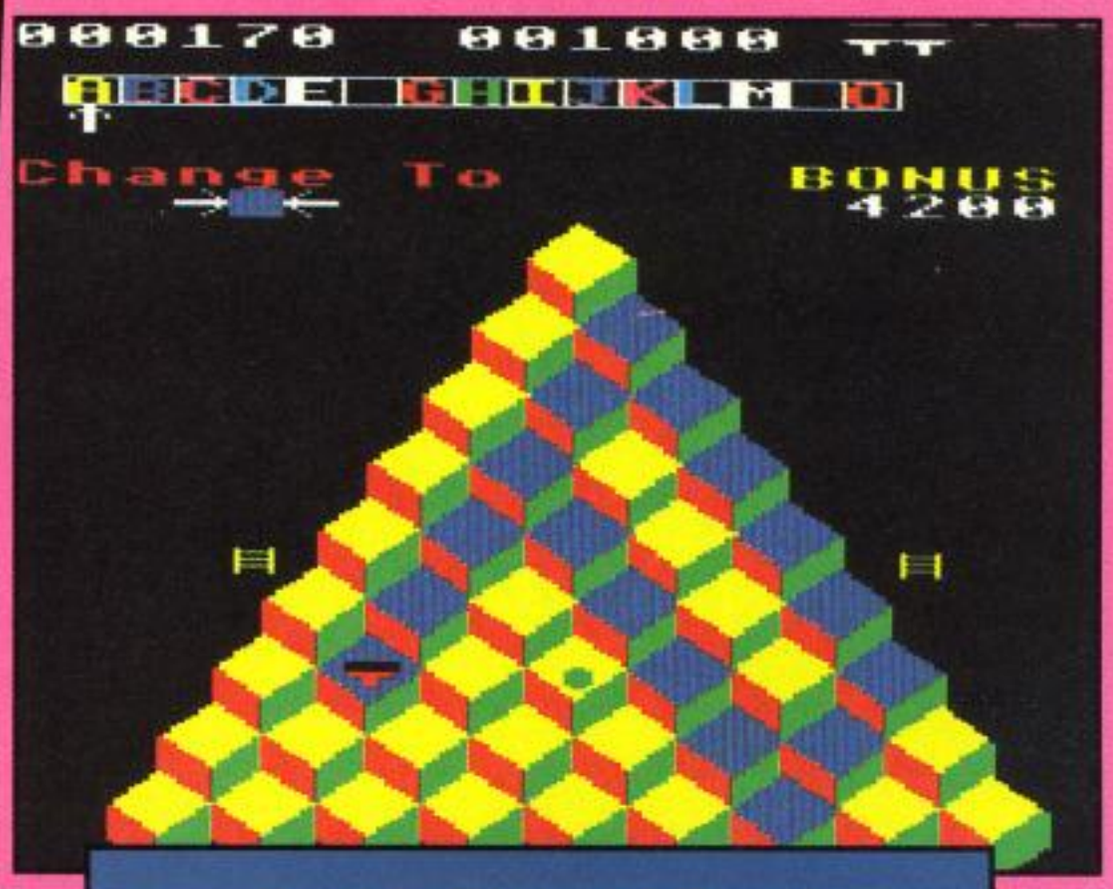
Game: SPACE SWARM
Maker: SOFTWARE PROJECTS
Machine: VIC 20
Format: cassette
Price: £5.50
Rating: K

Cheops Meets Dulux

Hah! You don't fool me. This is *Q-Bert*. Rather a crude Bert at that. Colour plays something of an active part here. Fact is it lights up the room like a disco and without sunglasses leaves you partially blind. *Q-Bert* has fallen in love with the beautiful Princess Aran from Tapen. Before being given access to the hand of said lovely lady he must complete a task set for him by her father, King Eg. This task is the painting of the Great Pyramid of Vali. So you guessed already, huh? Of course there's the inevitable bouncing ball, bouncing from the top of the pyramid, more than capable of pancaking Bert like a frog in the road, and the Thin Man instead of a snake.

The overall impression is one of a game released before the finishing touches are added. It lacks the roundness of a quality game and the key responses aren't what they oughta be. Nevertheless it does have a certain addictive quality, carried over from the original idea, I suppose. But why, would someone mind telling me, do the software houses continue to flood the market with copies of games already available? — **K.A.**

Game: PYRAMID PAINTER
Maker: THOR
Machine: BBC MODEL B
Format: cassette
Price: £5.95
Rating: K

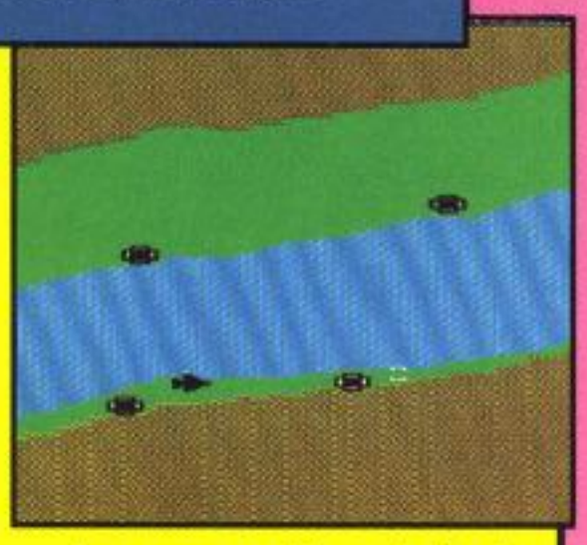


Beeb's River of Death

Shades of Carol Shaw's neat *River Raid* colour this furious Amazonian roller-coaster ride for the BBC B. In it you pilot a fast, if somewhat titchy, strike plane down a ludicrously well defended river canyon in order to decimate some nameless command centre and a nest of nasty missile silos. No easy task!

Missile launchers and popping pill boxes are bolstered by screaming enemy jets and patrol ships as you progress down the river, and it quickly turns into quite a fire-fest! As you might expect on this kind of mission, both of your fire power and fuel supplies are limited. To replenish you'll need to dock with a sister ship which (first) appears at around the 10,000 point mark. Needless to say if you run out of ammo before cranking up that kind of score you're in mucho trouble!

Although I began my fighter pilot career by bemoaning the limit of one plane per game I quickly forgave the oversight and



became well and truly addicted. The graphics are tight and colourful, if a touch symbolic, and the sounds are great. It loads like the last night of the proms!

I'd rate this one of the toughest, tastiest take-em-outs available for the old Beeb and consequently think it's well worth the ackers. Go give 'em hell. — **S.K.**

Game: EAGLES WING
Maker: SOFTWARE INVASION
Machine: BBC B
Format: cassette or disk
Price: £7.95 or £11.95
Rating: KKK

Swooosh!

A whisker late for last winter's Olympics, but this sparky simulation of ski slope bravado is a fresh-faced, cleverly paced game that keeps one steering digit from getting too good and another itching on the replay key.

It comes in three stages — slalom circuit, ski jump and downhill — and your begoggled Olympiast has to negotiate each punishing test with scarcely a pause to dust down his irons. The slalom is a comparative pushover, the jump difficult to garner the big scores on — and the downhill is plain murder. What really lifts the game is the wealth of detail: the sound of approaching skis on the jump followed by the deathly silence when your screen-size Steiner leaps is beautifully done, and the graphics are an all-round classic. When the skier comes to an untimely halt in going for gold, a helicopter breezes on to scoop up the shattered casualty.

In one sense this is an almost perfect game for the micro user, for the lonely dedication of the Slopes Superman makes an apposite heroism for the hacker to aspire to. You won't be piste off with this one too fast. — R.C.

Game: OLYMPIC SKIER
Maker: MR CHIP
Machine: COMMODORE 64
Format: cassette
Price: £5.99
Rating: KKK

K = Could Be Better
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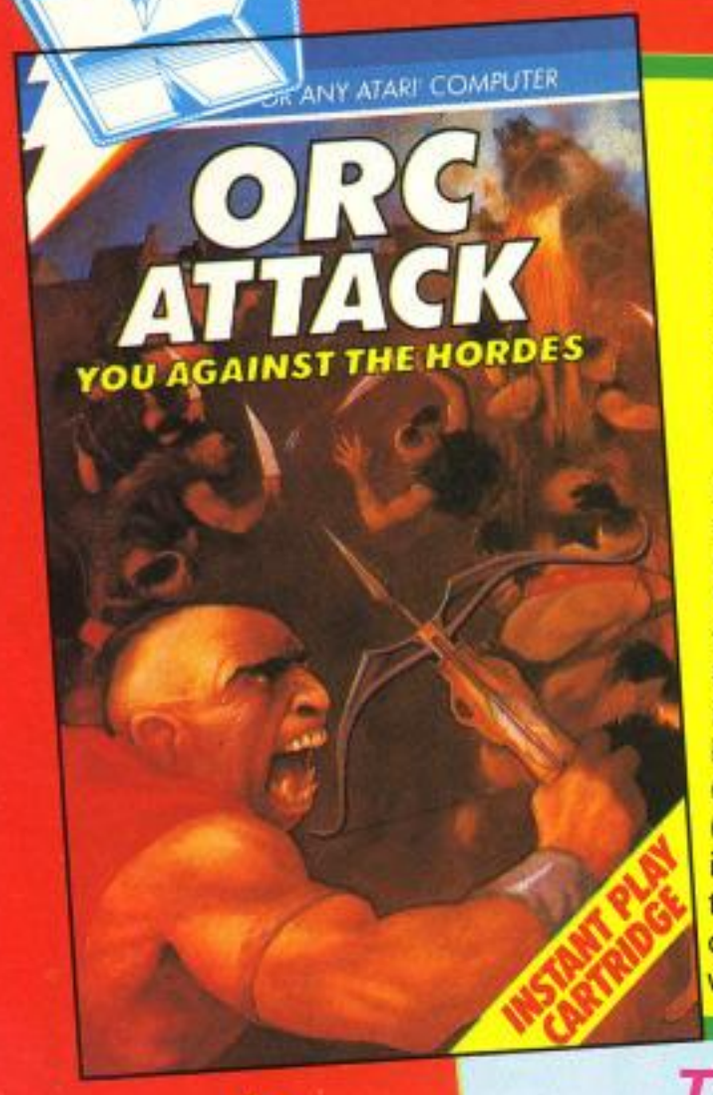

Let's Have A Show Of Heads

When Thorn EMI became Creative Sparks a few months ago they took the opportunity to dump a few pieces of naffware in their previous catalogue. One they didn't dump was *Orc Attack*.

This game has run into a little criticism from the mealy-mouthed on account of there's a lot of gore around. So what? When you're manning the mortices single-handed and endless hordes of evil goblins are scaling the walls, you do what you have to. Luckily you have handy (a) boiling oil, (b) a sword, and (c) a spear. Using these honest implements, you then proceed to slaughter as many of the opposition as you can over four wholesome screens.

Before we go any further let me just say that if you buy the farm your head falls off.

I like this game a lot. The general setup is a little like *Kaboom* — only *you* are the mad bomber, and the bombs you drop are actually buckets of high-temperature oliovascular liquids. Action and movement are very smooth — you leap to and fro along the battlements from boiling-oil store to spear rack, thumbing the fire button with an animal snarl to tip the bubbling pots over the ascending *svartalfar*. Cream the first wave and other nasties, including a sorcerer, finally take you out. But what an end!

Yes, by the Bad Breath of Helm (this *is* based on the Tolkien Helm's Deep episode, isn't it?), *Orc Attack* is a crudely-themed, highly-skilled, totally enjoyable slice of the kind of computer game that gets computer games a bad name among people who think spreadsheets in Arabic are the last word in self-indulgence. Although it's a ROM and therefore pricy, get it if you can. You'll enjoy the bit with the falling head ever so much. — **T.T.**

Game: ORC ATTACK
Maker: CREATIVE SPARKS
Machine: ATARI 400/800/XL
Format: ROM
Price: £9.95
Rating: KK

THIS ROMAN KNOWS . . .

In the neverending race to join the computer games market the software houses, as everyone knows, are adopting an attitude of if it's got 'computer game' written on it publish it'. If it goes on at this rate in six months time we can expect to fork out half a dozen hard earned oncers on something that adds two and two together. *Legion* isn't quite that bad — you've got to give it points for trying. It's an adventure., it's in Basic and it's about as amusing as eating dead cats. Naturally they've done a great job on the cassette inlay. Look at all those words, 'examine', 'smell' and 'wait'. Looks great on the shelf but wait till you get it home. All those lovely words displayed so alluringly elicit a useful response of 'eh?'. In fact apart from 'you can't do that', 'eh?' is the only response it does give. The icing on the cake is a thoroughly unimaginative set of descriptions and a particularly nasty reference to the talking habits of women, something an intelligent author should be above. All in all rather silly and a waste of everyone's time and effort, small though it might have been. — **K.A.**

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You have found:
The cells of a centurion's house.
A very bleak and cold place with two
barred doors,leading North-East and
West.
The doors are locked.
There is: A bunch of keys.
Command?GET
I don't see that here.
Command?GET KEYS
O.k.
Command?W
You can't do that.
Command?NE
You can't do that.
Command?OPEN DOOR
They're now unlocked.
Well done!
O.k.
Command?SCORE
Score=1 point.
Command?
```

Game: LEGION
Maker: SOFTWARE PROJECTS
Machine: BBC MODEL B
Format: cassette
Price: £7.95
Rating: None

Sleep in Wolf's Clothing

Say it in a theatrical whisper: *House of the Living Dead!* Isn't it wonderful! It's the sort of title that conjures up all manner of gross George (*Dawn of the Dead*) Romero-type imagery. Unfortunately those expecting buckets of arcade blood in the gruesome manner of *Forbidden Forest* or *Orc Attack* are in for a disappointment. This is a fun but innocuous (U certificate) maze game in which power pills and ghosts have been replaced by bats and skeletons.

You must collect a segmented holy cross from each corner of the maze and return to the crypt at the centre of the screen. This is simple enough at first as you've only a single bat to contend with, but clear enough screens and you're confronted by hordes of rattling skeletons and dismembered hands (EEK).

The animation is effective and the soundtrack, namely a jovial rendition of the death march, nothing if not appropriate. It's quite a change of pace from Phipps' renowned adventures and an entertaining alternative to the dread *Pac-Man*. — **S.K.**

Game: HOUSE OF THE LIVING DEAD
Maker: PHIPPS ASSOCIATES
Machine: SPECTRUM 48K
Format: cassette
Price: £5.95
Rating: KK

'OW YOU SAY? — "ESCAPE?"'

This promising text adventure was written using *The Quill* (reviewed in BIG K No. 2) and is one of a series released by Gilsoft to promote their adventure-game editor.

Following a mood-setting loading-screen, I found myself in a sparse cell inside a prison fortress from which I had to escape and make my way across a hostile island to safety. Escaping from the prison took a while, but once free I explored a reasonably large area of the island, negotiating deadly wildlife and a tribe of cannibals, amongst other perils. However, after the rigours of escaping the prison, most of the jungle's dangers were — with reasonable care — readily overcome.

With much careful work evident in the adventure, I hope there are some real problems ahead. The well-written descriptions create a good sense of atmosphere and some excellent — often humourous — responses made Devil's Island worthwhile. Useful clues, as the guards gun you down for the Nth time, will help you get events in the correct (necessary) order, making up a little for an ineffectual help response. 'Look' doesn't mean the same as 'examine' (make sure you do) and be sure not to overlook the simple but obvious! — **T.S.**

Game: DEVIL'S ISLAND
Maker: GILSOFT
Machine: SPECTRUM
Format: cassette
Price: £5.95
Rating: KK

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Soft we're not

FOR SPECTRUM 48K

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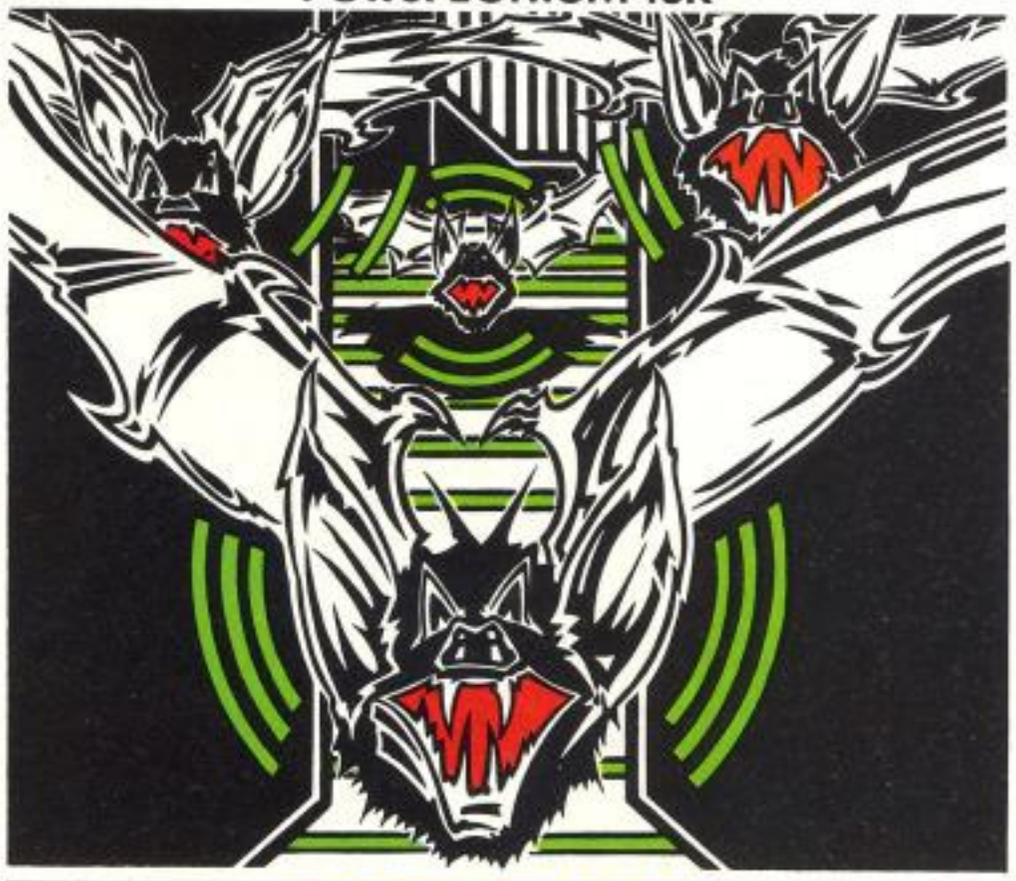
3D BAT ATTACK An all action, 3 dimensional maze game where you gather up blocks of gold, at the same time pitting your wits against vicious vampire bats whose only purpose in life is to locate, hunt and kill you.

4 levels of skill. At each level the game gets faster and more complicated, and the vampires more dangerous.

CheetahSoft
Soft we're not

FOR SPECTRUM 48K



3D BAT ATTACK

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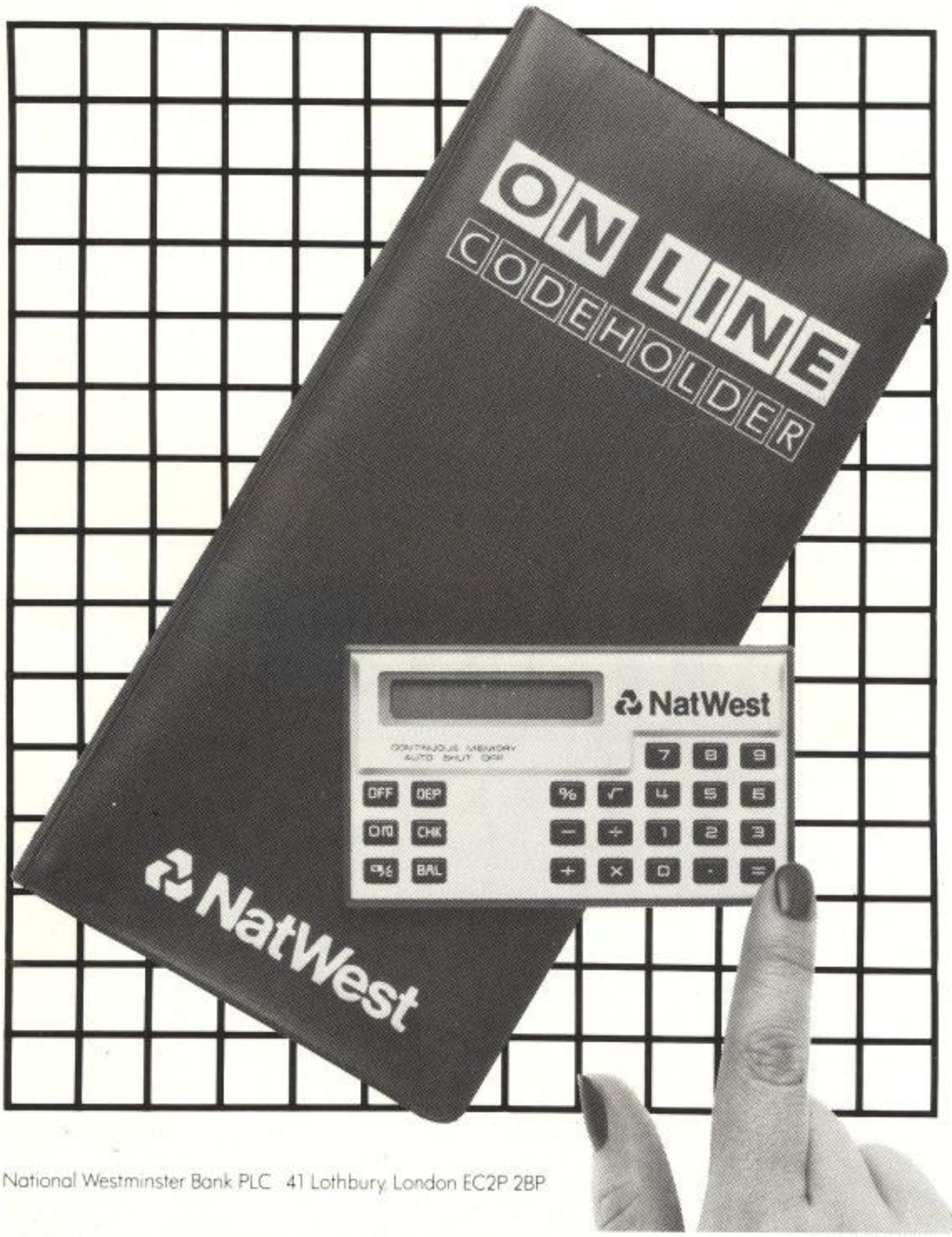

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KOSMIC KANGA

KOSMIC KANGA, a multi-screen, amazing, arcade standard original action game. Featuring superbly animated graphics and packed full of arcade features. Help **KANGA** find his space ship so he can return home to his planet. Leap about buildings, trees, clouds etc., pick up bonuses and throw boxing gloves at the enemies.

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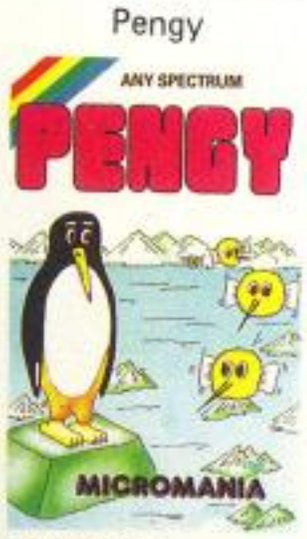
Tutankhamun

48K Spectrum

Pengy



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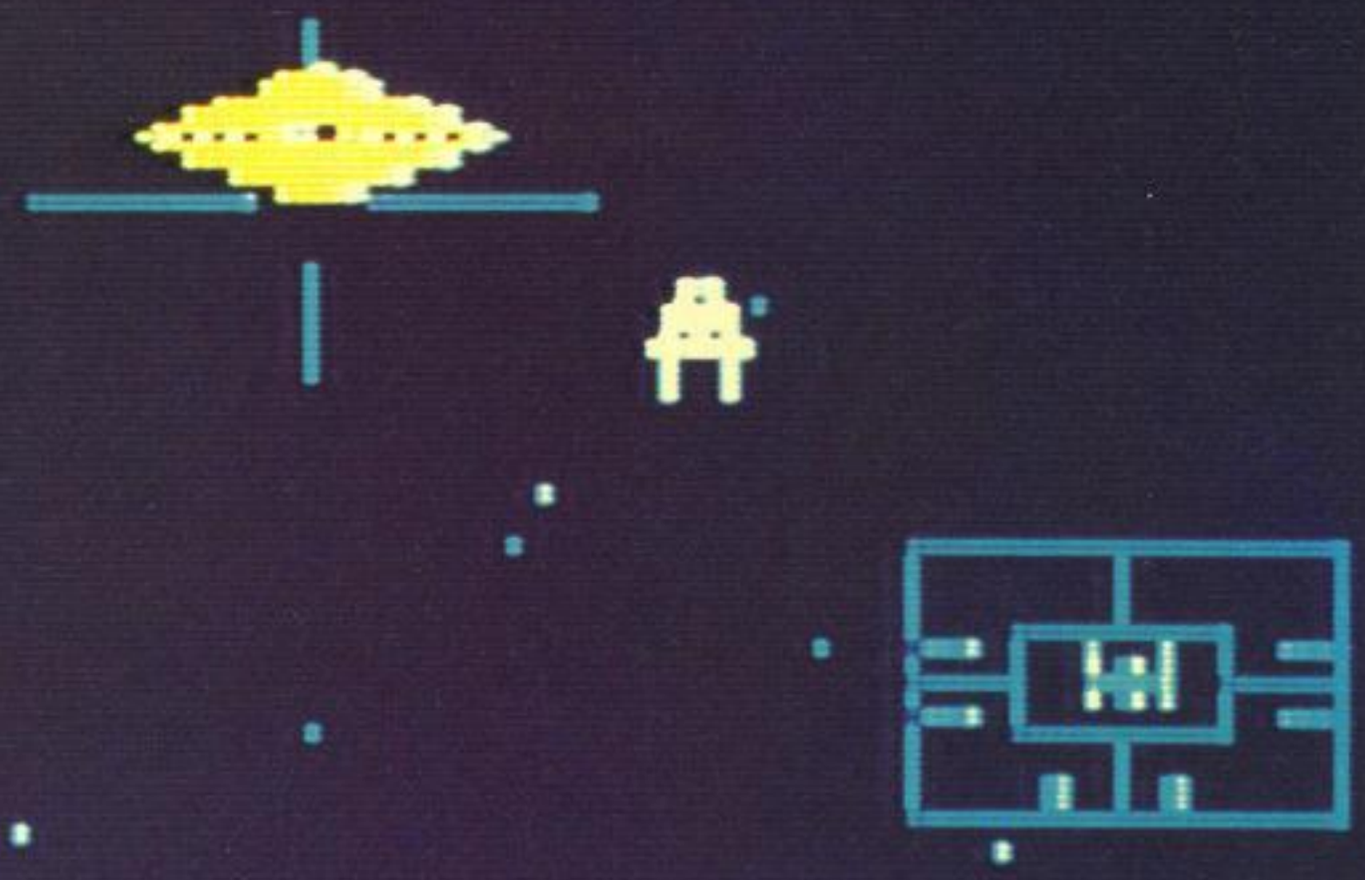
No. 4: STAR RAIDERS (ATARI)

In both VCS and computer formats, Atari's STAR RAIDERS cart has set the standard for 3D space war. TONY TYLER explains why.



WAIT TILL YOU SEE THE GREENS OF THEIR EYES...

ON THE FACE of it, the plot is familiar.

There you are, sole bristle-jawed survivor of a space corps decimated by the oncoming Fnurgs (or whatever). Luckily (thanks to those good ol' Earth boffins), there's a super-duper spacecraft just completed, ready for a hotshot pilot to take it up and Do What Must Be Done. Individually, it's a match for any Fnurg ship; it's the odds that make it difficult.

Yes, it's you against the universe.

Nothing new about that, of course.

However, this particular scenario has more than shade or two of *Defender*. Your ship is better than the Opposition's. For a start, despite their numbers, you alone have the inestimable advantage of The Warp. That's right, with a press of a key you can bring up a Galactic Grid that shows you at a glance where everybody is, including your own space stations and the enemy positions. After that, it's just a matter of selecting H for Hyperdrive, F for Front View . . . and then grimly keeping the target cursor lined up on the spatial foresight as Einstein gets shot to Hell and you turn into a collection of tachyons, ending up the wrong side of FTL drive and in your chosen destination. Then . . . a brief flash of L to give you the long range radar view, a touch of the keyboard to bring your speed up to a decent combat velocity (say, 6), and it's hunt-the-spook through the starfields until your energy runs low, you take too many hits (despite Shields), or you simply cream the Opposition right outta that particular sector.

It's tough being Buck Rogers. Even tougher being his groovier younger brother Phil.

Quite when the first game designer decided to blow out the hitherto-standard gamer's viewpoint of look-down or look-along remains unclear. It remains certain however that Atari's *Star Raiders* — like many another good idea an arcade steal — required some heavy-duty 3D thinking from its designer. The starfield rushing past, for example, is done by split-screen scrolling (the split occurring vertically down the middle), but so smoothly that you fall completely under the illusion that the starfield is rushing past in every azimuth.

Then there's the simple enough idea of the cursor AS the ship — move the ship and you move the cursor/gunsight. Press fire and the hapless Zit or Fnurg or Whatever gets his lunch between his optical extensors. Blow the mother up and the interstellar debris of his remains sails past your head in delicious slow motion. Miss — or forget to switch on your shields — and you become somebody else's lunch. Scroll in any dimension. Achieve Front or Aft views. And — best of all — dock and replenish at the mother ship.

Very difficult, this one. You have to find the right galactic sector, warp there OK, use Long Range Radar to identify the friendly ship and the GO VERY SLOWLY (say, Warp 2 at max) until you get the glowing little bleeder lined up in your gunsight. Down to Warp One should see you docked. Wait while the shuttle comes out to replenish you — then off and away again.

Keep moving at high-ish speed. Keep your shields up — even if the greenish glow gets on your nerves (it's worth it). Flip between Aft and Front View. Use your Computer Gunsight until it gets shot away.

Never give up.

People don't give up on *Star Raiders*. Like a few other designs, the number of its clones is legion (no names, no pack drill . . . you know who you are). But the Atari being the machine it is (and even the VCS is full of hidden surprises), it stands to reason that any game from their golden era is going to have something of the All Time Standard about it. *Star Raiders* is not only the original 3D Space War, it's still the best. As a ROM of course it's expensive — even in VCS form (which incidentally uses a special one-time-only keypad). But with full use of the keyboard as well as superb joystick action, as well as the best visuals in the business (and some of the best sound) it's in a class of its own.

This one will Run and Run. It already has . . .

TONY TYLER

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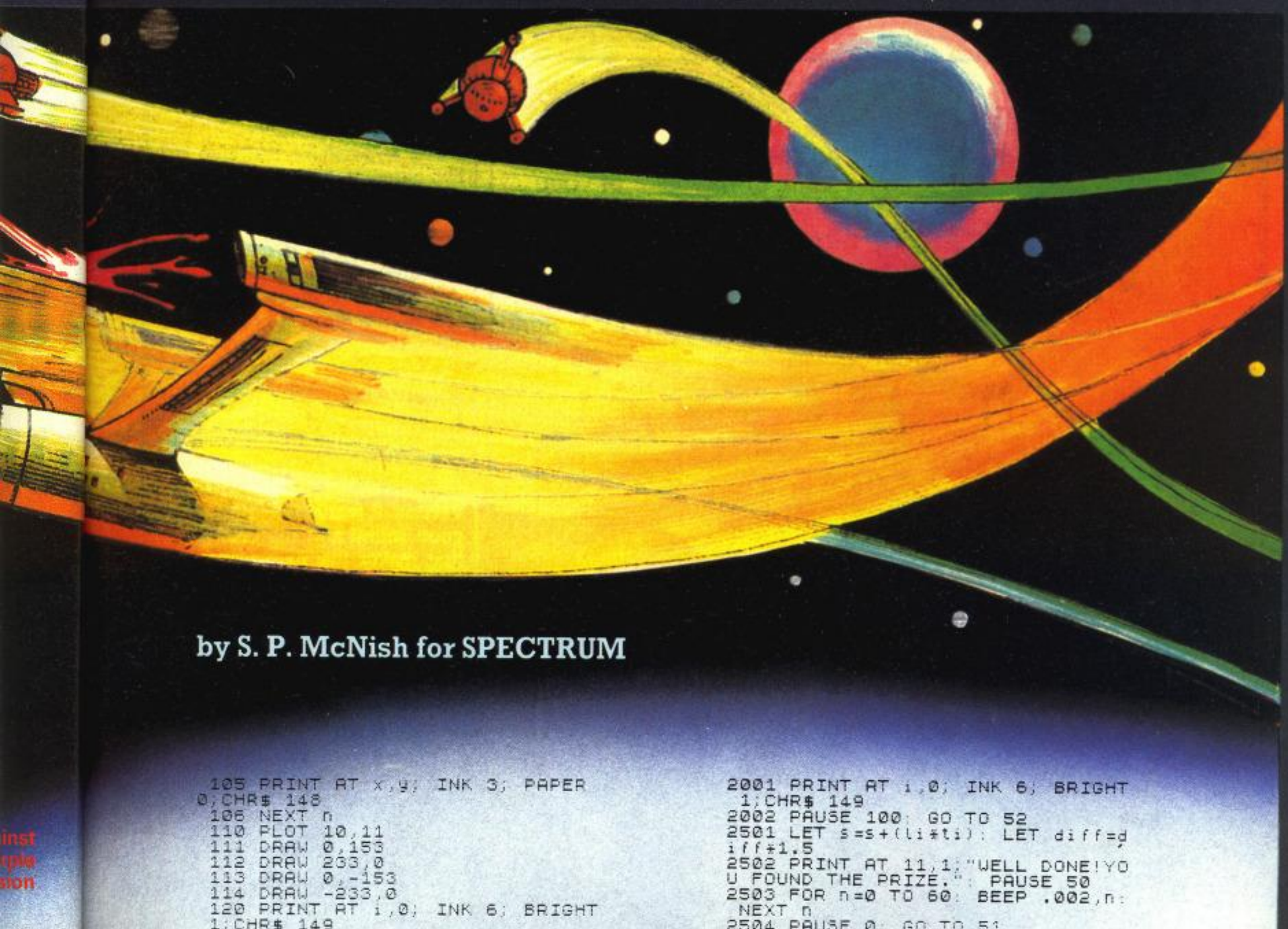
GAME CONTROLS:

K — left
L — right
D — up
C — down

```
  2 GO SUB 3000
  7 LET hi=0: LET a$="Simon"
  8 INK 7: PAPER 1: BORDER 1: C
LS
  9 PLOT 49,148: INK 5: GO SUB
6000:
 10 PRINT AT 3,8;"PACE"
 11 PLOT 114,148: GO SUB 6000
 12 PRINT AT 3,16;"EEKER"
 14 PRINT AT 1,28; INK 6;"By";A
T 2,28;"SPM"
 15 PRINT AT 8,3; INK 4;"The ob
ject of 'Space Seeker' is to fin
d the hidden prize      shown by
the arrows at the start of each
frame.                    Avoid
the bollards("; INK 3;CHR$ 148;
INK 4;") and theedge of the scre
en."
 30 PRINT AT 16,12; INK 5;"HI S
CORE";AT 18,12;hi;" by ";a$
 48 PAUSE 0
 49 BORDER 0: PAPER 0: INK 7: C
LS
 50 LET s=0: LET li=3: LET diff
=20
 51 LET i=INT (RND*18)+2: LET p
=INT (RND*28)+2
 52 LET ti=500: LET a=11: LET b
=15: LET dir=4
 99 CLS
100 FOR n=0 TO diff
101 LET y=INT (RND*28)+2
102 LET x=INT (RND*18)+2
103 BEEP .005,y
104 BEEP .005,y+20
```



by S. P. McNish for SPECTRUM

```
 105 PRINT AT x,y; INK 3; PAPER
0;CHR$ 148
 106 NEXT n
 110 PLOT 10,11
 111 DRAW 0,153
 112 DRAW 233,0
 113 DRAW 0,-153
 114 DRAW -233,0
 120 PRINT AT i,0; INK 6; BRIGHT
 1;CHR$ 149
 121 PRINT AT 21,p; INK 6; BRIGH
T 1;CHR$ 94
 130 PAUSE 20: PRINT AT i,0;" ";
 PRINT AT 21,p;" "
 150 PRINT AT a,b; INK 5;CHR$ (1
43+dir)
 151 FOR n=0 TO 1
 152 BEEP .009,(20-a)+20: BEEP .
01,(20-a)+10: BEEP .007,(20-a)+1
7
 153 NEXT n
 159 LET n=CODE (INKEY$)
 160 IF INKEY$="" THEN GO TO 176
 161 IF n>101 THEN LET dir=n-106
 162 IF n<101 THEN LET dir=n-96
 163 IF dir>4 OR dir<1 THEN LET
dir=4
 164 IF n=103 THEN GO TO 5000
 176 IF a=i AND b=p THEN GO SUB
2500
 180 LET ti=ti-1
 181 IF INKEY$<>"" THEN LET ti=t
i-1
 182 PRINT AT 0,6; FLASH 1;"TIME
"; FLASH 0;" ";ti; PRINT AT 0,17
; FLASH 1; INVERSE 1;"SCORE"; FL
ASH 0;" ";s
 183 IF ti=0 THEN GO TO 1000
 190 PRINT AT a,b;" "
 191 IF dir=1 THEN LET b=b-1
 192 IF dir=2 THEN LET b=b+1
 193 IF dir=3 THEN LET a=a+1
 194 IF dir=4 THEN LET a=a-1
 195 IF SCREEN$ (a,b)<>" " THEN
GO TO 1000
 200 GO TO 150
1000 LET li=li-1:
1001 IF li>0 THEN PRINT AT 11,7;
li;" lives left": FOR n=0 TO 20:
 BEEP .009,-20: BEEP .01,-15: NE
XT n: PAUSE 0: PAUSE 50: BEEP .0
.1,20
1500 IF li=0 THEN GO TO 5000
1998 PAUSE 0:
1999 PRINT AT 21,p; INK 6; BRIGH
T 1;CHR$ 94
2001 PRINT AT i,0; INK 6; BRIGHT
 1;CHR$ 149
2002 PAUSE 100: GO TO 52
2501 LET s=s+(li*ti): LET diff=d
iff*1.5
2502 PRINT AT 11,1;"WELL DONE!YO
U FOUND THE PRIZE.": PAUSE 50
2503 FOR n=0 TO 60: BEEP .002,n:
 NEXT n
2504 PAUSE 0: GO TO 51
3000 RESTORE 3020
3001 FOR n=USR "a" TO USR "f"+7
3002 READ g: POKE n,g: NEXT n
3020 DATA 6,31,63,210,63,31,6,0
3021 DATA 0,96,248,252,75,252,24
8,96
3022 DATA 108,254,238,108,124,40
,16,16
3023 DATA 8,8,20,62,54,119,127,5
4
3024 DATA 60,24,153,255,255,153,
24,60
3025 DATA 0,8,4,126,4,8,0,0
3026 RETURN
5000 CLS : PRINT AT 6,6; INK 3;"
YOU SCORED ";s;" PTS."
5050 FOR n=0 TO 60: BEEP .002,n:
 NEXT n
5070 IF s>hi THEN PRINT AT 11,6;
 FLASH 1;"■*■*■*";"HISCORE";"*■*
■*■": LET hi=s: PRINT AT 13,6;"I
NPUT YOUR NAME": INPUT a$
5075 FOR n=0 TO 500: NEXT n
5080 PRINT AT 15,6;"  AGAIN?": I
F INKEY$="Y" OR INKEY$="y" THEN
GO TO 5500
5085 IF INKEY$="" THEN GO TO 508
0
5090 BORDER 1: PAPER 1: INK 3: C
LS : FOR n=1 TO 360 STEP 5: LET
m=n/180*PI
5095 PLOT 128,87
5100 DRAW COS  *80,SIN m*30
5115 BEEP .009,n/4-20
5120 NEXT n
5200 PRINT AT 4,12; FLASH 1; INK
 6;"Bye-bye!": PAUSE 0: RANDOMIZ
E USR 0
5500 PAUSE 0: PRINT AT 18,6;"INS
TRUCTIONS?": PAUSE 0: INPUT INKE
Y$: IF INKEY$="y" OR INKEY$="Y"
THEN GO TO 8
5999 GO TO 50
6000 DRAW 0,-16,(PI*3)/3: DRAW 9
,23,PI*2/3: DRAW 0,16,(PI*3)/3:
DRAW -9,-23,PI*2/3: RETURN
```

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68000 ASSEMBLER

BERNARD TURNER Motorolas blithely on with his series on programming the Wonder Chip mnemonic-style. Don't know what a 'mnemonic' is? Then JMP to another location . . .

TO COMMUNICATE with the outside world Input/Output (I/O) chips are required by any computer. These are normally used as part of the keyboard, cassette port, video display chip, floppy disc and/or RS232 port hardware, depending on how the micro has been designed. In 68000-based machines these chips are "memory-mapped" and their internal registers are accessed as though they were just another part of the memory. This method is probably familiar to those of you who use 6502, 6800 or 6809 chips, but may be a little foreign to those among you who use the Z80 and its "IN" and "OUT" instructions.

Instructions tell the MPU what to do and are held as numbers stored in memory. The 68000, not being a 8-bit processor, reads instructions from memory in two-byte (word) chunks. The instruction read determines the functions performed as denoted by the particular number. Numbers are not very easy to remember, so for us humans the instructions are given names to indicate their function; these are called "Mnemonics" (Memory aids). It is these mnemonics that you type in when writing a 68000 (or any other) assembly language program. The assembler's job is to read your typed-in code (source program), converting the mnemonics back into the corresponding numbers which they represent. When the assembly is complete the MPU can then directly process the assembled numbers. This assembled program is called the "Object program".

All 68000 instructions are an even number of bytes in length. Similarly all 68000 instructions must be placed on an even numbered memory address boundary, due to there being no AO address line (do NOT confuse with the AO address REGISTER). If the instruction falls on an odd memory address then an Address Exception will occur.

Not only are Instructions and I/O chips part of the memory but so also are Data. If you program in Basic, Pascal or a similar high level language then you will not have concerned yourself with where and how your data is physically placed, or how to retrieve it. When programming in an assembly language this is now part of your jurisdiction. Data contained in memory is held only as numbers. It is how you look at and use data which determines how it appears to the person using your machine code program. Accessing of data is often termed "Addressing" — or producing different ways of determining where the data is obtained from. The 68000 provides the following methods of addressing:

EFFECTIVE ADDRESS MODES	NOTATION
Data register Direct	**Dn**
Address register Direct	**An**
Address register Indirect	**(An)**
Address register Indirect with postincrement	**(An)+**
Address register Indirect with predecrement	**−(An)**
Address register Indirect with displacement	**d(An)**
Address register Indirect with Index and displacement	**d(An,Xi)**
Program Counter Relative	**d(PC)**
Program Counter Relative with index	**d(PC,Xi)**
Absolute	**Abs.**
Immediate	**#**

(N.B. "n" can be 0 to 7.)

Implicit, also known as Implied or Inherent, addressing is also incorporated in the 68000 architecture. It is the addressing mode that is used when using instructions such as 'RTS' (Return from Subroutine). Although the Program Counter is affected, it is not explicitly stated in the instruction as the addressing mode to use.

Generally speaking the format of a 68000 assembly language instruction is in three parts (there are exceptions). The mnemonic and its associated data size indicator constitute the first part. The mnemonic states which function you require of it. After the mnemonic and a full stop the data size indicator is placed. It denotes by a "B", "W", "L", or "S" what size data to act upon. The two parts following the mnemonic and Data Size Indicator are separated by a comma and are known as the operands. The first operand of the instruction states where to obtain the data to act upon. This is called the "Source" operand. The second operand of the assembly language instruction states where the processed data will be placed when the instruction has finished. It is known as the "Destination" operand.

The Size Indicator states the number of bits associated with the instructions data: "B" for byte (8-bit) sized, "W" for word sized (16-bit), "L" for long word sized (32-bit), and "S" indicates short addressing when used with a branch instruction (16-bits). If the Size Indicator is omitted then the assembler should default to word size.

Operands, source and destination, can all use any of the applicable adressing methods (or "modes") stated above, but you will find that there are some restrictions, depending on the instruction itself — such as having the use of any adress mode for only one of the operands. That is, you may use any address mode for source OR destination operand, but possibly be forced to use a register for the other operand. These restrictions will become clearer when the instructions themselves are discussed.

Okay, we now have an idea of obtaining and storing processed data, but what can we do with it? Firstly each instruction will fall into a particular group, those being: control, arithmetic, shift and rotate, bit manipulation or logical functions. Secondly you'll find that if you are used to long statements in BASIC such as

●LET D=(A+B) * (A−B)●

then you can forget all about that! Small is beautiful! The process will have to be broken up into small steps such as:

●LET C=A+B●
●LET D=A−B●
●LET D=C * D●

We'll now attempt to simulate this in 68000 code!

If the example below is considered with the 'parallel' of D1 synonymous with "A", D2 with "B", D3 with "C", D4 with "D" then it may become clearer. (If all those vitamins don't make you clearer nothing will!)

EXAMPLE

```
.BEGIN
   MOVE.W  D1,D3   store "A" in "C"
   ADD.W   D2,D3   sum "B" TO "C", " 'C' calculated"

   MOVE.W  D1,D4   store "A" in "D"
   SUB.W   D2,D4   subtract "B" from "a" contained in "D", " 'D' calculated"

   MULS D3,D4   multiply "c" by "D" placing result in "D", " 'D' calculated" .FINISH

JMP FINISH   stop processing falling through.
```

This source listing contains four fields (areas) on each line. Reading across from left to right we have a 'label' field used to assign

values that the assembler and programmer use instead of actual addresses. This is so that the program is easily reassembled in different locations. Secondly we have the mnemonic field and its attendant Data Size Operator. In the third field we find that we have two pieces of information for the most part, namely the source and destination operands (the exception in this example being the JMP instruction). Finally in the fourth field we have comments. Comments are not part of the finally-assembled object program. They are there, like REMS in BASIC, merely as an aid to the programmer.

Quickly skipping over the label "begin" we come to the instruction "MOVE". This instruction is one of the most used instructions, especially if you are interested in doing character graphics on a bit-mapped screen, say for example on the Sinclair QL. The MOVE instruction comes in several varieties; the one concerning us here is termed by Motorola as "Move data from Source to Destination". What it does is to obtain data from the place indicated by the source operand — in this case from the Data register 1 (D1) — and place it where the Destination Operand dictates. In this example it is placed in Data Register 3 (D3). You should be careful when using the MOVE instruction, because it overwrites without thought whatsoever for what is contained in the Destination location. MOVE can also cause disaster if used when trying to read from I/O chips (e.g. 6850 ACIA) that clear their internal states when read. (To overcome this problem there is another instruction called MOVEP which we will discuss later.) The MOVE instruction does not affect the source operand at all, but it does affect the flags in the processor's condition code register. It always clears the Overflow and Carry Flags to zero. It sets the Negative Flag to "1" if the result is negative, otherwise it clears it to zero. It sets the Zero Flag to "1" if the result is zero, else it clears the flag to zero. The Extended Flag is unaffected. You may also like to note that the size of the data moved is word sized; because of this it will not affect the two most significant bytes in either source or destination. Other sizes permissible are Byte and Long Word. Permissible Address Modes are for:

MODE	source	destination
Dn	**yes**	**yes**
An	**yes***	**no**
(An)	**yes**	**yes**
(An)+	**yes**	**yes**
−(An)	**yes**	**yes**
d(An)	**yes**	**yes**
d(An,Xi)	**yes**	**yes**
Absolute	**yes**	**yes**
d(PC)	**yes**	**no**
d(PC,Xi)	**yes**	**no**
Immediate	**yes**	**no**

***Byte size not allowed.**

ADD, like MOVE, has two operands, source and destination. This instruction is best thought of as 'sum source to destination' — that is, add (in binary format) the source to the destination and place the result in the destination. In this example the size operand is set to 'word', thus only the lower two bytes of the registers D3 and D2 are used. Similar to the MOVE instruction described above, the Source Operand is read only, and thus does not change. The Destination will contain the result of its previous contents and the contents of the Source Operand, summed together. Those of you out there who have programmed the 6502 and are familiar with its 'ADC' (Add With Carry) instruction may like to note that the Carry Flag is not added into the result when using this 68000 instructions. Thus the Carry Flag does not affect the result placed in the destination operand. After the ADD has been done the Condition Code Registers flags are set as follows, depending on the result:

FLAG	SET	CLEARED
N	**Negative**	**If zero or positive.**
Z	**Zero**	**If not zero.**
V	**Overflow**	**If no Overflow occurred.**
C	**Carry Generated**	**If Answer can be contained in Destination.**
X	**Copies the C flag.**	

When using the ADD instruction one of the operands MUST use a data register as one of the operands. If you are using it as the Destination Operand then any Effective Address mode is applicable for the Source Operand (including any data register). If you don't use a data register as a Destination Operand, you MUST therefore use a Data Register as the Source Operand. If this is the case then only the following Effective Address Modes are allowable for the Destination Operand:

Modes Allowed when the Destination Operand isn't a Data Register:

(An)	(An)
(An)+	(A
−(An)	−(
d(An)	d)
d(An,Xi)	
Absolute	

The Second MOVE is the same as the first MOVE except that Data Register D4 and D1 are used.

The Subtraction instruction takes the Source from the Destination Operand, placing the result in the Destination. Like the ADD instruction it is carried out in binary arithmetic. The instruction has identical restrictions to the ADD instruction, regarding the necessity to use a Data Register as one of its operands. Flags affect, and are affected, in an identical manner to the ADD instruction. In this example D2 is subtracted from D4. The result is placed in D4.

MULS is the 68000 mnemonic that represents the instruction to do a signed multiply of the Source Operand and a Data Register, which must be used as the Destination Operand. All Effective Address modes (except An) are allowed for the Source Operand. The instruction takes both operand's data as signed 16-bit numbers, producing a signed 32-bit result which is placed in the Destination Operand. In the example above the D3 register is multiplied with the D4 register. The result is placed in D4. No flags affect the operation of this instruction, but all of the flags in the Condition Code Register (except the X Flag) are affected by the result. The flags are affected in the following manner:

FLAG

N Set if the result is negative, cleared if the result is zero or greater then it is cleared.
Z Set if the result is zero, if it isn't zero then it is cleared.
V Always cleared in zero.
C Always cleared to zero.

I have included a JMP instruction at the end of the program to stop the processor continuing further into memory; if it did so then it would try to execute unintended instructions that the memory contain thus it acts as a 'safety net', not allowing processing to fall through. The JMP instruction directs the processing from a position in memory to a position indicated by its operand, i.e. It 'jumps' the processing to a new location. The assembler will substitute the value of a label as an instruction's operand. A label is given a value by typing the label's name in the label field. In this example of JMP we have a label 'Finish' as the operand. The JMP instruction requires an address to jump for its operand. Immediately before the instruction, in the label field, 'finish' has been typed. This allocates 'finish' the value according to its location. Anywhere 'finish' is used in the source program the assembler will substitute the value it has been allocated. The assembler will therefore generate the address of the JMP instruction as the label's value. When the instruction is executed it will jump back to the start of the JMP instruction and then execute the JMP again — creating an endless loop. If you run this program you will find that the only way to reclaim the machine is either to press the reset switch or jiggle the power. The JMP instruction is not affected, and has no effect, on the Condition Code Flags. Generally a preferable method of ending a program is to use an 'RTS', 'RTE' or 'RTR' instruction to return you to the calling program. We shall be looking at these in future articles.

RECAP

We have briefly looked at I/O Devices as part of the memory map. We saw that 68000 instructions are formed from a Mnemonic, data size operator and the mnemonics operands (if the instruction requires them). That Operands could be up to two in number and that they are termed the Source and Destination. Following this it was pointed out that there were restrictions on permissible addressing modes for operands and that the restrictions were dependent on the particular instruction. The format of an assembly language source line was discussed and finally a small example was explained. Continuing the series we will look at address modes in more detail.

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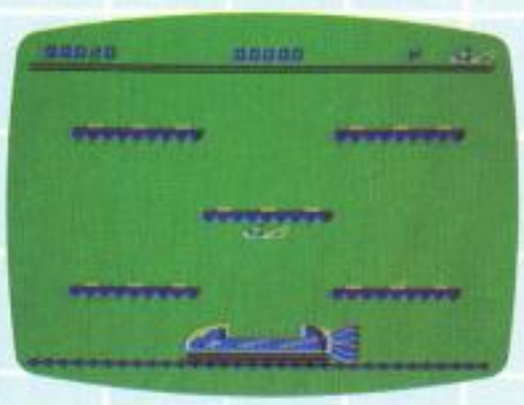

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SP = Spectrum, AC = Acorn, 64 = Commodore 64,

key

V20 = Vic 20, 81 = ZX 81, DR = Dragon 32, OR = Oric

TOP 30 GAMES (Retail)

				SP	AC	64	V20	81	DR	OR	Price
1	1	JET SET WILLY	Software Projects	*							£5.95
2	2	FIGHTER PILOT	Digital	*							£7.95
3	7	BLUE THUNDER	Richard Wilcox	*							£5.95
4	25	TRASHMAN	New Generation	*							£5.95
5	15	CODE NAME MAT	Micromega	*							£6.95
6	13	NIGHT GUNNER	Digital	*							£6.95
7	5	CHECQUERED FLAG	Psion	*							£5.95
8	3	ATIC ATAC	Ultimate	*							£5.50
9	9	POGO	Ocean	*							£5.90
10	6	HUNCHBACK	Ocean	*		*					£6.90
11	12	FRED	Quicksilva	*							£6.95
12	—	SPACE PILOT	Anirog		*		*				£7.95
13	—	GNASHER	Mastertronic	*							£5.95
14	8	SCUBA DIVE	Durell/Martech	*		*			*		£6.95
15	—	BLADE ALLEY	PSS	*							£5.95
16	4	MANIC MINER	Bug-Byte	*		*					£7.95
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18	17	REVENGE OF THE MUTANT CAMELS	Llamasoft			*					£7.50
19	—	PSYTRON	Beyond	*							£7.95
20	11	LUNAR JETMAN	Ultimate	*							£5.50
21	16	ZAXXAN	Starzone	*							£5.95
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VIDEO GAMES (Dedicated Consoles)

1	(1)	POLE POSITION (Atari)
2	(4)	PITFALL 2 (Activision)
3	(3)	SUPER COBRA (Parker)
4	(5)	MARIO BROTHERS (Atari)
5	(11)	FROSTBITE (Activision)
6	(2)	SPACE SHUTTLE (Activision)
7	(6)	POPEYE (Parker)
8	(9)	DEATH STAR BATTLE (Parker)
9	(8)	ENDURO (Activision)
10	(7)	MS PAC MAN (Atari)
11	(10)	Q-BERT (Parker)
12	(15)	FROGGER (Parker)
13	(13)	PHOENIX (Atari)
14	(23)	RIVER RAID (Activision)
15	(16)	DONKEY KONG (CBS/Coleco)
16	(18)	DIG DUG (Atari)
17	(12)	GALAXIAN (Atari)
18	(14)	BATTLE ZONE (Atari)
19	(22)	BIG BIRD EGG CATCH (Atari)
21	(20)	PITFALL (Activision)
21	(26)	SPACE INVADERS (Atari)
22	(—)	KANGAROO (Atari)
23	(—)	ALPHA BEAM (Atari)
24	(17)	SNOOPY VS THE RED BARON (Atari)
25	(—)	DECATHLON (Activision)
26	(19)	MOON PATROL (Atari)
27	(25)	COOKIE MONSTER MUNCH (Atari)
28	(29)	SMURFS (CBS/Coleco)
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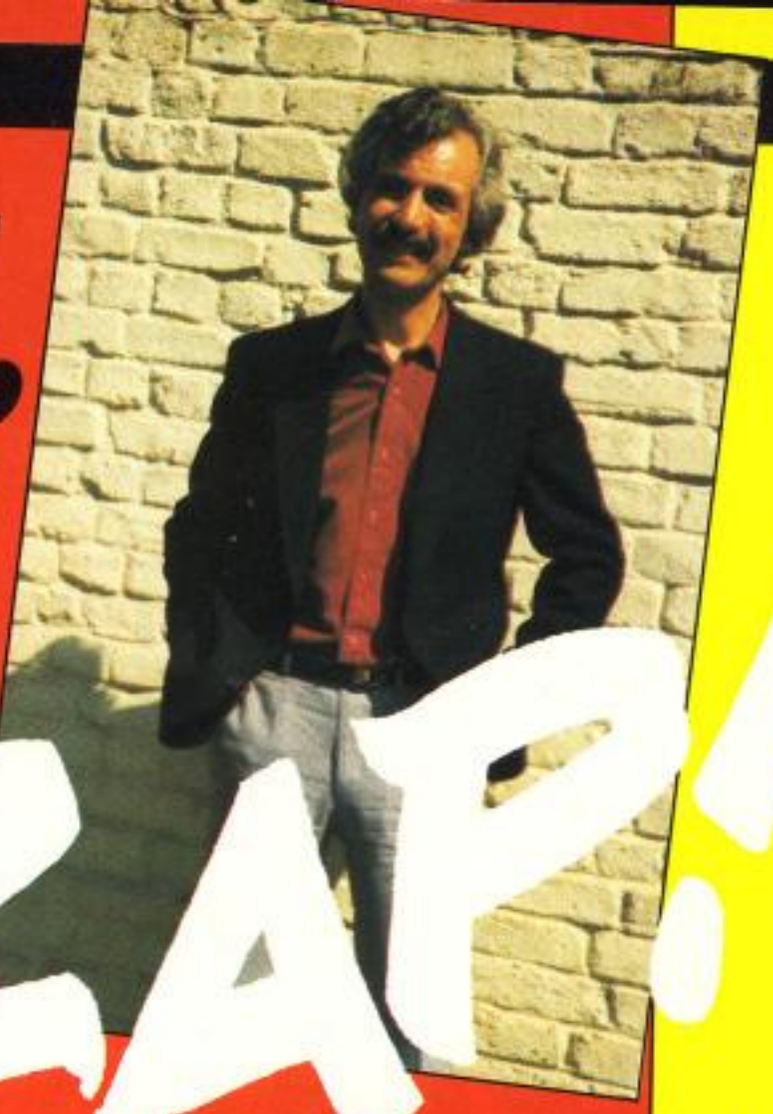
Slow, Quick, Slow, Quick, ZAP!



You don't have to be 13 years old with zits to be a whizz-kid. TERRY WATTS, K-TEL'S ace code-goader, is a withered 42, for example. AND a former Ballroom Dance champion. How unlikely a combination is that? NICKY XIKLUNA investigates . . .

TERRY WATTS, star K-TEL programmer, admits that he's not only a veteran of the Rock and Roll generation, but an uncontrollable manic enthusiast.

Terry's arrival is best equated with that of the fireball that suddenly zaps across the screen in his game, *City Attak*. Swarthy, bright-eyed and mustachioed, he has a wiry dancer's frame that has turned its way through many a tango in his other life as a dance teacher.

A Dance Teacher??

So how did the Suave Southender get programming?

"A dead giveaway of the manic enthusiast is fascination with gadgetry. Computers seemed like a gadget *par excellence*. I just had to have a go. So I built one."

A few months later, Quicksilva found themselves with *Quintic Warrior*, a Vic-20 best-seller.

CLASSICS

Terry wants to write classics — games that are totally absorbing time after time. "Some games simply prey on your ego," explains Terry. "You are compelled to keep playing out of sheer frustration, but you don't actually like them." Terry has written two very sophisticated games for K-Tel, *Odyssey* and *City Attak*, which certainly prove his pudding. We asked him for the recipe.

"I don't start by trying to think up original ideas. I play for hours, searching for a 'hook'. A movement, perhaps, only lasting a few seconds — but one that you want to keep doing again and again. That's my trigger to a train of thought — and I'm off!"

Mistakes can also be a source of inspiration. Should you get shot whilst playing *City Attak*, observe the flickering tongues of flame that engulf your prone craft. Realistic, huh? Terry stumbled across this effect when he forgot to terminate a lightning flash. It combined with another character, and the resulting sprite sparkled alluringly. "Eureka!" cried Terry, for he had Discovered Fire.

Being a little older than the common garden whizz kid has its problems. Running a busy dance studio and a young family take up a lot of time. Terry's favorite programming hours are midnight to 6 am. **(Nothing unusual there — Ed.)** His young son 'persuaded' him to become nocturnal in order to avoid distractions. Whilst finishing a complex game, Terry was distracted by the boy. "Look, Daddy!" said Simon, brandishing an electrical plug and beaming with pride. The whole program vanished down the tube. Horrified, I asked Terry what he did about it.

"Patted him on the head," said Terry. "Hard."

But Terry also finds advantage in extra years. "I'm not as easily distracted as a 19-year-old. The young haven't tasted disappointment, and don't realise just how hard it is to succeed. You've got to be completely set on what you're doing. The most important thing is never to give up." No doubt manic enthusiasm helps.

ENGINEER

Terry had no formal education. He informed his careers advisors that he was going to be a television engineer. He was offered a choice of jobs: road sweeper or park attendant.

Our hero nevertheless managed to become a television engineer, but failed to find the glamorous life he'd forseen. It was then he began to ruminate on the idea of rock-stardom.

Unfortunately, his band consisted of fifteen guitarists who preferred to fantasise about their impending stardom than practise their instruments.

All except Terry. (But then he had that old M.E.)

"The only way we could get through a number was to split the lead into sections so that we could take turns in each doing a little bit." Meanwhile, the guy who was supposed to be playing lead, mimed.

This glorious group finally found themselves a drummer. It was then that it dawned on them that none of them could keep time. They promptly (and wisely!) disbanded.

Terry grows pensive. "There are parallels between what was happening then, and where we are now in computing. For a while it seemed that the world of music could be anyone's oyster. Then the industry became increasingly professional. In computing, the importance of the programmer is dwindling as P.R., advertising, distribution, etc. become equally vital. The competition and the standards are hotting up all the time. Professionalism has become the most important thing in writing today."

So what is Terry up to Professionally? "Oh, it's a completely new concept in game-play." Well? "All I can say is that it uses 50K of machine code, and I'm half way through it." This irrepressibly ebullient chappie had suddenly gone quiet. Could this perhaps be Terry's adventure debut? Could it be K-Tel's newly-announced blockbuster?

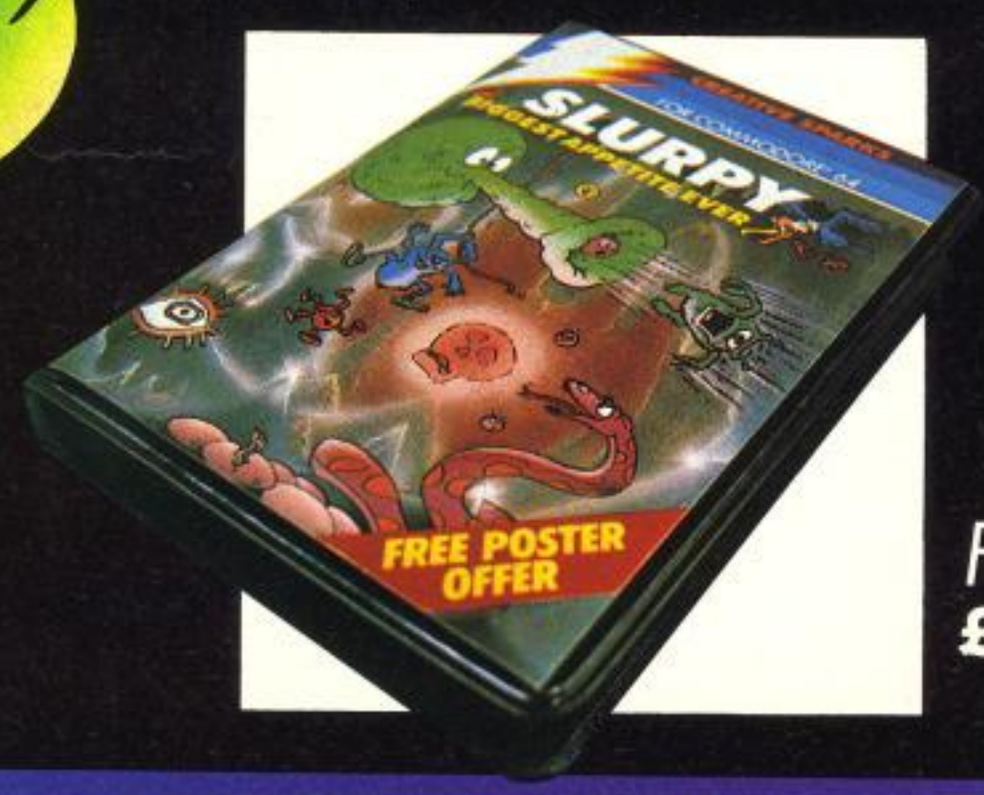
At this point he looked at me solemnly, and placed a hand over my mike. I can say no more . . .

Meet Slurpy

Slurpy has the biggest appetite in the world! He spends his day slurping tasty snacks such as Glowbugs and Widowmaker spiders. Greedy Slurpy may even slurp poisonous creatures which he must immediately spit out again.

To his enemies, Slurpy's plump little body is a delicious titbit. He must continually be on the look out as he slurps from cave to cave where he encounters earthquakes, whirlwinds and phantoms. Help Slurpy eat his fill before something eats him!

Slurpy is an amazing fun game. Superb graphics, colour and sound really bring Slurpy to life. The game comes with an eight page scenario and a free poster offer. You can find Slurpy in all major software retailers.



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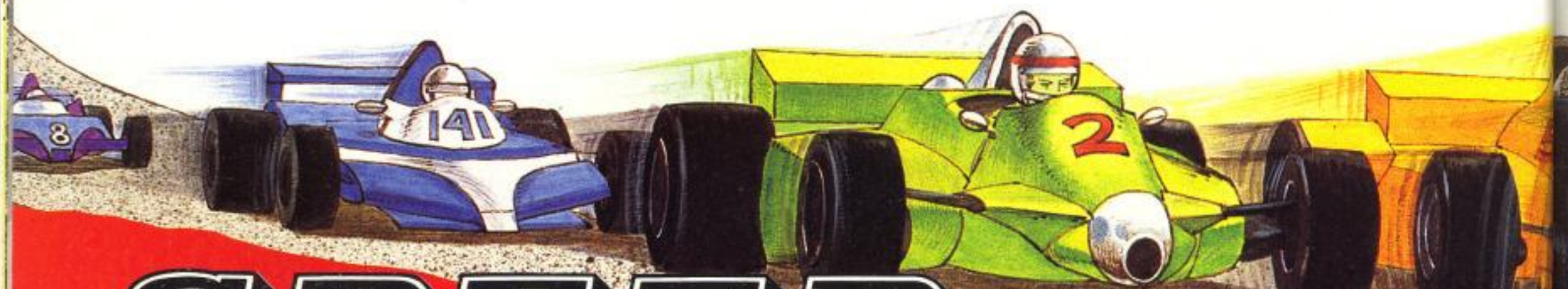


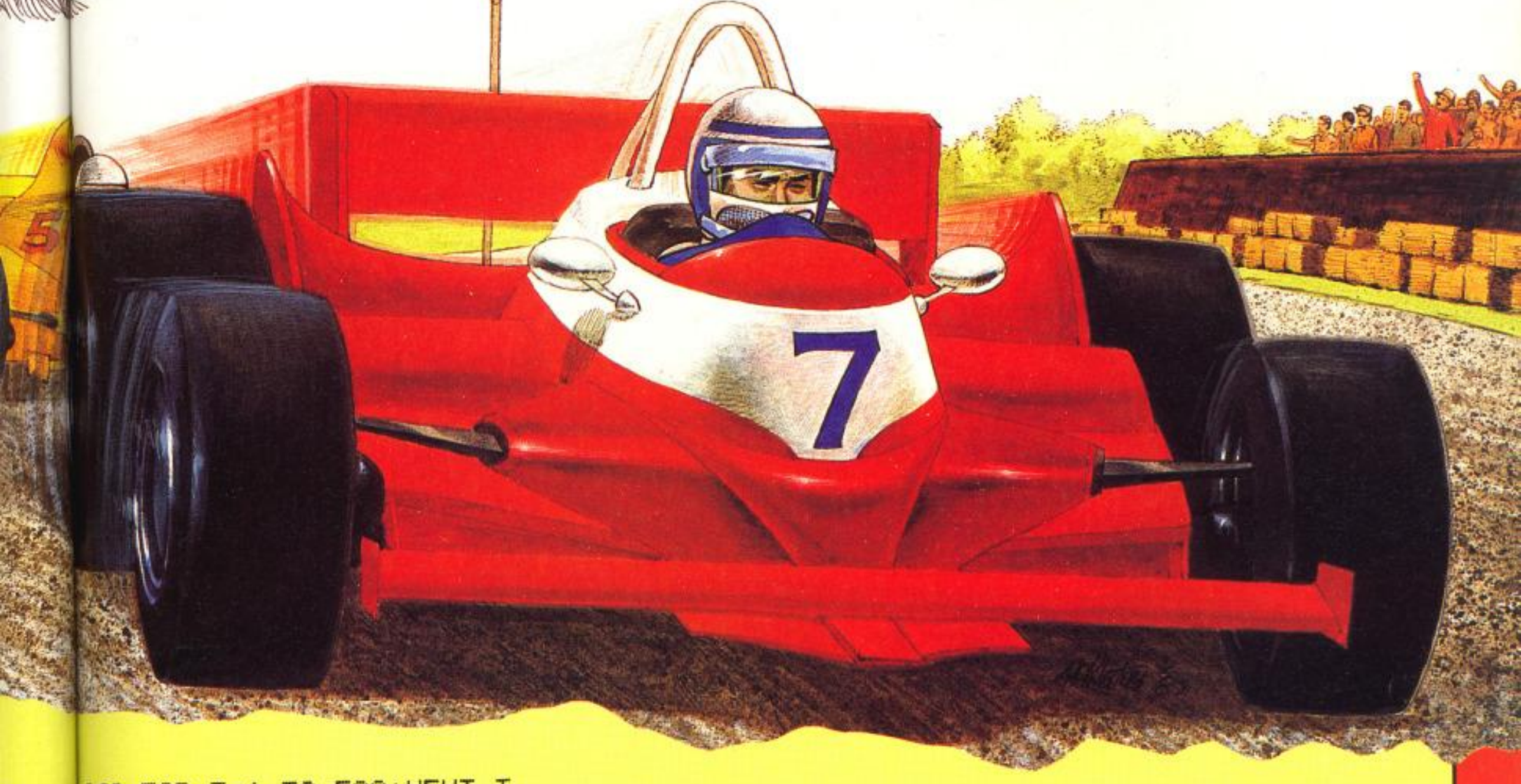
SPEED ARENA

by M. Gral

```
5 REM*SPEED ARENA                BY M.GRAL
   EY
10 PRINT"■"
11 HI=100
15 SC=0:L=1:LI=3:GOTO 250
20 X=0:Y=0:DI=0:C=30720:A$="":B$=""
30 POKE 36879,27
40 FOR F=7680 TO 7701:POKE F,160
   :POKE F+C,0:NEXT F
50 FOR F=7680 TO 8164 STEP 22
   :POKE F,160:POKE F+C,0:NEXT F
60 FOR F=8164 TO 8185:POKE F,160
   :POKE F+C,0:NEXT F
70 FOR F=7701 TO 8185 STEP 22
   :POKE F,160:POKE F+C,0:NEXT F
100 FOR W=1 TO 100
105 GET A$:IF A$<>"A"AND A$<>"Z"AND A
   $<>"L"AND A$<>":"THEN A$=B$
110 IF A$="L"THEN X=X-1:DI=60:SC=SC+1
120 IF A$=":"THEN X=X+1:DI=62:SC=SC+1
130 IF A$="A"THEN Y=Y-1:DI=1:SC=SC+1
140 IF A$="Z"THEN Y=Y+1:DI=22:SC=SC+1
145 B$=A$
150 P=7910+X+22*Y
160 IF PEEK(P)<>32 THEN 300
170 POKE P,DI:POKE P+C,2
180 FOR Q=1 TO L
190 A=INT(RND(1)*500)+1
200 POKE 7680+A,160:POKE 7680+A+C,0
210 NEXT Q
220 FOR T=1 TO 25:NEXT T
230 POKE P,32
235 PRINT"■■■ SCORE:"SC" HI:"HI
240 NEXT W
245 L=L+1
250 PRINT"■■ENTER ARENA"L
```

Up your Macho Moment!

Steer your buggy around the rapidly-materialising obstacles and win silver cups, champagne and the chance to go on Name That Tune with Murray Walker! Get girls! Lose spots! Up your Macho Moment! All you need for perfect celestial harmony and clean spark plugs is to remember that A and S move you left and right, while L and (do the vertical equivalent. Rrrrrrrrummmm!




```
260 FOR T=1 TO 500:NEXT T
270 PRINT"■"
280 GOTO 20
300 POKE P,160:POKE P-1,160
    :POKE P+1,160:POKE P-22,160
    :POKE P+22,160
310 POKE P+C,4:POKE P-1+C,4
    :POKE P+1+C,4:POKE P-22+C,4
    :POKE P+22+C,4
315 POKE 36877,200
320 FOR S=15 TO 0 STEP-1:POKE 36878,S
    :FOR T=1 TO 50:NEXT T:NEXT S
330 POKE 36877,0
340 FOR E=0 TO 3:POKE P,32:POKE P-E,42
    :POKE P+E,42:POKE P-22*E,42
    :POKE P+22*E,42
350 POKE P+C,2:POKE P-E+C,2
    :POKE P+E+C,2:POKE P-22*E+C,2
    :POKE P+22*E+C,2
360 POKE 36878,10:POKE 36875,200
    :FOR T=1 TO 25:NEXT T:POKE 36875,0
370 POKE P,32:POKE P-E,32:POKE P+E,32
    :POKE P-22*E,32:POKE P+22*E,32
380 NEXT E
385 LI=LI-1
390 IF LI>0 THEN 250
400 PRINT"■■■    SPEED ARENA      ■"
405 PRINT"YOU WRECKED ALL YOUR  CARS."
410 PRINT"YOU SCORED"SC
420 IF SC>HI THEN PRINT"A NEW HI SCOR
    E":HI=SC:GOTO 440
430 PRINT"HI SCORE"HI
440 PRINT"PRESS P TO PLAY"
450 GET Z$:IF Z$<>"P"THEN 450
460 PRINT"■":GOTO 15
```

WIN

in our super

This month BIG K, in conjunction with K-Tel, is proud to present one of the most exciting competitions ever run by a computer magazine.

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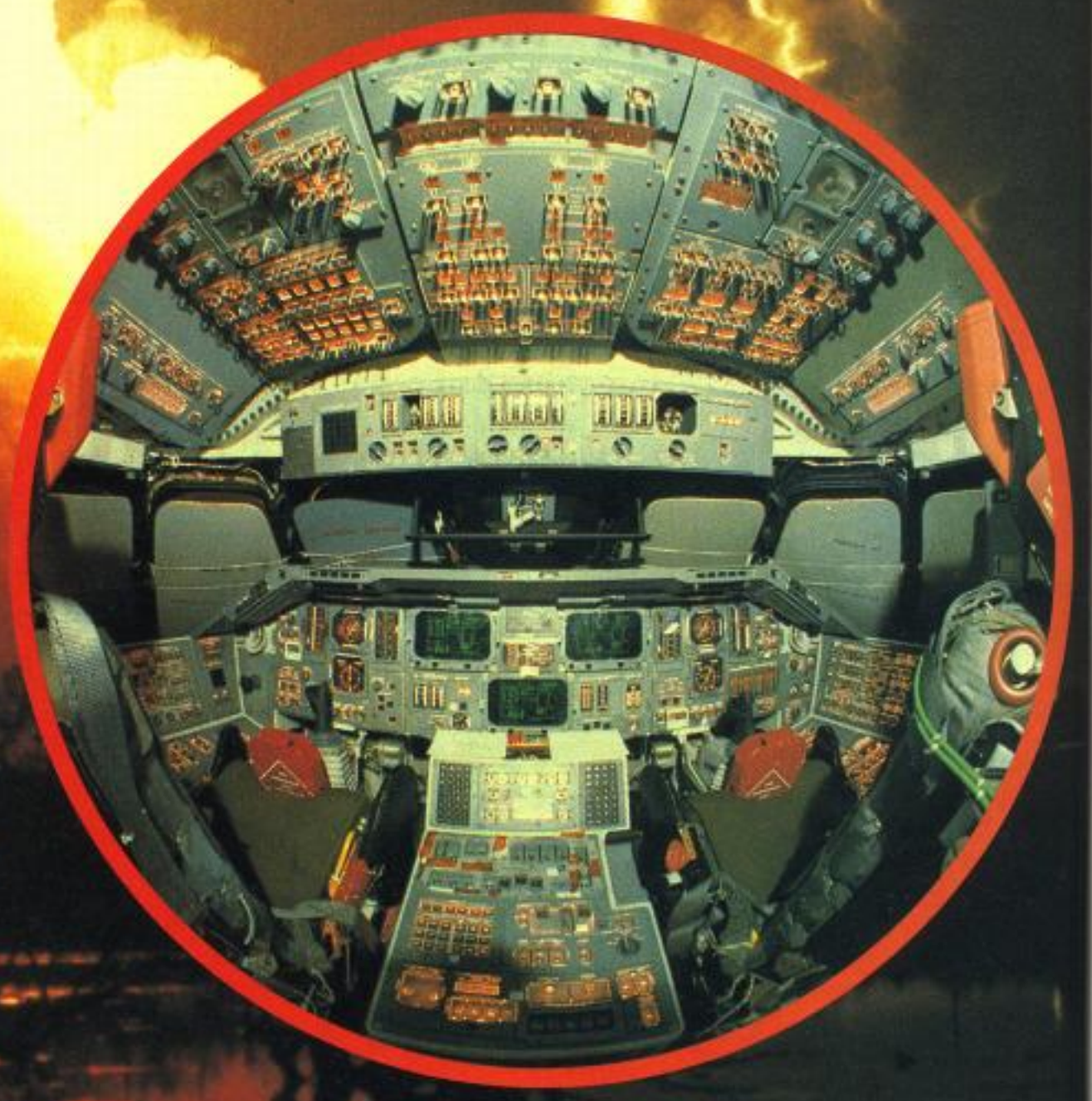
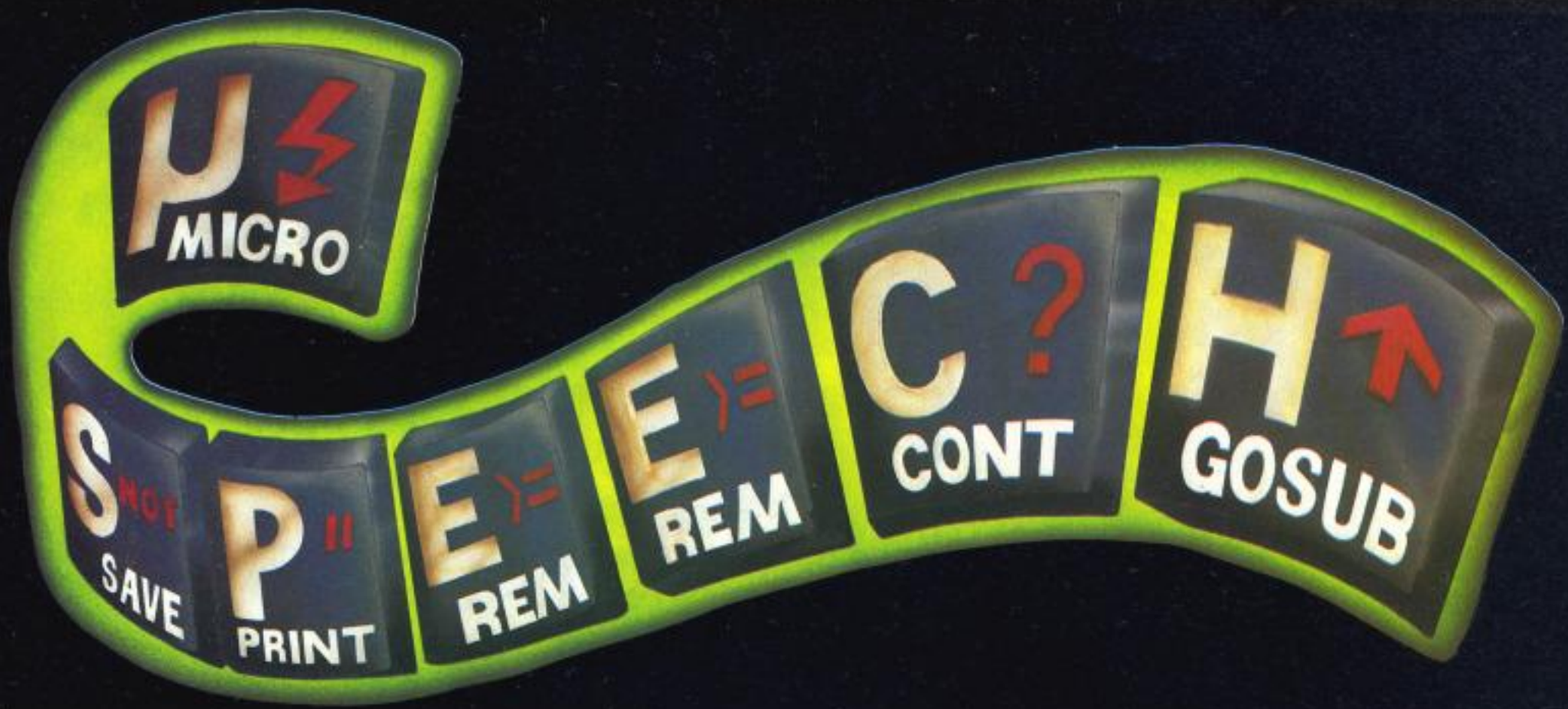
*One of whom MUST be an adult with a driving license



ABOVE: THE SHUTTLE boosts into orbit from Cape Kennedy, Florida.
RIGHT: Inside the big bird. The winner won't get this far, but car hire is free!



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THE IMAGE

TV Effects machines such as Quantel's Paintbox and Mirage are as far above common-or-garden home micros as a Lamborghini is to a dustcart. It seems there is literally nothing these devices can't achieve by way of graphics and image manipulation. They are truly the State of the Art. But which art? KIM ALDIS reports.

THREE O-CLOCK in the morning and the phone was ringing. I crawled out of bed and fell over the cat. This had better be good. It was Big K. They needed information — fast. Subject — computerised special effects in film and video. I poured myself a coffee and thought carefully. This was going to be a tough one. Reaching into a drawer I pulled out my book of contacts and came up with two names. The Moving Picture Company, one of London's biggest video companies who also had a large film special effects unit; and The Digital Picture Company who specialise in solid computer graphics. State of the art stuff, this. It was going to be good.

First stop was The Moving Picture Company where I met Maggie Allison, the production manager.

MOTION CONTROL

We approached a small black door at the end of a dimly lit corridor. 'This is Motion Control' Maggie said. We walked in and were confronted by something that looked like Stevenson's Rocket left in the clutches of a berserk chimp with a Meccano set.

'Hello' it said. I retrieved my jaw from the floor and pushed it firmly back onto the bottom of my face. Obviously the situation needed reassessing. Then a small ginger head poked through a massive tangle of wires like an orange on a plate of spaghetti. 'Hi' said the head. 'This is Peter Truckel' said Maggie, 'he's in charge here'. Maggie asked Pete for a demonstration and he walked over to the control desk. Hands flew across the keyboard, producing a totally incomprehensible array of figures on the plasma display. Suddenly, with no warning, the beast flew along its tracks, a camera on the front gyrating crazily. Pete pointed to a monitor screen above the control desk and we watched a spaceship fly in from the distance, do a victory roll and then disappear out of the top of the screen. A quick glance down the end of the studio revealed that the spaceship was in fact a model, the impression of movement being given solely by movement of the camera on the Rig.

So what is Motion Control? Remember Star Wars? All those X-Wing fighters and Ty-fighters in eternal conflict? They were all models filmed on a Motion Control rig, similar to this one, in the States. Essentially it's a robot camera which can move in ways that would make the average cameraman go green.

Basically this rig is a large aluminium framework with a movie camera on the front. Within this framework is a mass of pulleys, cogs and motors all dedicated to moving and focussing the camera. Mini angle stepper motors are used for movement, each pulse generating 2.5 degrees of movement, which means that by the time they've been geared down very fine positioning can be achieved.

All this is controlled by the computer. A twin Z80 IMC (International Motion Control), purpose built for this type of application. Big enough for Pete to use as a work desk, it drives twelve motor control boards which in turn pulse the steppers on the Rig. Simple innit?

The ability to repeat moves accurately is one of the biggest advantages of the system. One of the most complicated jobs Pete worked on was the title sequence for BBC's *'The Natural World'*. Six discs fly into the picture one after the other and hover on top of each other. Once they're all in position a globe wipes up and over them, the edges of the discs forming the latitude lines. Each disc was filmed separately flying into frame. Just as one might expect the computer has all sorts of tricks up its sleeve. Programming in basic moves is fairly simple once you get used to the way the thing works, but hidden in the depths of the machine are all sorts of routines for different effects. For instance you can have the camera do a time exposure on each frame and at a preset moment, say halfway through exposure, make the Rig move. The result on film is a moving object with a streaked 'tail' behind it. The length of the tail can be varied during the shoot so that it's made to 'catch up' with the model.

The Moving Picture Company rig is unique, built from scratch on the premises. As Pete put it, 'We thought, what the hell, we can do it better than anyone else — so we bought lathes and milling machines and *did* it ourselves'.

PAINTBOX

THE THING about most systems is that they need a trained operator to make them any more than an impressive piece of useless junk. Quantel's Paintbox, on

BENDERS

the other hand, has been designed so that a complete technical moron can get results at a first sitting.

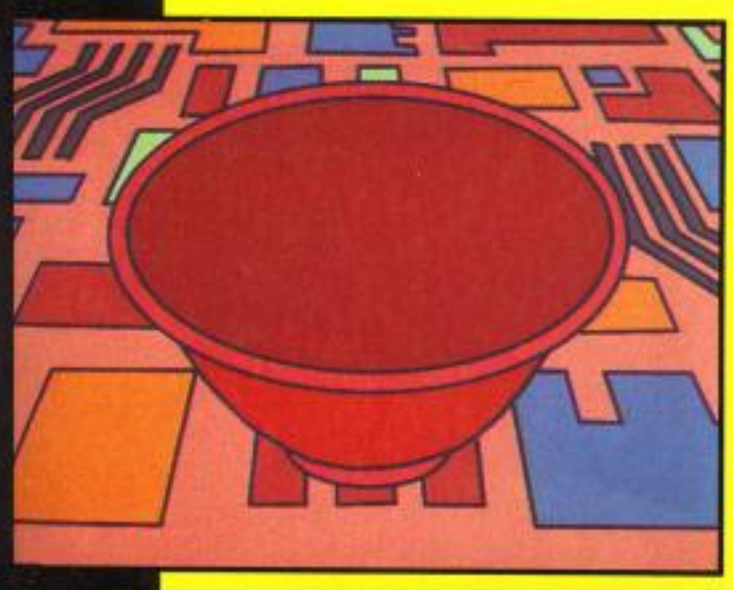
I switched into Complete Technical Moron mode and sat down at Paintbox. A video monitor, a piece of formica and a pencil on the end of a wire lay in front of me. I picked up the pencil and tried writing with it. 'It's broken' I cried. A savage backhander caught me from behind. 'Look at the screen, idiot' screamed Maggie. Was she tiring of me so soon? I looked at the screen and there, sure enough, was a faithful reproduction of my scrawl. I tried writing my name, got it wrong and tried again. Time to let an expert take over. That's where Anne Tilby, one of The Moving Picture Company's designers, came in. I'd given her a few pictures of myself to play around with on Paintbox. Something I might come to regret. I watched as she started work. Oh my God!!

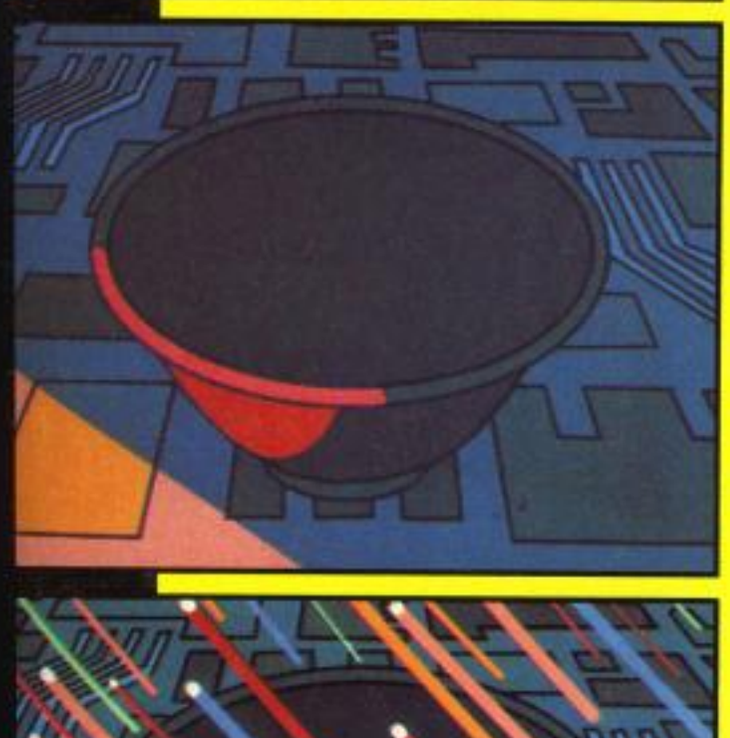
The whole concept of Paintbox keeps all the complex workings completely hidden from the user. He doesn't even need a keyboard. The piece of formica is in fact a digitising tablet, the pencil a stylus and underneath is hidden a complex system for drawing anything producable with traditional drawing materials, and more, but electronically.

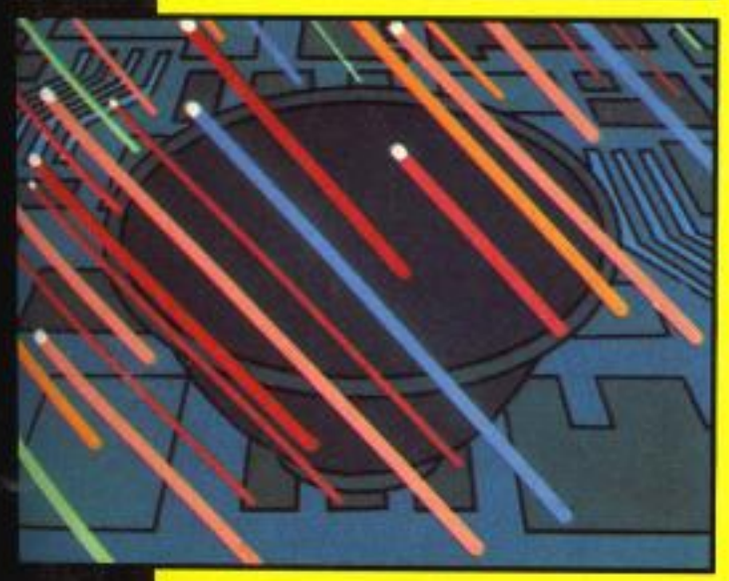
Using the system is simplicity itself. Draw with the stylus on the digitising tablet and the result comes up on the monitor. But there's more to it than that. Wipe the stylus across the screen and the pallette appears, a grid containing thirty predefined colours and a row of various sizes. Touch the stylus on a colour and the stylus 'picks up' the colour. Touch one of the dots to select your brush size and away you go. Then comes the good bit. Paint a blob of colour on the mixing area, pick up another colour and mix it into the first one to get another colour. Grand total of colours available: sixteen million! Van Gogh eat ya heart out . . .

Obviously all of this would be totally useless if created images couldn't be kept. Images can be saved to disc, both complete images and cutouts, and called back in an instant. Acccess time for one image is 1.5 seconds. Pretty

TURN TO PAGE 75

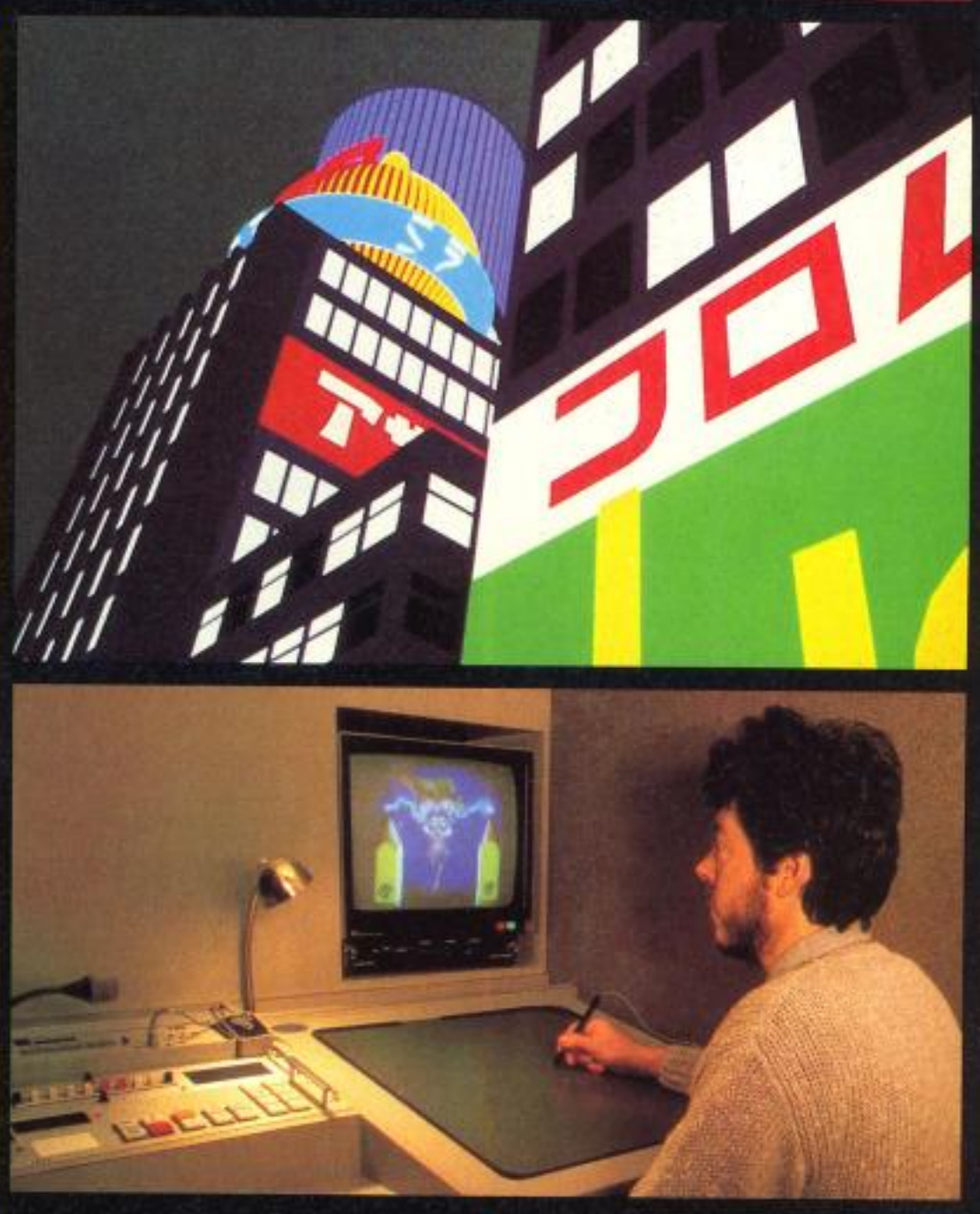


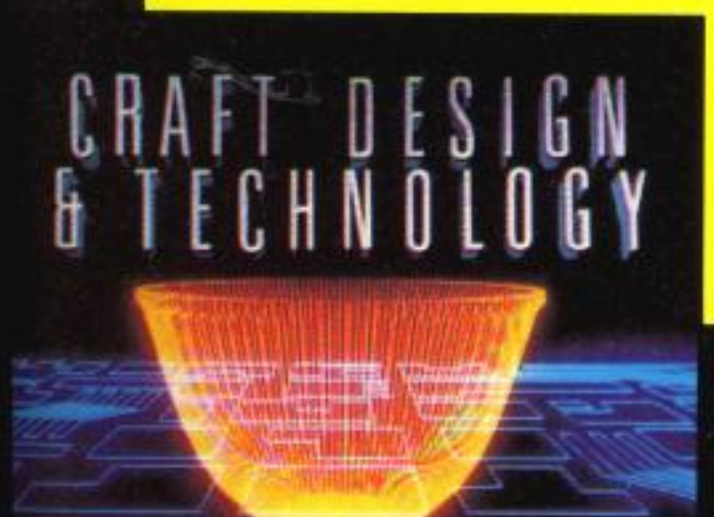




Not just TVFX, but your actual Artshow stuff as well. The series of Caves was shown using Quantie's Paintbox — from the end — user point of view, a formica tablet and a scruffy old bit of pencil — then coloured and overlayed to form a showpiece catalogue cover (left). Total of instantly accessible shades: a lousy sixteen. But mix'em together as if they were paint and this number exponants uphill to a call 30 million. Roll over imagitte!

Access time for any one image using Paintbox is 1.5 seconds. However frames can be stored on film or video tape and then run as fast as you like.





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THE IMAGE BENDERS

CONTINUED FROM PAGE 73

impressive when you consider that each frame uses over a megabyte of information. In addition to this there is a hardware framestore capable of holding up to twenty-five images. Images can be pulled onto the screen fast enough to be animated in real time. This makes it ideal for the animator who can view his work in an instant and alter it in seconds. Hard copy can be taken on Polaroid, colour slide, 35mm movie film or video tape and by the same token images can be taken from either film or video.

The possibilities are mind-blowing. Imagine it — you're making an advert for face cream and your leading lady turns up after a night on the tiles, bags under her eyes and a face full of zits. Panic? No way. Make your film, put it into Paintbox, touch up the blotches and put it straight back on film. No problem. Richard Dean, one of The Moving Company's directors, made the TV commercial for Hills Samuels, the merchant bankers. He used the same technique to make a whole square mile of London appear to drop from the clouds on a massive column of rock!

In typo mode Paintbox can be used as a very comprehensive type-setting facility. Up to six hundred fonts are available and these can be rotated, enlarged or reduced, have shadows, be embossed or given thickness.

All this has some pretty impressive hardware supporting it. Each picture contains just over one megabyte of information and because the system interacts with a user this info needs to be processed fast. You can't muck about with megs on a Spectrum so they whopped a mainframe behind it. Images, cutouts, etc, are stored as files on a 168Mb Winchester alongside a couple of Mb of system data.

But does it play games?

MIRAGE

Mirage is made by Quantel, the makers of Paintbox, and is a machine for manipulating video imagery in real time. Of course there were existing systems for doing this prior to Mirage (remember some of the effects they use on Top of the Pops?) but none quite so versatile. Previously facilities were limited to a predefined set of effects designed by the machine's manufacturers. Need a new effect? Buy a new machine. Mirage has put a stop to all that. Now if you need a new effect you just program it in. As we saw before the effects can be previewed as a wire-frame and adjusted if necessary, then all you need is a piece of video to put in it. What it does is take the video frame by frame as it comes in and make each point on the image directly addressable as a memory location. Of course this is a vast oversimplification. The way the addresses are stored is complicated because each point bears no relationship to the next point. For example, in an explosion effect, the relationship is totally random. Nevertheless, Quantel have sorted it out because the system works like a dream. There's not much you can't do with it. I'd seen the showreel earlier and the screen image was all over the place, the corner can be lifted and folded over like a page turning or rolled into cylinders, cones or globes and moved all over the screen at reduced or enlarged size. Even transparent and exploded images are possible. Mirage can also cope with two images. For example in a simple page turn effect, the second image can be revealed on the back of the first.

Normally Mirage is programmed first and then connected to an edit suite where the video image is put in. It's possible, however, to use it in live television. Effects can be programmed beforehand and then called up on the air. There are also a set of pre-programmed routines for simple effects like page turns and cylinders that can be called up by a non programmer.

'OK, ready', a voice came over an intercom. We looked at the screen and the wire-frame we had seen earlier was replaced by a woman's face. As we watched the image went through all the contortions we had seen the wire-frame go through, folding into a cylinder, rolling around the screen and finally exploding into a mass of fragments. Poor lady.

DIGITAL PICTURES

DIGITAL Pictures live in a basement in downtown Covent Garden.

We decided to have a look at their showreel first. I was impressed — I mean IMPRESSED. 3D letters from an Imperial Tobacco ad logo flew into shot and settled into position one after the other. You'd never know it was a computer graphic. The title sequence from *Weekend World,* due to go out in autumn, showed flyovers of the major cities of the world. The detail was amazing. 'What kind of pixel resolution do you have here', I asked. 'About two thousand by fifteen hundred', Producer Pete Florence remarked casually.

Digital Pictures is one of only two facilities for solid computer graphics in England. Only a year ago it meant a trip to the States. The problems involved are frightening. If you want to get any detail at all then the memory requirements are horrendous. At Digital Pictures each frame of animation uses 9Mb of data. What the hell do you do with that kind of information? Here they use two Data General C330 minis. Because of a bit of internal mucking about they can address 1Mb of memory. Just in case that ain't enough they've each got a 92Mb hard disc as back-up store. Good enough? 'They're a bit outmoded really', resident expert Paul Brown remarked casually. Hard discs outmoded? He saw the look on my face and continued, 'yeah, we thought about bubble memory but it's a bit slow. So we're thinking about laser disc at the moment. Give us a few gigabytes to play around with and we'll really have some fun'.

The real heart of the system is a QLRD Hi-Res film recorder, pointing straight at a Mitchell ciné camera.

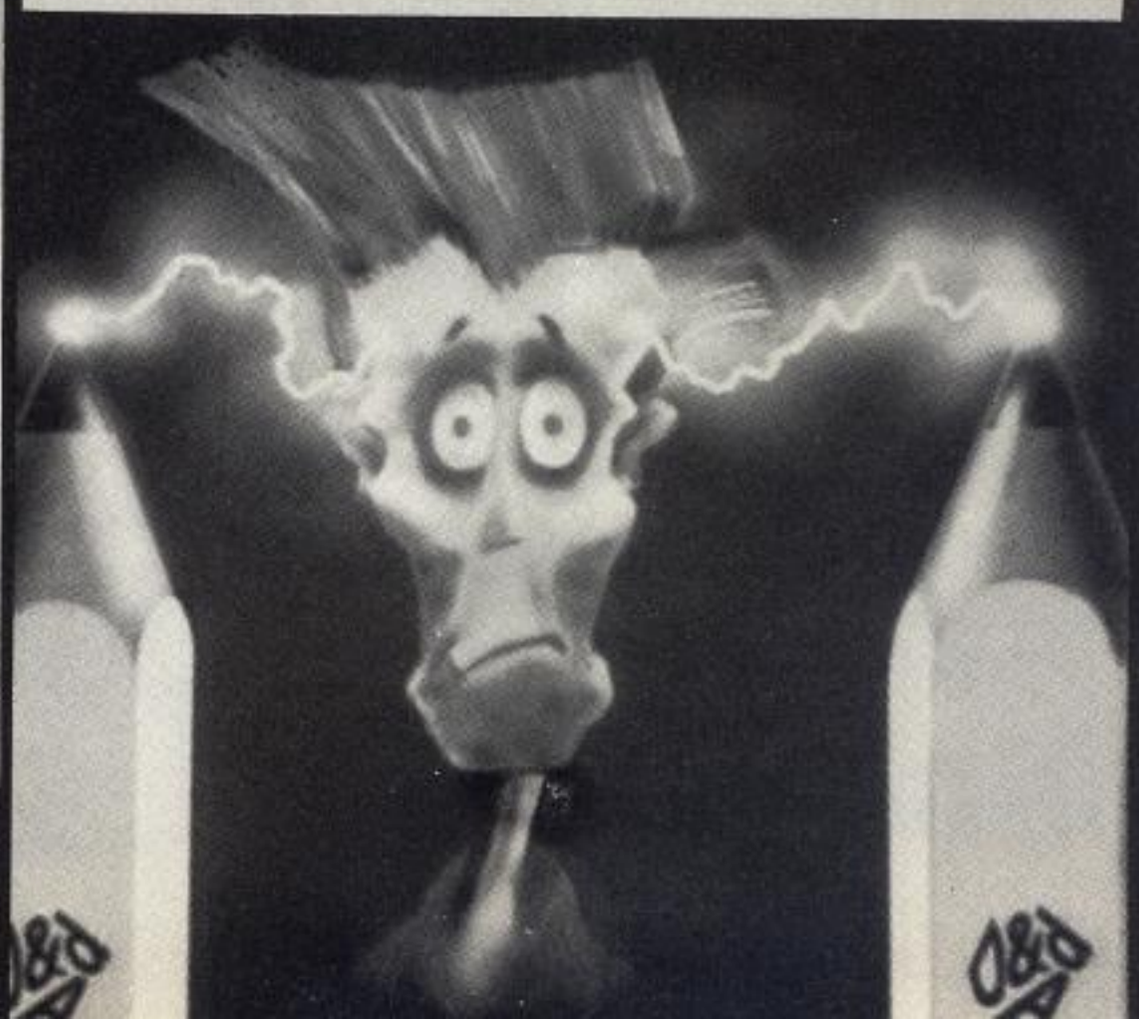
We took a closer look at the hi-res film recorder. This was the piece of gear responsible for putting the digital image on film. It decodes the information from the Data Generals, turns it into an RGB signal and puts it onto a hi-res, flat screen tube in front of the Mitchell.

The actual computing for this lot is handled by the two Data Generals, all the software written in-house by Paul and his oppo Chris Briscoe. How do they get complicated shapes on the screen? Description of the objects is handled by a piece of software known as a Modeller. Shapes are built up using polygons, easily (???!) controlled mathematically and smoothed off by a method called 'Fong shading'. Once the modeller has finished its work the Scripter takes over. This is used to place and move the objects.

The images produced at Digital Pictures are impressive — there's no doubt about that — but reality is something that needs to be worked on. 'The problem is that this method is not the same as the way the eye sees reality', said Paul. In Japan they're looking at a recursive method that emulates the scattering effect of light. He showed me some pictures, a tray of globes, some transparent, some reflecting. They were as real as you could wish. The problem with recursive methods is memory. With 9Mb if you take each point down through just a few levels of recursion you're talking big megs. 'We're working on it . . . some time next year we should be able to do this'.

The mind boggles.

The author after finishing this article in short order.



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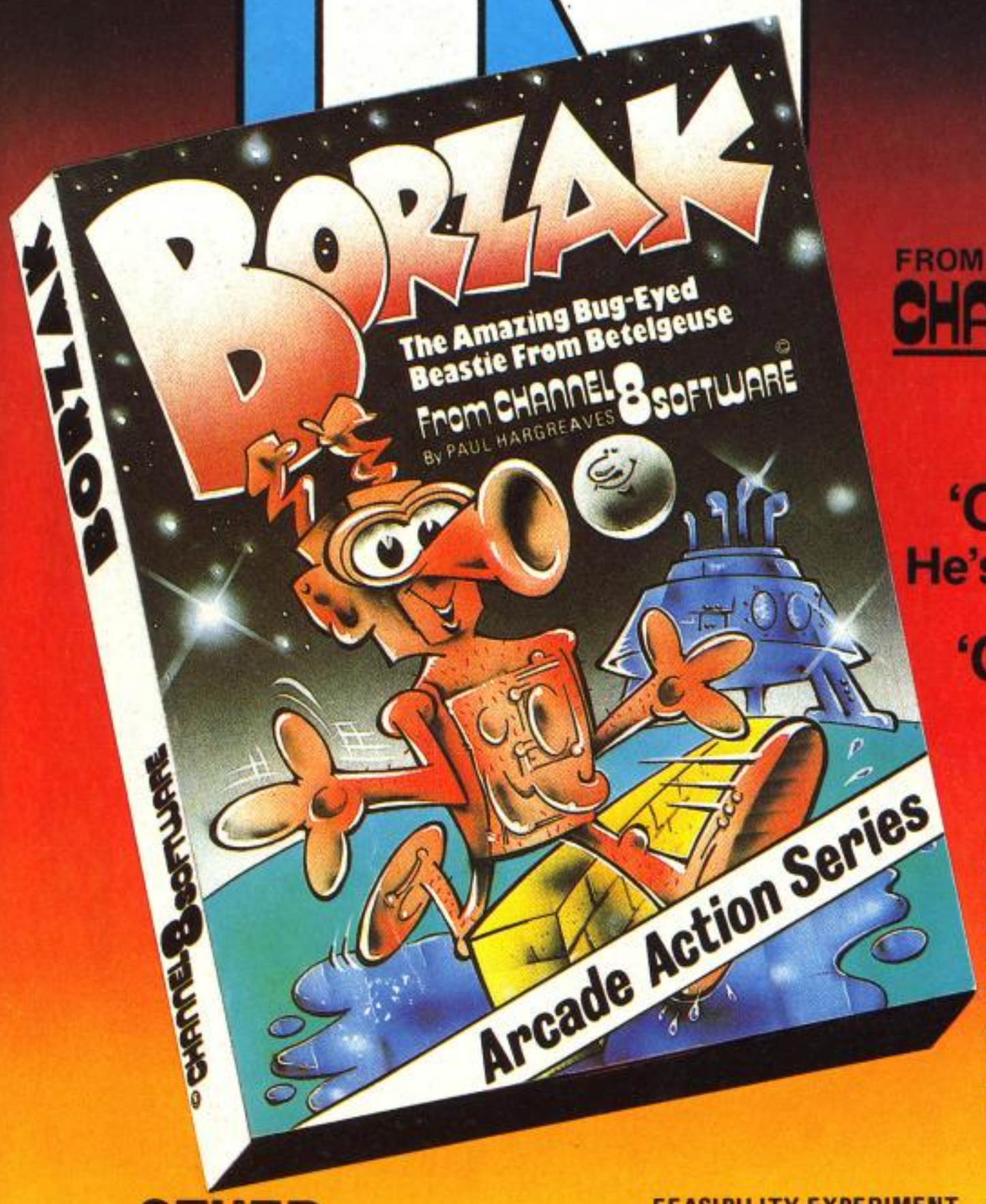

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empty tum sweet melodys
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By TONY TYLER

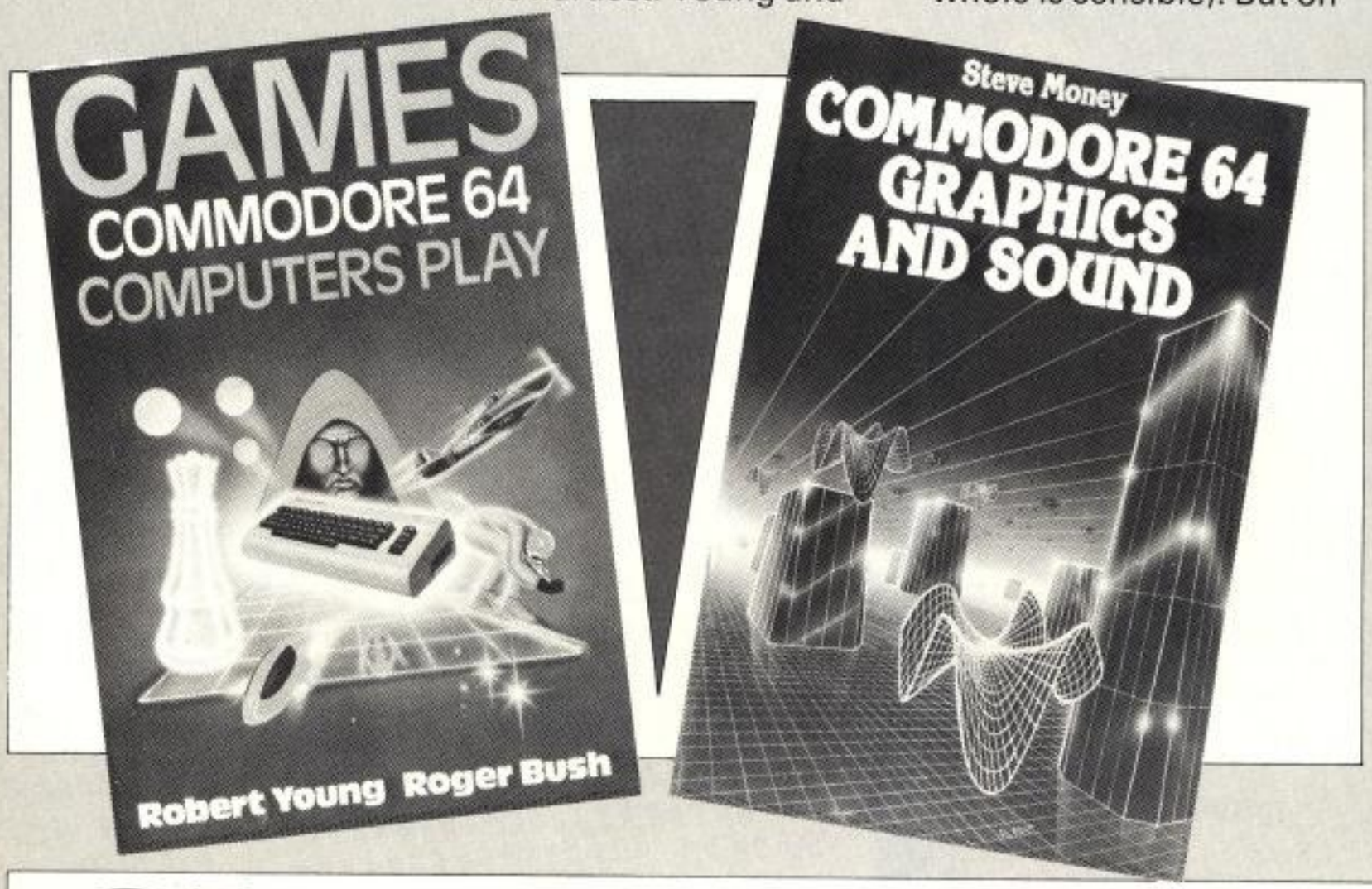
ME AND MY COMMODORE

ADVENTURE GAMES FOR THE COMMODORE 64 (R. J. BRADBURY: Granada £6.95)
COMMODORE 64 GAMES (KEVIN BERGIN: Duckworth £6.95)
GAMES COMMODORE 64 COMPUTERS PLAY (ROBERT YOUNG & ROGER BUSH: Addison-Wesley £6.95)
COMMODORE 64 GRAPHICS AND SOUND (STEVE MONEY: Granada £6.95)

Why £6.95? What is it about this particular price figure that makes it so *right*, so *appropriate* for publishers of computer books? In fact it's a truism that most computer books are ludicrously overpriced, certainly compared to computer magazines. The assembly and (more importantly) documentation of a handful of decent games for the ubiquitous 64 is not the easiest job in the world, true, but neither is it the hardest. Young and Bush give us a mixed bag of twenty, all nicely listed in "untranslated" versions) which on the whole is sensible). But on the whole they don't go as far as they might into this business of explanation.

Better in this regard is Kevin Bergin; he provides 18 games, more randomly mixed. Arcade games chase short adventures chase utilities through the list — each of these, by the way, is the size of a good-sized magazine version.

Granada's two offerings, by Bradbury and Money, balance equally between how-to manualism and example listings. Certainly there is a need for specialist volumes on the 64 to explain all those things the offical manual leaves out. Both these books are well thought-out and Money's can also serve as a dedicated games-writing manual. Bradbury takes us deep into adventure theory — sentence parsing, grandfather-father-objects, cell structure for locations, and so forth. The tortuous splitting-off involved in adventure structure is very clearly explained throughout.



Slinky brown stuff

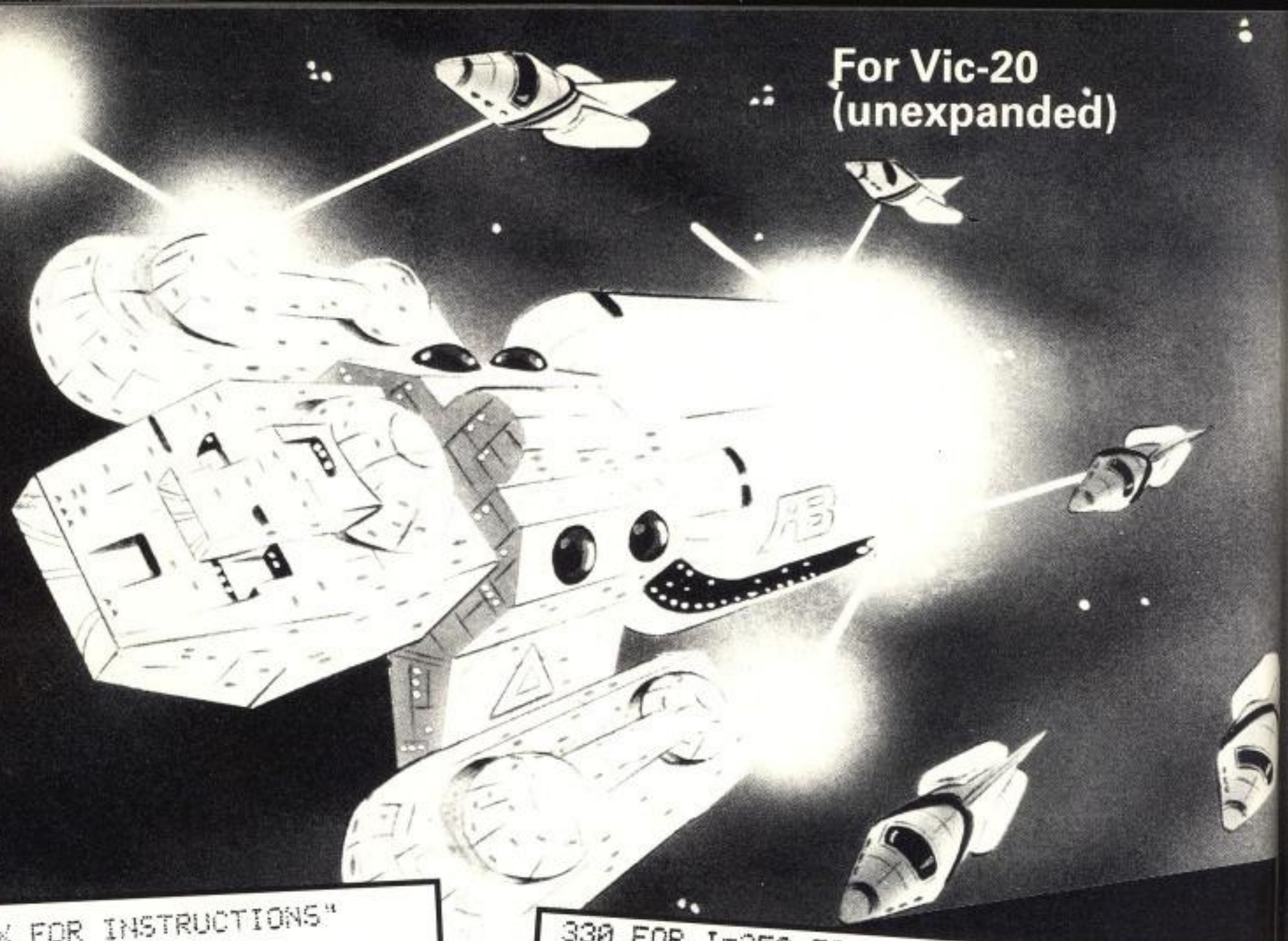
SPECTRAVIDEO COMPUTING (IAN SINCLAIR: Granada £6.95)
THE MICRO USER'S BOOK OF TAPE RECORDING (MIKE SALEM: Duckworth £2.95)

Despite glowing reviews when they first appeared about six months ago, the Spectravideo range of computers (two, actually) have not yet exactly taken off like polecats. Perhaps, as MSX draws near, their time will come. In the meantime Granada, clearly with one eye on MSX, have issued a decent first-user manual for the cheaper Spectra machine, written by the respected Ian Sinclair (no relation). It's an honest and reasonably thorough piece of work, no frills, and I like the way Sinclair owned up to the fact that he'd found no way to re-program the function keys.

Assuming tape recording is your thing and the sight of reels rotating sends you into spasms of ecstasy, Mike Salem's lot (geddit?) of knowledge on the subject should fill you with joy. Mysterious sub-topics like Head Azimuth Angle and Cassette Interface Waveforms — all perfectly useful stuff, I'll be bound — grace the 90 pages of this slimline but learned little tome. Scrap that disc! Dump that EPROM! Cassette and all other forms of slinky brown stuff are here to stay. At least, if they're not, then Mike Salem is in bad trouble.

For Vic-20 (unexpanded)

W = UP
X = DOWN
S = FIRE
D = FORWARD
A = STOP



There you are, lifting off the surface of Planet Electro in the warm dusk of an early September evening. Inside the ship — a calm atmosphere. Chip supper courtesy the robochef. Brookside on the VCR. The sundowner (with ice and lemon) nestling in the right hand. Suddenly your Jimmy the One says: "Cap'n! Them mothers out there is shootin' at us!" You look, and sure enough he's right . . .

```
50 PRINT "HIT X FOR INSTRUCTIONS"
51 PRINT "OR T TO RUN"
55 GET A$:IF A$="X" THEN GOSUB 1200
56 IF A$="T" THEN RUN 100
57 GOTO 55
100 REM X$="■" ** KILL
110 D$="■■■■■■■■■■■■■■■■■■■■■■"
    :X$="■■■■■■■■■■■■■■■■■■■■■■"
120 POKE 36879,8:PRINT"■":Y=10:DX=0
    :S=0:H=0
130 DIM X(2),Y(2),F$(2):FOR I=0 TO 2
    :F$="D":X(I)=10+INT(RND(1)*11)
    :Y(I)=INT(RND(1)*10)+5
140 NEXT I
150 DIM A(2),B(2):FOR I=0 TO 2:A(I)=99
    :NEXT
160 PRINT LEFT$(D$,Y+1)"■■■■■■■■■■■■■■■■■■■
```

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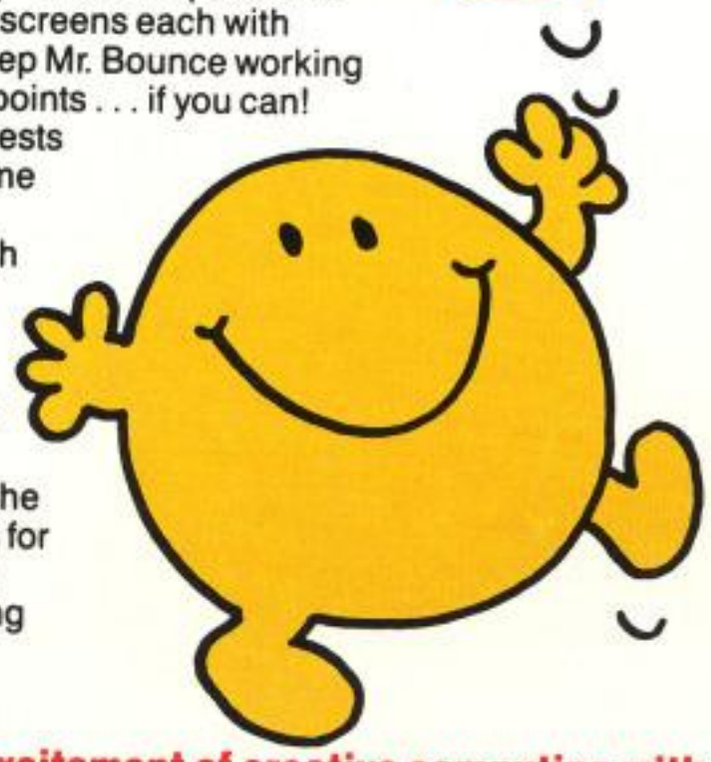

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ARCADE ALLEY

BIG K

THERE'S NO mistaking the Tazmi TX1, latest in one of the oldest of arcade staples, the simulated racing car game.

For a start, it's almost as large as the real thing. More eye-catchingly, there are three screens rather than the usual one. The panoramic view that ensues is quite striking, particularly — once you get that far — in a night-time sequence. Otherwise, I suspect that the triple screen effect is more of an appealing gimmick than an aid to the game itself. Because although there *is* a much broader panorama than in the usual one-screen games, there's no real use of the three screens within the confines of the game itself, i.e. you can't, for example, see cars approaching (receding?) from a distance — so far as this punter could make out anyhow, all the action occurs on the familiar central screen.

Still, it does look good.

Tell a lie: on the left-hand screen there is a small inset of the whole course in which you can glimpse your overall progress. Mind you, the 'race' takes place at such a clip that a novice probably won't have the time or the inclination to look away from the dead ahead. There's a brake, accelerator and a two-speed (High, Low) gearstick. The wheel controls are hairsbreadth fine — as presumably they are on the full speed real thing — so that the slightest movement has its effect.

Being a non-driver, the merest hint of a curve in the monitors had me veering wildly. The first indication of this happening is when you hear yourself skidding; fail to check that and you go into a spin; unless you're quick and correct your motion there's a good chance that disaster will occur when your vehicle hits one of several thoughtfully placed billboards, walls etc. The race takes place in four progressive stages; if you get as far as the last of these a flick of the wheel enables you to choose from one of eight Grand Prix circuits — Monaco etc. etc. Whether these are actual replicas of the real thing, only an expert could tell you. To a non-driving layman it's all pretty convincing. After only ten minutes' play I had three broken ribs, a lacerated leg, severe burns all over my body and irreversible brain damage. I left the arcade with a statuesque blonde on each arm and a magnum of champagne at my lips. It has to be said: after TX1 any ordinary racing game is . . . just the pits!

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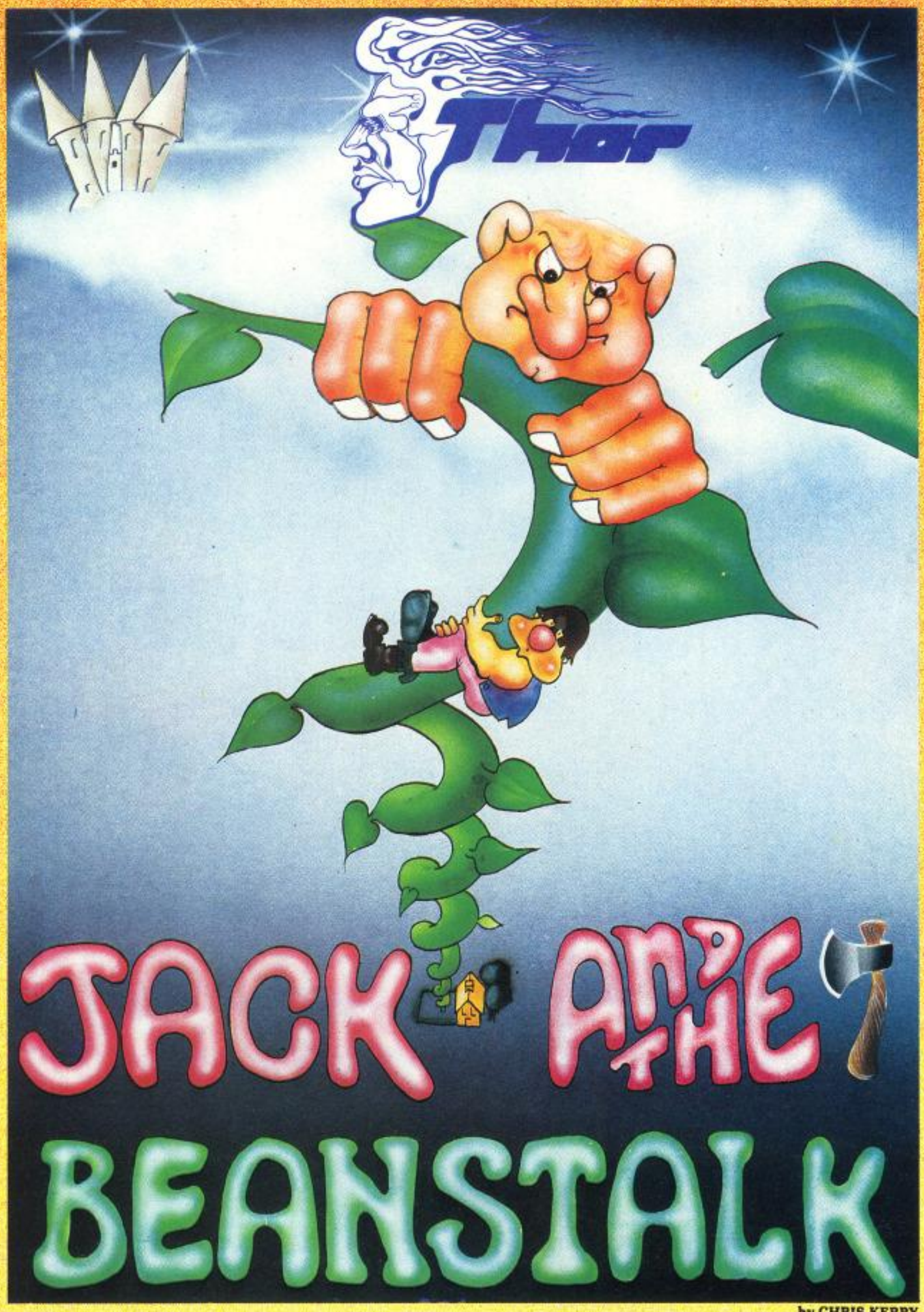

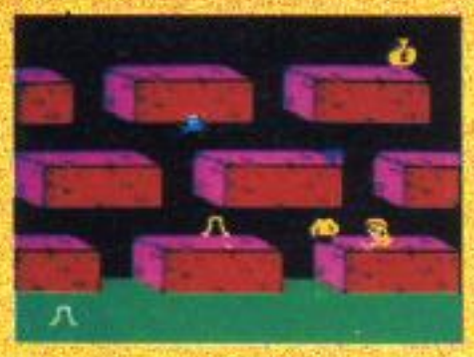

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Letters to BIG K

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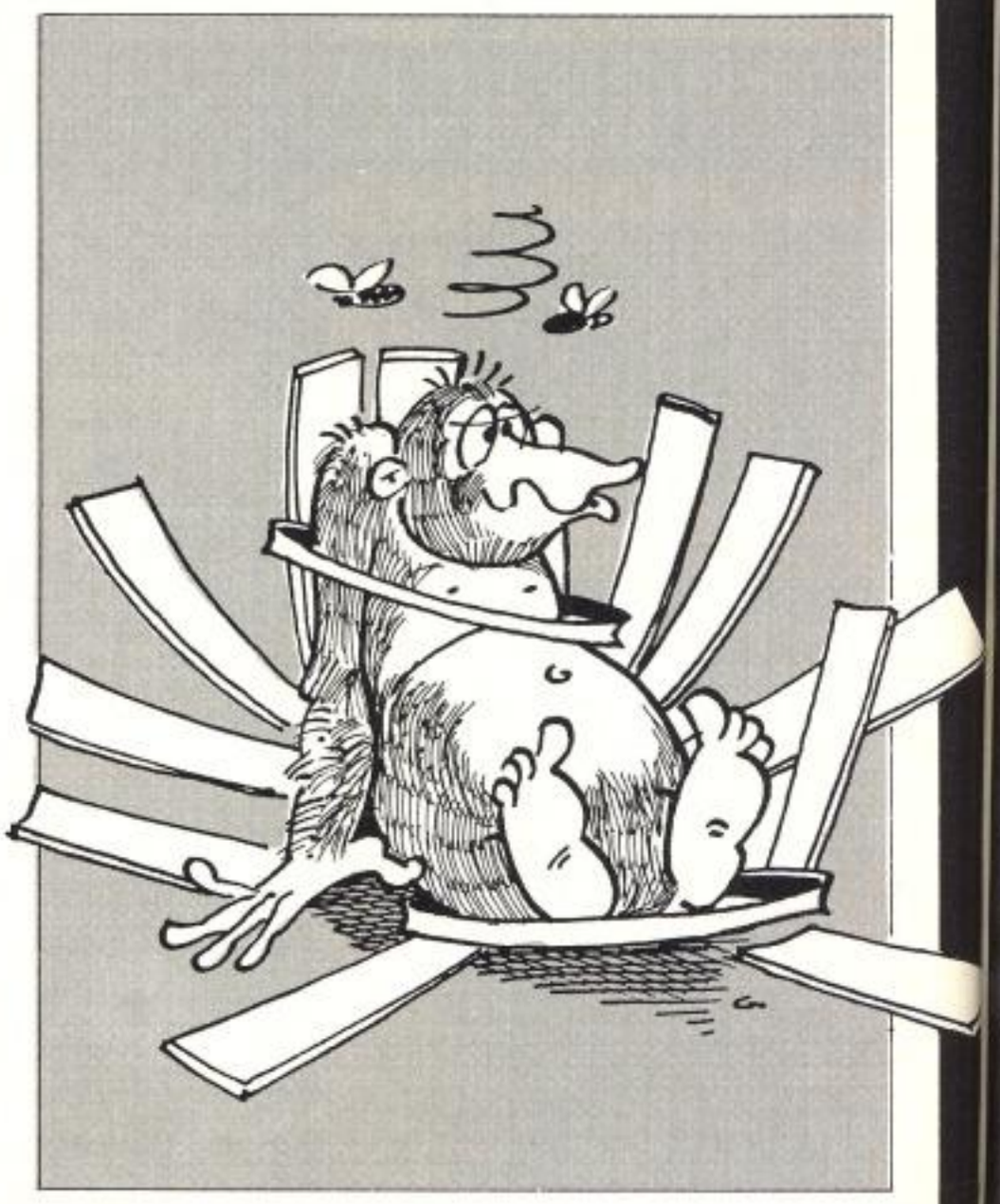
APE FAN

WHAT KONG game do you think is best for the Commodore 64?
ANALECHI NIVADI
London

● **We just don't know, vieux haricot. The truth is, we can't abide 'em! Dodgin' that dratted anthropoid's barrels (or other flotsam) just doesn't turn our collective crankshaft. Tell you wot, tho'. We'll give £5 to the Kong fan who can contrive the most awe-inspiring and convincing plug for his personal choice. (It had better be good). You never know, you might get spotted by Saatchi's and make your fortune be selling oil to the Arab states. Me? I'm still waiting to be spotted.**



Combien?

I HAVE written a couple of programs myself and would like to know how much Big K pays for them.
MARK RYAN,
Blackpool.

● **We don't have a given fixed sum, as the quality, originality and sheer graft that goes into progs varies so much. Howzabout minimum £50 up-wize to £100 on the sliding-shekels-scale?**

If you do want your prog to get a quick going over, note that priority is given to those with clear documentation attached. (And label your cassette clearly.) Equally alluring (if you have the technology,) is a prog tastefully wrapped in its own 40 column print-out.

An Irate Pensioner Writes

THE Video Recordings Bill was bought in because nasty-minded little men, such as film producers and the current TV producers (who would probably peddle their own Granny for money,) chose to pander to the sick-minded and perverted in the fierce race for cash.

As I write, my own grandchildren are busy playing and enjoying a "clean" computer game. No one deplores the fun violence in the 'A-Team' or 'The Fall Guy'. The objection is to unchecked programming executed by exploiters, perverts and sadists in their unprincipled efforts to obtain wealth.
W. LOXTON
Mablethorpe.

● **We're not wild about pervs and sadists either, Pops — honest. What Big K stands for (trumpets!) is clear thinking on very important legislation that could have far reaching effects for us all. If we've got to have censorship, then the Who, the How, and the Why must be debated in public. And let's make it specific to this vast, important, popular and unique industry. It's not only inadequate but ignorant to try to lump in vid games with legislation existing for video films.**

The inappropriately named Mr Bright will find in his dictionary that *video* simply means 'I see'. Both films and games require 'seeing', but apart from that, they just ain't the same ball game at all.

Let us reiterate. There has been NO actual prosecution in this country for "video game obscenity". And there's no real evidence of Marquis de Sade types writing programs, either. Don't panic.

No Subs, Use Force

I WOULD like to know how much it would be to send me Issue No 1 of your great magazine.
ADRIAN PINN,
Exeter.

● ***Whoops! Sorry Ade, and all those others who've been writing in asking for back issues. 'Fraid the demand has been so great that we're flush outa copies. And until that rapidly approaching time when subscriptions will be freely available, the only solution is to flex those speedy, well-oiled video-reflexes over the counter of your nearest newsagent each time release day draws nigh. But no violence, please. Oh all right — just a bit.***

Earnest plea

I AM the World's Greatest Electron User. Well done — for actually caring for us old mistreated Electron types. It's not Acorn's fault that they didn't get our micros out in time.
ASIF KHAN
Hounslow

● ***Why isn't it Acorn's fault? Know something we don't?***

ETTERBASELETT

K edited by NICKY XIKLUNA

Yours Unrepentantly, A Software Pirate . . .

YES, I do copy programs from friends' tapes — and I make audio copies using two tape decks. I know it's theft and I honestly don't care. Here's why. Computer software is, in the main, overpriced rubbish. Just like music. I buy a lot of records and I also tape a lot because I have been fleeced enough by record companies. £5 plus for a record is quite a lot, considering an average of 40p goes to the musician. Alright, you may say I'm not helping the poor muso very much by taping his songs, etc, but I'm a semi-pro musician myself. Somebody like David Bowie or Sting is hardly going to miss 40p, and anyway, there is something in the laws of patent about copying which the anti-tape brigade never mention.

It is no breach of patent to manufacture a copy of the patented article for one's own use, or to give a copy to a friend. It seems record companies and software houses want the best of both worlds. Surely the Copyright laws and Patent laws are brothers under the skin, so surely home taping is perfectly legal?

I would be less inclinded to copy software if it was better value for money. It is recorded on really cheap quality tapes, badly packaged, poorly illustrated (Hi, Artic!) and as for the standard of English . . .

Finally I am very shocked that you should wish to kiss the arses of the software houses with sycophantic, anti-tape-piracy articles. Why on earth didn't you raise the points I have mentioned? Does it mean you have a personal interest in a software company? Or do you just want to keep your advertisers sweet?

I'd like some feedback on all this, from readers, writers, and companies themselves, without the waffle about loss of profits, etc, because I don't care. I just want better software and at a lower cost, and I want it now!
PAUL BELLAMY,
Sheffield.

● Of course it's perfectly possible to take the full-blooded anarchist point of view, as you have. It's no more than the truth that as the megastars who make and sell programs and records are all so rich, they won't miss *your* money. I think you destroy your own case, however, by saying that you would be less inclined to copy software if it was better value for money. Why "less inclined"? Surely your fearless stand shouldn't be diluted by false and bourgeous considerations of things like "value for money"? And isn't it true that people like you would still feel aggrieved and ripped off even if it came free with the milk? Ergo, you feel exploited and you want revenge. Understandable, but don't climb on a moral soapbox about it.

Do I have a personal interest in a software company? No. Do I want to keep my advertisers sweet? Of course, but not at all costs. And this problem affects all software makers, not just those who have the inkredibly good taste to advertise in BIG K. — Tony Tyler.

Ripped off

NEXT TIME you need a poll, could you please put some useless advert on the reverse side, or make it double sided, or get on-line with a modem?
D. BUDGEN,
London.

● We had no idea, D.! Didn't think you'd treasure our Mike Male 'He wrote one' piece so dearly. Just for you, we're going to use the Batphone. Meanwhile, I've got to calm down the Editor, who interviewed Mike Male. Thanks to you he now thinks he's written a classic.

Slow down

I'M SURE that a lot of people who have computers don't know or understand everything that is written, so an indepth study in plain and simple young people's English would be welcomed by a great many people.
R. HARRIS
Leics.

WHY DON'T you get a learners' section in your magazine?
JOE BENSON
Limerick, Ireland.

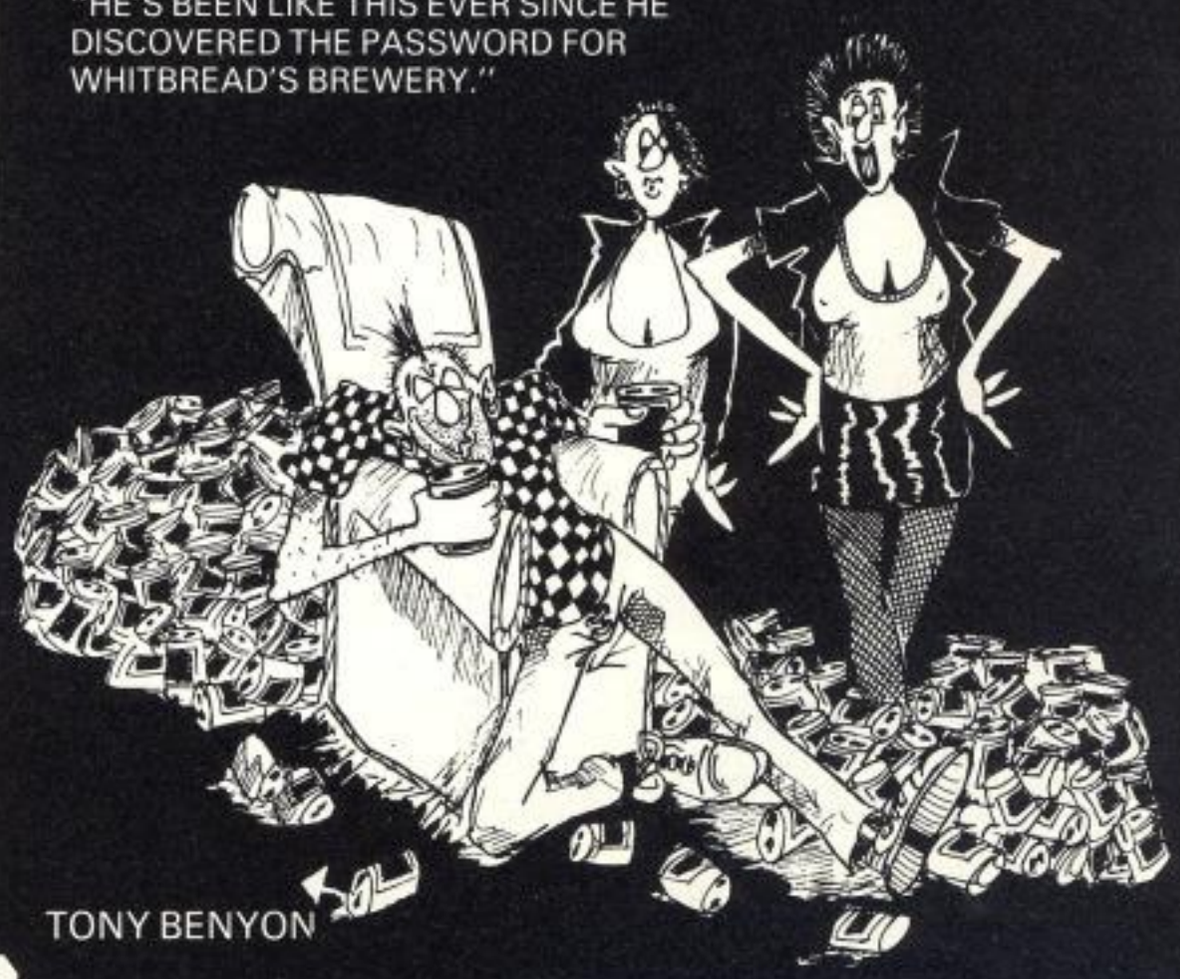
● *The aim of Big K is to pitch at all levels at once, so there's something for everyone in each fab ish. You'll pick up more than you realise when you're having fun — so stop worrying about their intimidating bits, get your head down and enjoy!*

LINE NOISE

MY FRIEND told me that he had had problems loading a game on his Dragon. However, he discovered that by moving the power supply as far away from the TV as possible, his problem disappeared, and the tape loaded straight away. When I got home, I tried doing the same thing with my machine, and it loaded first time. Why?
ASLAN SEZEN
Charlton.

● What your mate was getting was a nasty dose of "line noise." Remember that anything metallic that's attached to your micro will act as sort of mini radio transmitter. So if your machine starts giving you stick with interference or general malingering, it's worth having a quick spot check on your proximities. A'right?

"HE'S BEEN LIKE THIS EVER SINCE HE DISCOVERED THE PASSWORD FOR WHITBREAD'S BREWERY."



TONY BENYON

CONTINUED FROM PAGE 54

ATARI GRAPHICS

Using Antic mode 4

The best use of this mode is with a redefined character set. Using this you can create some very colourful effects on the screen.

The following program utilises this to create some coloured bars on the screen. As we are going to only use 4 characters there is no need to copy the whole character set across and I only define the four characters that I will be using, i.e., a, b, c and d (see last month's issue).

```
10 MEMTOP=PEEK(106):
POKE106,MEMTOP-8

20 GRAPHICS 0:CHSET=
(MEMTOP-4)*256

30 DL=PEEK(560)+256*
PEEK(561)

40 POKE DL+3,68:FOR X
=6 TO 28

50 POKE DL+X,4:NEXT X

60 FOR X=0 TO 31:READ A

70 POKE CHSET+97*8+
X,A:NEXT X

80 DATA 255,255,255,
255,255,255,255,255

90 DATA 85,85,85,85,85,
85,85,85

100 DATA 170,170,170,
170,170,170,170,170

110 DATA 85,170,85,170,
85,170,85,170

120 FOR Y=1 TO 20:FOR
X=1 TO 8

130 PRINT "abcd";:NEXT X

140 PRINT:NEXT Y:
PRINT

150 GOTO 150
```

As you can see there are four stripes of different colours across the screen. If you wish to see a few colour variations change line 150 as below and add the other lines:

```
150 FOR X=0 TO 255:
POKE 708,X:NEXT X:PO
KE 708,40

160 FOR X=0 TO 255:
POKE 709,X:NEXT X:PO
KE 709,202

160 FOR X=0 TO 255:
POKE 709,X:NEXT X:PO
KE 709,202

170 FOR X=0 TO 255:
POKE 710,X:NEXT X:PO
KE 710,48

180 GOTO 180
```

Another possible variation on this is to see what effect printing all of these new characters in the inverse mode (i.e., after pressing the Atari logo key) has on their colours. The only one affected will be the blue 'a' which becomes purple. This is in fact the true fourth colour. The 'd' is actually a mixture of 'b' and 'c'. The best way to find out what colours are possible is by experimenting. Do not forget that you can change the default colours by using either the SETCOLOR statement or by POKEing the colours directly.

As I promised last month both redefined characters and Antic mode 4 will be used to create a game for next month's issue. I am glad to report that it is now well on the way to completion.

The idea behind it is that you are in a power boat going down a river. In order to navigate your way safely you will have to blast boulders out of your way. The screen is in Antic mode 4, the river, its banks and the boulders are all redefined characters and the boat with its torpedoes are going to be player missiles. Despite the fact that the game is written totally in Basic with absolutely no machine code whatsoever it still runs quite fast. To find out how book next month's copy right now!

BOOST YOUR BEEB'S MEMORY

FROM PAGE 53

```
1150          EQUD &0D212157
1160          EQUB 0
1170    ]:NEXT
1175
1180 REM_______________
1185
1190 FOR pass%=0 TO 2 STEP 2
1200   P%=&74
1210   [:OPT pass%
1220          LDY #0
1230          LDA &FE30
1240          STA &73
1250          LDA #12
1260          STA &FE30
1270          LDA &70
1280          STA (&71),Y
1290          LDA &73
1300          STA &FE30
1310          RTS
1320   ]:NEXT
1340 ENDPROC
1355
1360 REM_____________________
1365
1370 DEFPROCdump
1380 PRINT''"DUMPING TO RAM"
1390 PRINT'"PLEASE WAIT"
1400 FOR I%=0 TO &7FF
1410          PROCwrite(?(buffer%+I%),&8000+I%)
1420    NEXT
1430 VDU7
1440 PRINT'''"PRESS <BREAK> ONCE"
1450 PRINT'"THEN '*TEST'"
1460 PRINT'"IF ALL IS WELL
YOU WILL GET A MESSAGE"
1470 ENDPROC
1475
1480 REM_____________________
1485
1490 DEFPROCwrite(data%,address%)
1500 ?&70=data%
1510 ?&71=address% MOD 256
1511 ?&72=address% DIV 256
1520 CALL &74
1530 ENDPROC
1535
1540 REM_____________________
1545
1550 DEFPROCread(address%)
1560 ?&F6=address% MOD 256
1570 ?&F7=address% DIV 256
1580 Y%=12
1590 data%=USR OSRDRM
1600 ENDPROC
```

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Scarthax has scoured the Universe to bring together the six ancient stones of lifeforce. United in Doomsday Castle they are being used to wield an irresistable power over the cosmos, emanating waves of corruption through every galaxy.

To save the Universe, you must battle your way through the Castle to find and collect the six stones and use their force against Scarthax to destroy Doomsday Castle, hopefully escaping yourself before the final cataclysmic explosion. The task is not easy (saving the Universe never is!) and it will take youmany games to unfold the structure of Doomsday Castle and discover the locations of the ancient stones. The addictive arcade style action will keep you coming back to play but the overall challenge should still keep you occupied for months.

You take on the role of our super hero ZIGGY shown here above in his exploratory capsule in combat with an Urk disguised as a pangalactic gargleblaster (!!) This is a true representation of the on-screen graphics.

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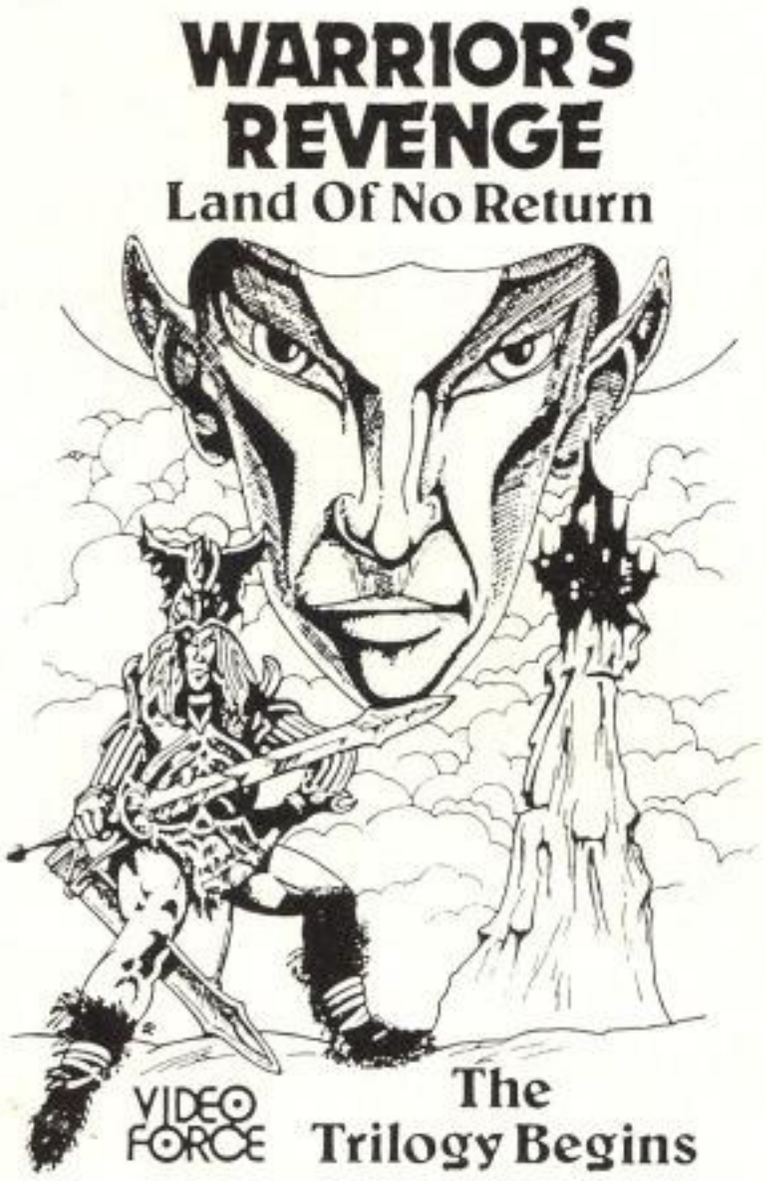

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