Australian Personal Computer

MICROBEE GAMES REVIEWED

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$2.50*

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

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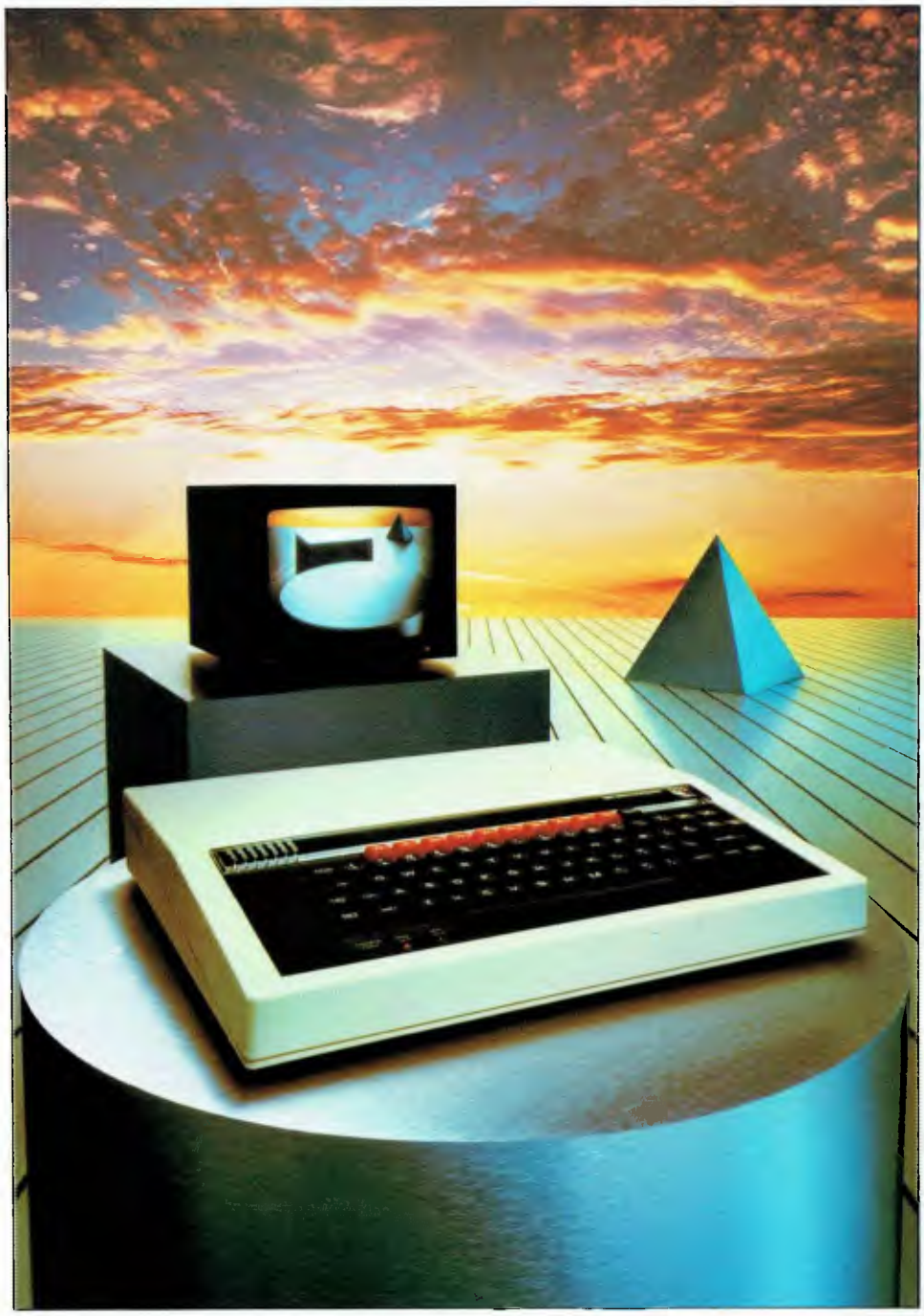
BBC Microcomputer now Starring on National Television in 'The Computer Programme'



The BBC Microcomputer is at the heart of a massive computer education project: 'The Computer Programme', now running on ABC National Television.

This complete computer literacy programme includes two series of television programmes, each ten episodes, for students and novices on the use and applications of computers.

The first series commenced on ABC-TV in June in most states (September in SA) at classroom viewing times.

The BBC Microcomputer, designed and used extensively in UK schools computer education, can genuinely claim to satisfy the needs of novice and expert alike. It is a fast, powerful system which can synthesise music and speech. Its high resolution colour graphics provide a 'picture' of exceptional quality.

The BBC Microcomputer has been approved for use in Australian Schools by the Education Departments of WA, SA and Tasmania. (Other Australian State decisions on approved computers for schools are pending.)

A wide range of games and educational software is available.

The computer can connect directly to cassette recorder, domestic TV set, video monitor, disk drives, printer and paddles. Its Econet network system allows numerous machines to share the use of expensive peripherals.

BASIC is standard. Plug-in ROM options allow instant access to high level languages and word processing software.

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- ☐ Educational Software
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DEATHWORLD -1
THE BLOODSTAR CONSPIRACY

President Catto has been assassinated! Blown to pieces in his own maximum security apartment. The ruthless forces of the Fearros Empire had penetrated deeper into the Dogod Federation security system than had ever previously been feared. Now the mad child-woman Empress, Fess, was preparing for war. Only the experience and skill of President Catto could halt bloody interstellar conflict, but he was dead ...

CRUSADER

It was time for the Super-intelligence Brotherhood, CRUSADER, to spin into action. The fanatic, and fantastic, guardians of the fragile structure of inter-world peace was up against its most dangerous mission. Catto had to be reinstated, but how? The Brotherhood orders Sturt Jeb Kyrik into action. Number one Cosmic Crusader; known to Dogod as Status Quo.

COSMIC CATASTROPHE

Somewhere on the forgotten world of Bloodstar was the answer. Forgotten, that is, to all but the planets deadly — and highly impressive — defence systems. Bloodstar contained the presidents genetic code; enough material to reclone him. But time was running short.

Status Quo's almost impossible mission: Penetrate the lethal robot defences of Bloodstar and recover his gene banks.

Already the forces of Fearros were ravaging Dogods allies, raping, killing, destroying for her pleasure and slowly gathering battle cruisers on all frontiers. Cosmic catastrophe is only hours away!

The Bloodstar Conspiracy is the first of Cosmic Software's new graphical/adventure/arcade series, combining exciting animated graphics and fast machine language. DEATHWORLD #1 is the introductory quest into the world of action space adventure with the Cosmic Crusaders. Look out for DEATHWORLD #2, Planet of Treachery.

TRS-80 model I ONLY & SYSTEM 80
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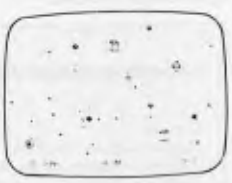

ASTEROIDS PLUS

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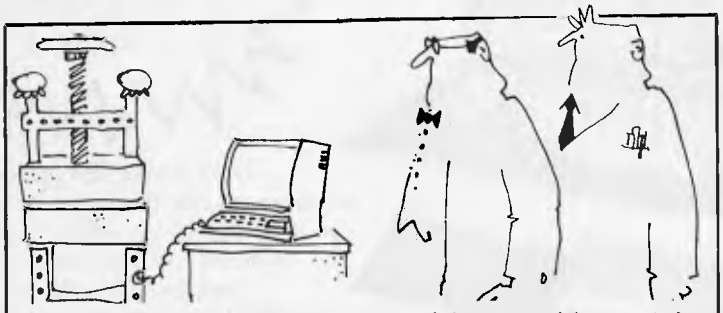

'It's on loan from the printer company until the new models come in.'

Note to Readers

Without going into the tedious reasons of why we've had to change *APC's* size slightly to the more conventional quarto dimensions, suffice to say that the print run has been increased again making it necessary to change to a bigger printing firm which uses a Web printing machine. This form of printing is faster and produces better quality but it's suited to quarto and not A4. So, we changed.

With some delays associated with alteration of artwork, us getting used to the new printers (as well as vice-versa) and so on, it has been necessary to join the June and July issues to produce a joint issue. The next issue will be the August issue, out at the beginning of August.

Sometimes it's hard to believe it, but *APC* is into its fourth year. As Australia's first microcomputing magazine, we got off the ground in May 1980 catering for what was then a very obscure hobby indeed. Now we outsell all the other upstart mags and there's no sign of the market's expansion rate slowing down.

This is our biggest issue ever — 152 pages plus cover — and, like the market, we've not planning to stop growing. Just as we've scooped every other microcomputing magazine on either side of the Pacific with Benchtests on such machines as the IBM Personal Computer, Sinclair ZX80, the Atari 800, the OKI if800, the Sinclair Spectrum, the new Sony and most recently, Dick Smith's VZ-200, we'll continue to be first with the news here and abroad. And to break editorial policy, we'll preview the next issue's contents which contains another first: an exclusive full Benchtest of Apple's *Lisa*.

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It's that easy.

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As well as dBase II itself, with the Budget Plus you get Tutor - to help you get dBase II working to solve your problems and ZIP, a program that speeds and simplifies dBase II's operation.

OSBORNE 1 Standard Features.

Standard Hardware:
- Z80A™ CPU with 64K RAM.
- Dual floppy disk drives with 204K bytes storage each.
- 5" Green phosphor CRT with 52/80/100 column display.
- Business keyboard with numeric keypad and cursor keys.
- RS-232C and IEEE 588 Interfaces.
- Weather-resistant, portable housing.
- Operates on International voltages.

Standard Software:
- WORDSTAR® word processing.
- MAILMERGE® mail list.
- SUPERCALC™ electronic spreadsheet.
- CBASIC® programming language.
- MBASIC® programming language.
- CP/M® operating system.

OSBORNE 1 Optional Extras.

- Battery pack for one hour of processing.
- 300 baud auto-answer, auto-dial modem complete with software. (Pending Telecom approval).

Optional Software

Forth™: Forth is a high-level computer language in which the Osborne user can use the vocabulary provided, or extend it with his own words for specific applications. This language is ideal for controlling peripheral devices such as printers, cameras, timers and laboratory devices.

Microsoft® Basic Compiler: Allows Osborne users to compile their MBasic interpretive programs into true Z80 machine code. The Basic Compiler provides you with three major benefits:
1) increased speed of execution for most programs;
2) decreased program size for extremely large programs;
3) source code security.

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SuperSort is compatible with Basic, Fortran, Cobol and assembler application programs, and can also be used with mail lists maintained with Mailman and WordStar.

Personal Datebook™: This popular program handles a calendar and appointment schedules for two people or offices (using Osborne 1 single density), keeping an accurate and complete schedule for the busy executive or professional.

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muMATH-80™: muMATH-80 is a fully interactive Symbolic Math System that efficiently and accurately performs true algebraic and analytic operations.

System Checker™: A very simple verification program which allows the Osborne owner to have confidence in operation of the computer.

Disk Doctor™: This program reclaims damaged diskettes and allows you to recreate accidentally erased files.

BSTAM™: BSTAM is the telecommunications program that allows the Osborne user to send and receive any CP/M file with complete error checking.

OSBORNE
BUDGET PLUS

PRINTOUT

APC reports on the latest news from the world micro scene

Presidential happenings

Columbia Data Products has come up with a portable version of its IBM work-alike and expects the machine to be available in Australia in mid-July from President Computers.

The portable is basically the Columbia IBM-compatible machine in a different case, complete with 8088 processor, 128k of RAM, twin half-height floppy drives storing 320k each, and one spare IBM-compatible slot compared with eight in the desktop version. The price here will be $3995 including MS-DOS, CP/M-86, MS-Basic, BasicA, the Perfect range of Writer, Filer, Calc, and Speller, the Macro/86 assembler, the Fast Graphs graphics package, Space Commanders, and Home Accountant Plus, together with diagnostic, tutorial, and communications packages. The price includes sales tax,

President Computers is, however, hopping up and down with excitement about another product which was first seen publicly at Data 83. It's an Australian designed and manufactured fully portable 16-bit micro. And the get-in price for the Magnum 256 is $1995 (incl. tax).

Because *APC* will be reviewing this product fully in a future issue, only a brief outline of the machine follows:

It measures 12 x 11 x 2 inches, has a full QWERTY keyboard, an 8 line by 80 character display on a lift up console, 256k of battery backed RAM (so memory contents are retained when the machine is turned off), 128k of internal ROM and 128k of "personality" (i.e. customized) ROM. MS-DOS is the standard operating system for the Magnum and some applications software will be included in the price, although Terry Crews of Dulmison (the manufacturer) declined at this stage to specify exactly what, until current negotiations are complete.

The machine is a wealth of innovative ideas — such as preserving battery life by switching off the cpu while it is not actually required to process even when applications programs are running — and to do it justice further description should wait until the full review.

It is slated for release in August.

Loop-holes

Apple seems to be experiencing quite a difficult time at present. No sooner does it injunction one distributor/retailer from selling "Apple compatible" machines than another company releases a new product. And each time Apple is successful in its attempt to prevent the sale of such compatible machines, (thereby establishing a precedent,) so a newly configured Apple compatible is designed which avoids the specific component or feature used to justify the injunction. It's all a bit like the taxman's ongoing saga against the people: as soon as one loop-hole is closed so another is found.

This is by the way of an introduction to the Fox-640 which has been released in Australia by Fox Computers. It is a 6502 driven, 64k RAM micro with colour card, eighty column card and it can run Apple and CP/M software. The top of the line Fox comes with a built-in 9" monitor and dual disk drives. The price tag is $980 (excluding tax). For more information catch the Fox on (02) 476 4582.

Two Shows

Next year there will be two Australian Personal Computer Shows and each will be a day longer than the three days of the first APC Show this year. Already indications are that the Shows will be sellouts with companies like IBM, Digital Equipment, Apple, Tandy, Commodore, NEC and Barson Computers going for large prime sites while some of the other previous exhibitors are booking even larger spaces.

The first Show next year will again be in Sydney at Centrepoint from March 14 to 17. The World Trade Centre is to be the venue for the Melbourne Show from July 18 to 21.

In the coming months, up until the time of the Show, we'll be issuing updates on exhibitors and other bits and pieces of interest. More on Australia's best Micro-computing Show next month — watch this space!

Olivetti add-on

Olivetti isn't sure that it's all that important, but the M20, just as an aside, now runs standard operating software.

That is: it runs CP/M-86 and MS-DOS on an add-on processor.

You had to be pretty keen-eyed to spot this. The announcement spent a paragraph talking about how the machine was 'oriented towards professional applications'.

Then it said it was 'suitable for use in many other applications'.

Then the text dwelled lavishly on the Zilog Z8001 processor, the disks, the screen, the graphics, and the keyboard.

Next, the fact that the screen could be adjusted took up a fair amount of print. Windows were mentioned.

After that, we were told that the M20 'is able to work with other computers as a terminal' and that, in turn, 'other peripherals could be attached' to it. These included, we were informed, printers.

Finally, on the bottom of the page, the announcement said that the M20's operating system, — PCOS, Professional Computer Operating System — 'is exclusive to Olivetti, and fully exploits the system's potential'.

There was another page. It began with a nice, fat paragraph on Basic 8000, assembler and Pascal languages. It mentioned all the OLI brand software.

And then just fleetingly, before passing on to a last paragraph which told of a possible local network *(Oh, no! Not another one! — Ed)* there was the shy little announcement.

'In its bi-processor version incorporating an Intel 8086 processor, the M-20 is also able to operate in the popular CP/M-86 and MS-DOS environments for which a host of application programs are available on the market.'

For the price of this add-

on, I was referred by the press office on the stand to the sales staff. They suggested that I get the price list from the press office. I suggested that I had work to do, and left. I suppose they see their sensible move as some kind of admission of failure . . .

Guy Kewney at the Hanover Fair.

Laboratory Thrills

Have you ever noticed how advertisements for home computers usually contain something along the lines of "Designed for business, education, entertainment and scientific purposes". It's staggering that there are machines at all so ideally suited to all these applications, let alone with a price tag of generally under six or seven hundred dollars.

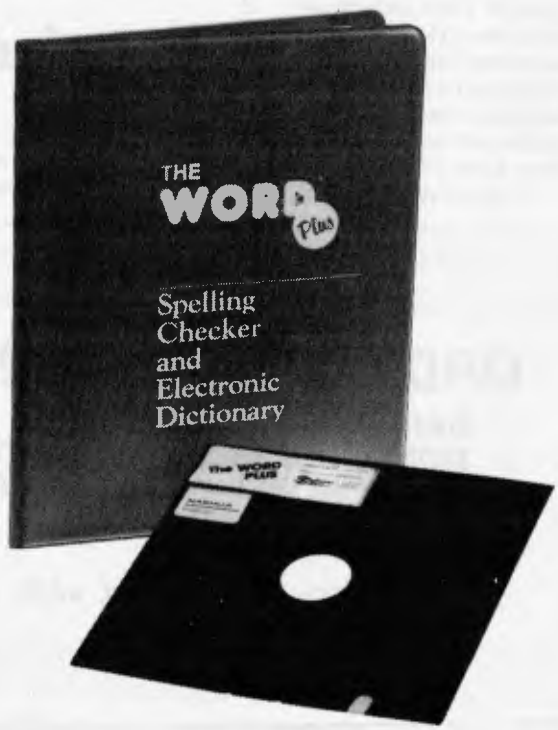
At Searle Laboratories in the Quality Control Department at Fairfield, technicians are combining at least some of these home computer attributes and are actually finding some sort of high-tech pleasure weighing tablets using a TI 99/4A, according to a press release from Texas Instruments. It's headed "Searle Laboratories and Texas Instruments make tablet weight analysis fun". There is no further reference in the screed detailing how much fun it is to weigh tablets or indeed how such fun is derived from what was, pre-TI 99/4A, a "monotonous, time consuming chore".

If you've got a tablet weight analysis problem, TI apparently have a funny solution for you.

$231 Million gift

Apple Computer has offered over $231 million of computer equipment to Californian schools, which is a massive amount of money for one company to allocate to nearly 10,000 public and private schools throughout California.

While there have been tax concessions legislated in the state (a credit of 25% of the value of the donated equipment) and Apple is no doubt looking forward to sales of further peripheral, software, etc, and sales to school children for their home use, it is a move which should be loudly applauded. Hopefully Apple will have something modelled on this in the pipeline for schools here.



Software Source has announced that it has been appointed exclusive distributor for 'The WORD Plus' dictionary program. The software is actually a series of integrated spelling check tools with the ability to find and fix incorrectly spelled words in context and to suggeest similar words and to build word lists to augment the 45,000 words on file (claimed to be the largest dictionary under CP/M). The WORD Plus is compatible with nearly all CP/M wordprocessors and text editors. Greg Lister of Software Source is expecting a grammar checking program later this year. Telephone: (02) 389 6388 for more information.

Australian RAM disk

General Electronic Developments has introduced an "M-Drive" for their CentriNet computer. "M" is supposed to stand for memory but it is really a standard RAM disk, details of which were published in the March issue of *APC* (page 42). The drive is of benefit to earlier GED computers, but the CentriNet has been specifically designed to maximise the disk access speed increase. GED are on (02) 816 2211.

You can't say no

After a disastrous start with the TI 99/4, Texas Instruments bounced back with the all-round better 99/4A home micro and has recently announced its intention to enter two other major areas of the market-place. The TI Professional is a business machine (which believe it or not, is IBM PC compatible) and Benchtested fully in this issue, so there's need only to mention the Compact Computer 40.

It is slightly larger (and more expensive) than the standard hand-held micros from people like Tandy and Sharp, but is smaller (and cheaper) than micros at the other end of the "hand-held" market, like the Epson HX-20. The most similar machine in size is Hewlett Packard's HP-75C which is dramatically more

expensive at $1600 versus the CC-40's price tag of $350.

The TI comes with a 31 character liquid crystal display, 34k of ROM containing the Texas Instruments Enhanced Basic, 6k of RAM (expandable to 18k), and measures 9½ x 5¾ x 1 inch. The contents of the RAM are retained when the unit is turned off for the anticipated 200 hour duration of the life of the battery.

A plug-in module port is provided for application software — no details of what it is to be are available yet — of up to 128k of ROM. Peripherals to be available later this year are an RS232 interface, a printer/plotter, a Wafertape digital tape drive, a modem, and a black and white television monitor.

The CC-40 is due to be released this August in Australia.

On the subject of TI the company will release fifteen education software cartridges for the 99/4A in the third quarter of this year. The new software features mathematical learning exercises for children in kindergarten to grade 9. They include six titles from Developmental Learning Materials, four additional titles from Milliken, three from Addison-Wesley and two from Scott Foresman.

TI describes one of the programs: "Hungry alligators lurk in a colorful swamp in prey of apples that contain correct answers to addition and subtraction problems appearing on their stomachs. Children open the alligator's mouth when an apple with the correct answer on it appears, and close it rapidly when the answers and the problems do not match." For further details, 'phone (02) 887 1122.

Tandy three this year

Three new micros will be released here this year by Tandy Corporation. They are the Model 100 portable, a VZ-200-scale version of the Color Computer called the MC-10 and the company's first purpose-built CP/M system, the Model 4.

The Model 100 is a briefcase style machine like Epson's HX-20, and is made for Tandy by Kyocera in Japan. It is built around a low-power CMOS version of the 8085 8-bit processor, and comes with up to 32k of RAM, built-in LCD display with eight lines of 40 characters, 240 x 64 graphics, full keyboard, and internal rechargeable batteries. An auto-dial modem built into the US version will not initially be available, althoughy Mal

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Williams of Tandy says work is being done with the manufacturers to incorporate it in later versions. In the meantime, an RS232 interface will be included here.

Half goes

There has been a restructuring of the ComputerLand Australia store franchising operation. ComputerLand Corporation of Hayward, California has acquired a fifty per cent interest of the company from Lorna and Rudi Hoess who remain as directors.

"The restructuring promises the Australian operation better access to the overseas ComputerLand group which provides buying power, training and marketing skills", said Darryl Rudolph who has been appointed managing director of ComputerLand Australia Ltd.

ComputerLand is the world's largest computer store franchisor with 425 stores in 25 countries. It expects sales to reach US$1 billion this year.

Sharper Sord

It would be comforting to be able to dismiss as a joke Sord's threat to launch at least two 32-bit micros this year. Unfortunately, the company has the reputation of producing systems on time, and these will almost certainly appear.

A 32-bit system from Sord will almost certainly be a lot more expensive than an 8-bit system, but it will probably be pretty cheap by current standards.

Sord boss Takayoshi Shiina was tantalising vague about it all. He would not say which chips would be inside the system, and he wouldn't quote prices.

But he did say that the first 32-bit machine would be out 'soon' and hinted at June, and said that its performance would be 'about half the power of a VAX 11-780' — a very powerful 32-bit mini from Digital equipment.

And the price, he said, would be about a tenth. That would put it at around $9000.

In America, Inner Vision showed a system using the Zilog eight-bit Z80 plus the National Semiconductor 16032 (a 32-bit chip) — and it was built on an S100 card, available now. So the Sord prediction is roughly in line with what we know to be going on in the world.

Sord also announced a local area network, of course.

Integral graphics a must

A powerful argument was put forward by Microsoft boss Bill Gates to indicate

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that "graphics are going to be a standard part of all computers," — and was followed by a promise that Microsoft's latest version of MS-DOS would be up to this need.

Gates told his super-seminar audience that the future of software required rethinking of several aspects of program design.

First, he said, integration of software products would have to be made a matter of designing compatible data structures — not trying to build all-in-one programs "like one and two thirds" — a reference to Lotus' 123 package.

Second, the user interface would have to be made far more understandable by the use of clever graphics — for icons, for special type faces, and for other more esoteric purposes.

Third, there would have to be much greater clarity about the "metaphor" used for various types of data, so that the application program used would be loaded according to how the user wanted to see the data — whether as spread-sheet cells, for instance, or as text, or as grapjhics, or as formulae.

Fourth, data from outside the stand-alone micro-system should be accessible without specialist know-ledge of whether it was held on a neighbour's micro, on the central mainframe (through complex job control statements for differing operating systems) or on a commercial database like Dow Jones.

Bill Gates.

And last, many facilities which are today regarded as applications programs — such as graphics, networking, telecoms — should be part of the operating system supplied.

Later, Gates told us that one of the major features of MS-DOS would be a very high level of graphics ability. "We will totally virtualise the screen," he said, implying that software writers would no longer have to bypass the operating system if they wanted to perform quick or clever screen formats.

He refused to be drawn on when this version of the operating software would be adopted by IBM as PC-DOS 3.0.

"We did a lot of work on version 1.0 and it was a question of how far we could get before we had to stop and say 'this is the next version'," said Gates. "Neither can we predict when we will be able to stop and say "this is version 3.0 finished."

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DATELINE: NEWS/NCC '83

APC's report on the recent National Computer Conference held in Anaheim, USA, gives details of the latest models to be launched.

AT&T signs to put Unix System V on more processors

Unix originator AT&T has pulled off quite a coup, signing up the three leading 16-bit processor makers — Intel, Motorola, and National Semiconductor — to put the latest Unix System V on their products.

The deal means that the three chip firms and AT&T subsidiary Western Electric will co-operate in porting System V to the Intel iAPX286, Motorola 68000, and Nat Semi 16032

House: Still shooting at competition.

processors.

And even better for Western Electric, the three other companies will do most of the work and then give all selling rights to the new products back to Western Electric.

Intel's microcomputer group manager Dave House confirmed this, but would not say whether Intel was paying Western Electric for the privilege of putting System V on the 286 and then buying its copies back from Western Electric. "Some money did change hands, but I'll let you guess what direction it went in," House told us.

Intel has just launched Microsoft's Unix look-alike Xenix for the 286, with the chip firm doing the hardware-dependent kernel and Microsoft doing the rest of the work on the port. But House does not see any problems in co-operating with Microsoft on System V as well.

"We will continue to work closely with Microsoft to develop System V for the 286 under the terms of the arrangement with Western Electric," he says.

Motorola's director of microsystems, Tom Beaver, claims to have 80 percent of the existing microcomputer Unix business with the 68000, and believes that System V will help keep that share against increasing competition.

Beaver also plans to produce an enhanced version of System V for the 32-bit 68020 processor when that finally appears in numbers next year.

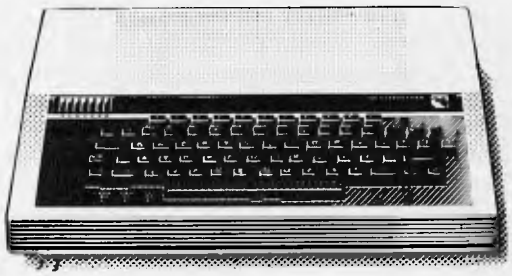
It's rare to see three processor makers co-operate in this way, but there is little chance of a cosy relationship over System V in the marketplace.

"We have only agreed to use the same calibre bullets, but nobody here is going to stop shooting at the others," says House.

Gorilla and frog fight for public attention

Anaheim's animal kingdom; the giant frog (top) is Charles River Data Systems' odd way of drawing attention to its Universe 68 range of 68000-

BBC Microcomputers



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based 16-bit supermicros. Note the slogan — "Leapfrog to 32 bits." And the equally giant gorilla was an attention-getter on the Leading Edge stand, where it was promoting the company's latest printer distribution deal. The printer, you see, is a Seikosha-style uni-hammer machine that is "Guaranteed Tough". And

not content to leave well alone, Leading Edge has not only called the printer Gorilla, but promotes it with a big poster and advertising campaign featuring a large banana and no text . . .

Sanyo promises an IBM work alike

Sanyo showed off its first foray into the IBM-compatible business with the MBC550 — with an entry price of just $995.

That only includes one 160k disk drive and does not include the monitor or operating system though. Features that are included are the 8088, 128k RAM, colour graphics, parallel port, and diagnostic and utility packages. Other software thrown in includes Sanyo Basic and "word processing and spreadsheet software."

Options are the monitor (!), monochrome or colour,

Sanyo's $995 IBM compatible.

another 128k of RAM, the 8087 maths chip, a second disk drive, double-density disk storage, MS-DOS, and winchester disks.

Sanyo in the US says it is taking orders now, for delivery in the autumn.

Briefcase version of Toshiba's T100 makes its debut

Toshiba launched two new products at the NCC, a 16-bit desk-top and a portable version of the T100 built into a briefcase.

The T300 is an IBM work-alike, with an 8088, 192k RAM, single or twin 640k floppy drives, Centronics and serial ports,

Portable T100: LCD in the lid.

and seven expansion slots which are presumably IBM-compatible — Toshiba omits to say. Extra RAM can take it up to 512k, and 650 x 500 graphics in eight colours are an option. Colour text display, 80 x 25 is standard.

It can read IBM PC disks, and Toshiba "is preparing a list of IBM PCV programs that can run without modification on the T300," for issue sometime "in the near future".

The new portable is the T100 built into a briefcase, with a 40 character by eight-line LCD display in the case's lid. A 300 baud modem is also built into the lid. RAM space is 64k, but programs and data can be stored semi-permanently in add-on RAM packs holding up to 32k each, these packs have battery back-up.

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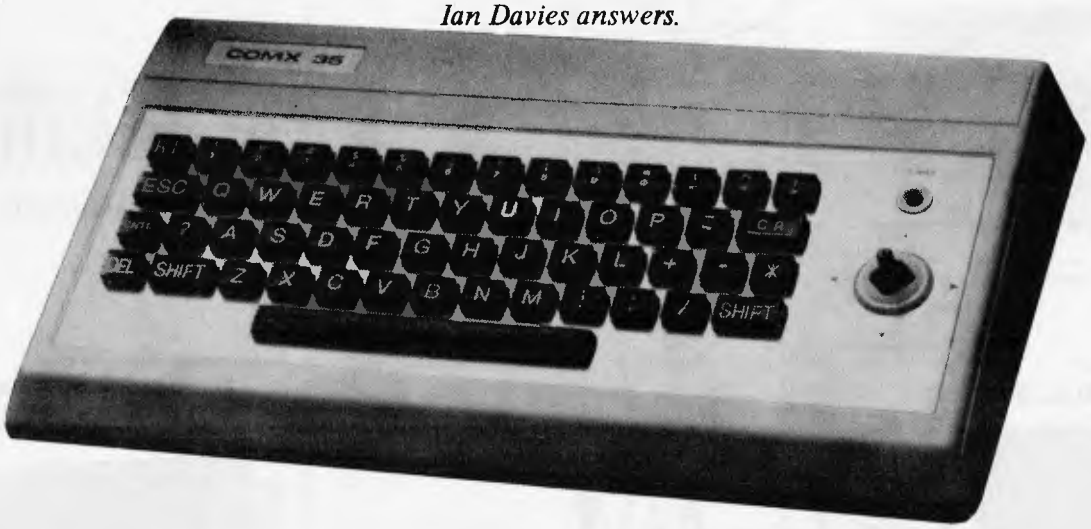
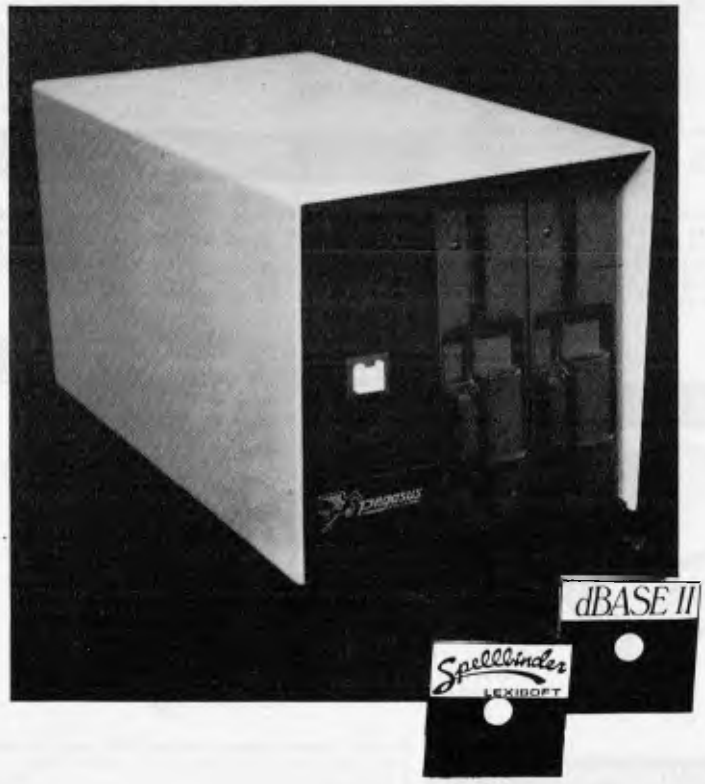


The COMX-35 is a new RCA 1802 based, low cost, colour computer following on the heels of the ZX Spectrum and the DZ 200. For just $299, the COMX includes a 16k ROM, 35k of RAM, colour, built-in speaker and joystick.

The COMX is about 5 x 8 inches and about 1½ inches thick with calculator style keys. The 65 key keyboard layout is quite peculiar, but would be easy enough to become accustomed to after continuous use. The small joystick is located on the main unit just to the right of the keys and feels stable enough for games use. A RESET key is provided and, like most machines these days, requires the depression of a second key (the space bar) before operating.



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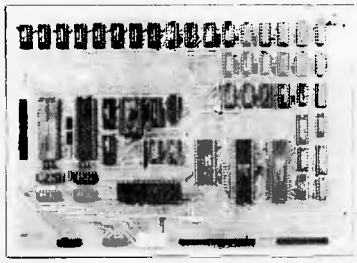

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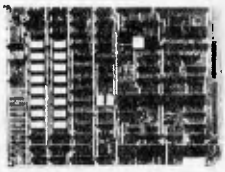

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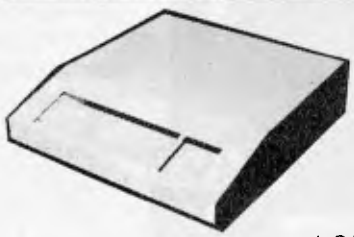

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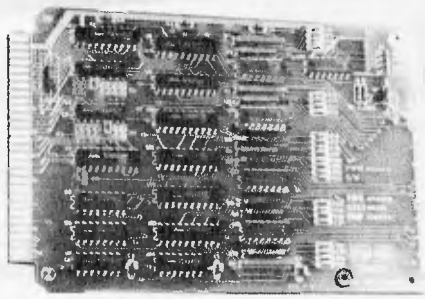

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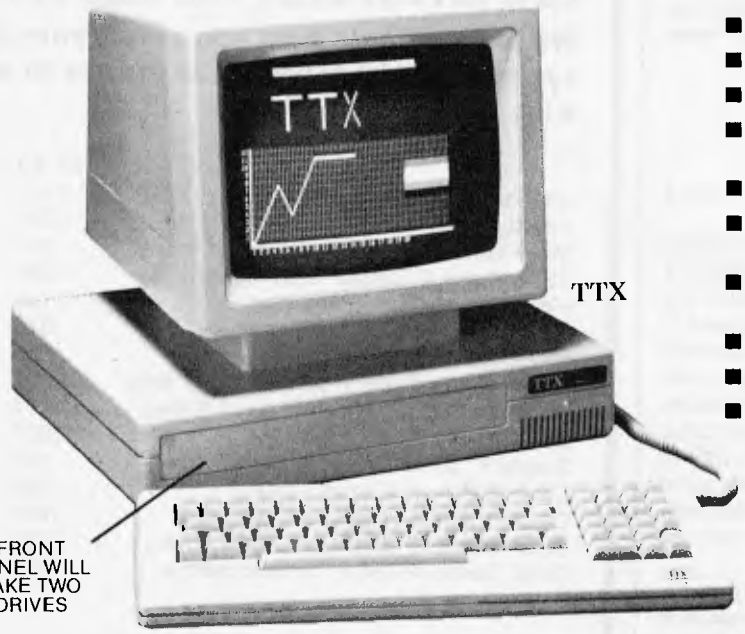

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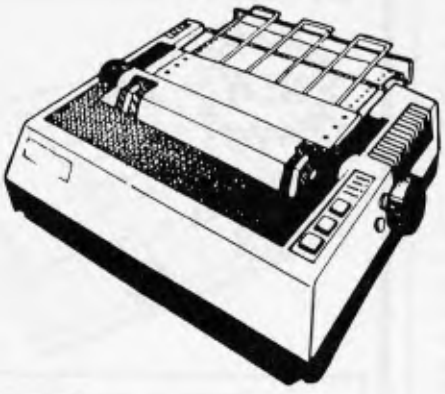

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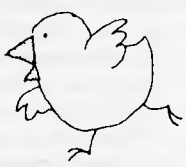

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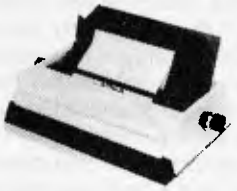

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The machine outputs its colour display through an in-built video modulator to a UHF colour TV. Since most colour TVs have UHF capability, this should not be a problem. Storage is by means of a normal cassette recorder, requiring only earphone and microphone connections. The power supply is external to the main unit, being a "plug pack".

Setting the beast up is easy enough due to the small number of leads. The only possible mistake could be to reverse the earphone and microphone connections to the cassette. My one criticism is the length of the cables provided. The video output cord in only just long enough to reach from the back of the TV set around to the front — far too short for comfortable use. The display was quite steady with good colours and did not require too much tuning to achieve a decent picture, so presumably the video cable could be extended without sacrificing video quality.

Basic

The COMX runs a non-Microsoft 16k Basic which includes a number of interesting and unusual features.

Perhaps the most useful feature is that of "time controlled subroutines". This facility allows you to use the TIMOUT statement to declare a subroutine to be branched to when the "stop watch" reaches zero, and then issue a TIME command to set the "stop watch". Your program can then continue processing other code and, when the specified time elapses, the COMX will perform an automatic GOSUB to your subroutine. After processing, the subroutine can reset the clock and execute a RETURN to get back to the mainstream. This facility is invaluable for any situation where you are trying to do more than one thing at once, such as in most video games. Although multiple clocks can be an added convenience, even just one greatly eases the task of simulated multi-tasking.

The greatest nuisance value is that the Basic very rarely provides readable diagnostic messages. All of its standard errors are displayed as codes, specifically: "ERR CODE nn". Until you have memorized the 72 different error codes, it will be necessary to refer to the back of the manual to find the meaning of the numbers it may spit at you. The COMX runs a 16k ROM, and I do not think that the Basic is sufficiently full of advanced features to justify this sort of unfriendliness. A similar example is the RENUMBER command. Firstly, let me say that it is very commendable for a Basic to include the RENUMBER command and, given that, the COMX RENUMBER is quite a good one, as it recognises the existence of "computed branches", in other words, a GOTO or GOSUB where the line number is an arithmetic expression. Most RENUMBERs simply ignore computer branches, whereas the COMX provides a warning of the form "nn COMP BR", meaning that there were nn computed branches. With the expense of only one dozen bytes, this useful message could also have been made readable, and with very little extra effort, it could have listed the line numbers containing the computed branches, thereby greatly easing the task of tracking them down. This example characterises the COMX — it is very nearly a great machine, but lets itself down in a few areas.

Data storage is provided via a normal domestic cassette recorder, with the commands PSAVE and PLOAD being used for program storage. Unfortunately, no VERIFY command is provided, and a bad load results in the loss of the program in Basic memory. Two similar commands, DSAVE and DLOAD are used for saving and loading the Basic variable memory to and from tape, including arrays and strings. This is an interesting idea, and is used to replace the normal PRINT# and INPUT# statements. One inconvenient side effect is that a DLOAD erases all the variables currently in memory, so it may not always be practical for a program to load data files from tape during execution.

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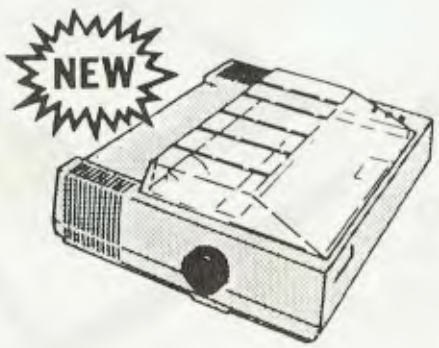

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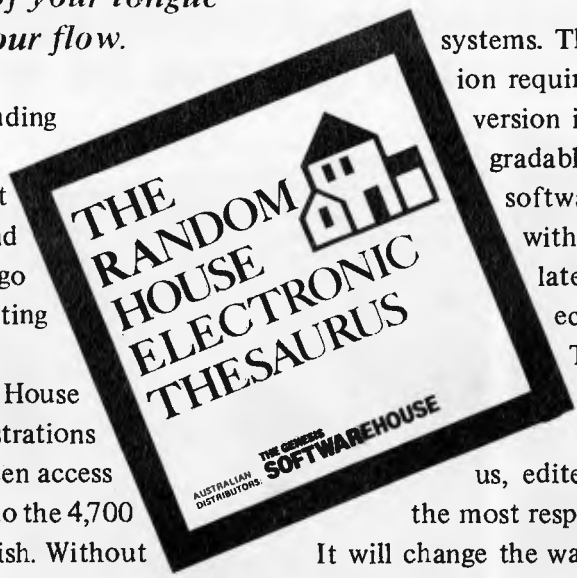

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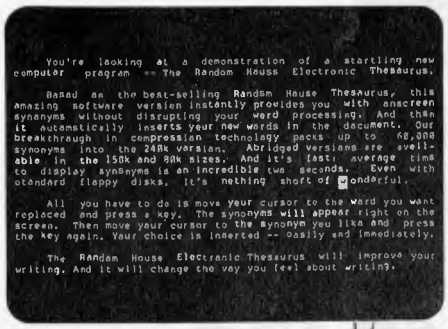
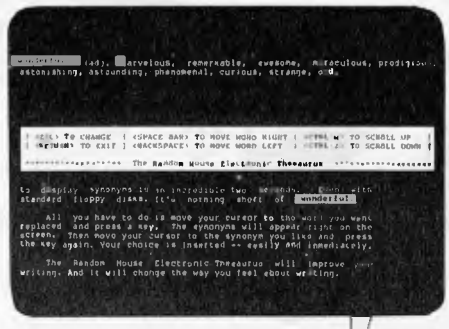
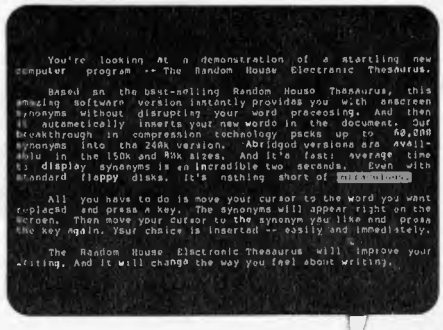


1 To find a synonym, simply position your cursor on the desired word. Or you can just type the word.



2 When you press ESCAPE twice. the top of the screen clears and fills with up to 100 synonyms. When you find a suitable synonym, bring your cursor to it and press ESCAPE again.



3 Your old word is deleted and the synonym is automatically inserted. Or you can press RETURN and return to your text without making any changes. You can also scroll through the listings.

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The colour graphics capability of the machine is rather interesting. Each character is displayed using 6 x 9 pixels, and produces a surprisingly high quality result. Three Basic commands are provided to control the eight display colours. The first of these is the COLOR statement, whose single numeric parameter may be in the range of 1 to 12. This statement controls the colour of the characters the computer prints and the colours you key in, not independantly. The SCREEN command sets the background to one of eight possible colours and the CTONE command produces an interesting effect whereby all output characters are the same colour as the background except brighter. The one limitation of these commands is that they take effect for the entire screen. For example, if you set the output colour to yellow and print some information and then set the output colour to green, then *all* of the output on the screen will be green, not just subsequent output. However, the programmable character facility allows you to program around this.

The SHAPE statement is the Basic command to redefine the character set, and is considerably easier to use than the POKEs required on many other machines. The parameters for the SHAPE command are the character code and an 18 hex digit string, for example

SHAPE (65, "48487E6A7E48484800")

redefines all "As" to a Chinese symbol. The first two bits of byte define the colour for the remaining six pixels in that character row. This implies that colour selection for each character is on a row by row basis, but this should not be a noticeable limitation in most situations. Since only two bits are used to select the colour, there are only four possible colour selections. This is effectively doubled since the COMX provides two different groups of four colours depending on whether the character was displayed by the machine or keyed by the user. The four colours for computer generated output are black, blue, green and cyan, leaving red, magenta, yellow and white for user-keyed characters. I suspect that there may be some POKEs to avoid this limitation, which could hopefully be included in an advanced techniques manual.

Control of the built in sound generator is provided through four Basic statements: MUSIC, TONE, NOISE and VOLUME. The MUSIC and TONE statements require frequency octave and volume parameters and will continue playing until called again with zero parameters. I could find no noticeable difference between MUSIC and TONE and, indeed, they cannot both be active at the same time. the NOISE statement generates white noise according to the specified frequency and volume, and it is possible to have a NOISE active at the same time as a TONE or MUSIC. The VOLUME statement appears to be a reduction factor applied to all subsequent MUSIC, TONE and NOISE statements.

The Basic also supports a function called KEY, which returns the ASCII code of the current key being pressed, and it is this which provides access to the built-in joystick from within Basic programs by returning four special character codes corresponding to the four possible positions of the stick. This means that the joystick cannot be used to generate diagonal movement, but again, I suspect that there are some undocumented PEEKs which could be used for this purpose.

Although this Basic provides high level commands for most aspects of machine control, it also provides constructs to ease the task of POKEing and PEEKing when required, such as 16 and 8 bit hexadecimal and binary constants.

Some of the more distinguishing features of the Basic are: multiple parameters in the CHR$ function, a modulus function, a CALL statement and a FORMAT command to set the output width of integer PRINT items. The RUN statement is unusual in that it does not erase all variables prior to execution, so most programs will need to commence with a CLD (clear data) command. One interesting feature is the RUN+ command, which replaces all GOTOs and GOSUBs with absolute addresses, thereby avoiding the overhead of searching for the destination line number each time the branch is executed. This is a clever idea and it would be nice to see this sort of partial compilation in more Basics, as it is usually the search time which slows down execution.

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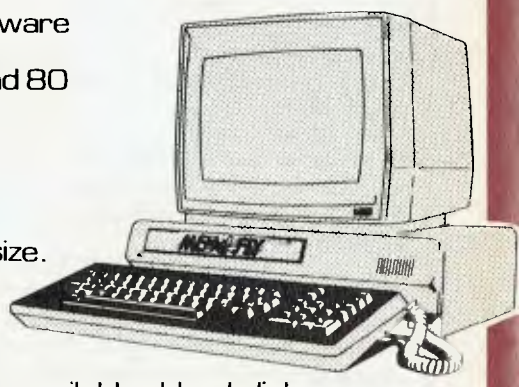

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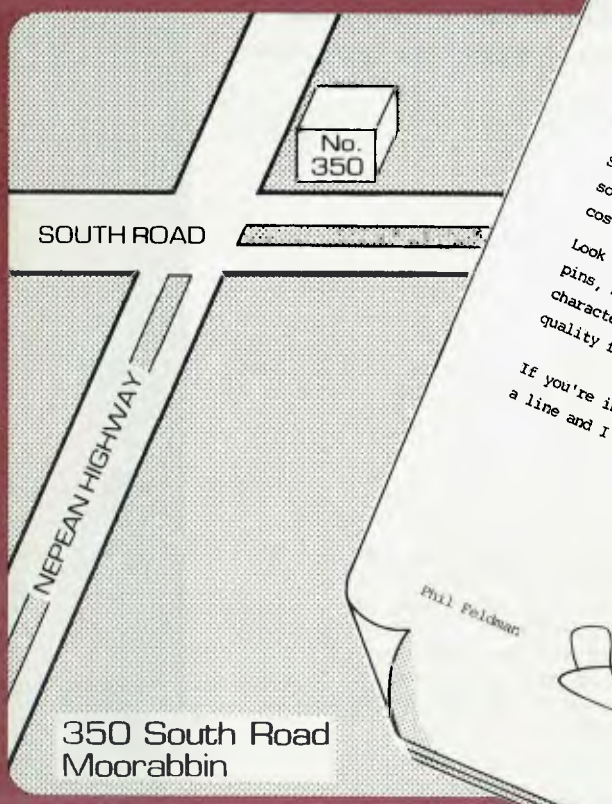

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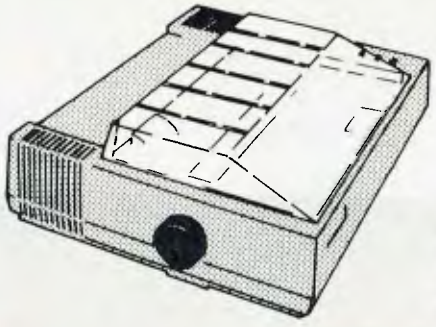

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1st July, 1983

Dr Gary Kildall
Digital Research
P.O. Box 579
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Dear Gary,

As the company responsible for the marketing and distribution of "DAVIDSON BUSINESS SOFTWARE" we would personally like to thank yourself and your organization for providing us with the means to broaden our marketing perspectives. I refer specifically to the CB-86 compiler provided and the assistance and advice that came with it. As a result we have been able to successfully implement the software on a range of 16 bit micro-computers including the NEC-APC and the IBM-PC.

Judging from inital market response and early orders it seems that end-users are also pleased with CB-86. This comes as little surprise to us having already had the benefits of a compiled basic in the 8 bit version CB-80. It is extremely reassuring as a distributor of software to have such a reliable and efficient product.

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John Johnston

Documentation

The only documentation provided with our COMX was the "Introduction to Basic Programming". This is quite a good manual and although I suspect that it has gone through a translation at some time, is generally very clear and readable. It successfully treads the fine line between being an introduction for the computer novice and being a reference manual for an experienced computerist. The manual provides numerous realistic and practical examples which successfully demonstrate the use and power of the COMX commands.

The documentation does, however,lack the sort of information that is vital to reviewers, such as what CPU the machine uses, a memory map and system variable areas. There is a definite need for an advanced programming manual to address the area of PEEKs, POKEs and the expansion port.

Conclusion

The COMX is certainly a nice machine for what you get, specifically advanced documentation, software and peripherals. If you were thinking of buying the COMX with the idea of expanding it into a complete system, then it would be worth your while checking the availability of these products. The COMX is probably best suited as a dedicated games machine, and it should not be too long before we see a host of quality machine language games appearing.

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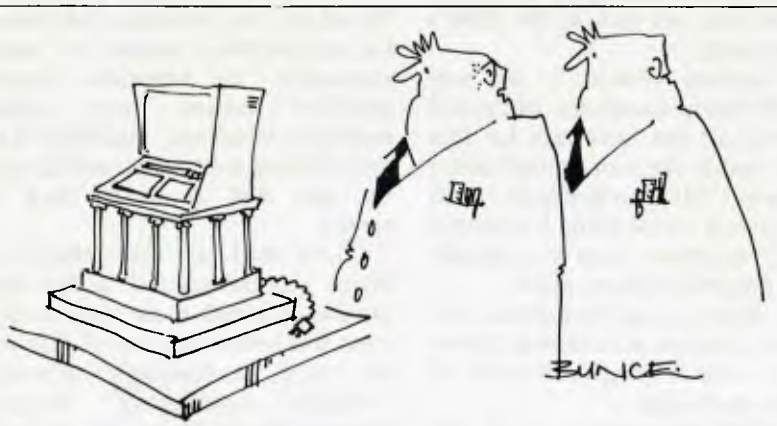
ASC	FORMAT	PRINT
ATN	FUAL	PSAVE
CALL	GOSUB	RAD
CHR$	GOTO	READ
CLD	IF	REM
CLS	INPUT	RESTORE
COLOR	INT	RENUMBER
COS	INUM	RETURN
CPOS	KEY	RND
CTONE	LEN	RUN
DATA	LET	RUN+
DEFINT	LIST	SCREEN
DEFUS	LOG	SGN
DEG	MEM	SHAPE
DIM	MID$	SIN
DLOAD	MOD	SQR
DSAVE	MUSIC	TAB
EDIT	NEW	TIME
END	NEXT	TIMOUT
EOD	NOISE	TONE
EOP	PEEK	TRACE
EXIT	PI	USR
EXP	PLOAD	VOLUME
FIXED	POKE	WAIT
FNUM		



I suppose all designers go through their classical phase.

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MIGHTY MOUSE

The "mouse" is all the rage now. Apple started the trend with the "Lisa", Visicorp quickly announced Visi-On (a scaled down version of Lisa's spectacular user-interface software for ordinary micros like the IBM PC and Sirius and utilizing a mouse) and now Microsoft has succumbed to the temptation with its own mouse and mouse-driven software.

Gates' word-processing mouse failed to convince some sceptics.

Somewhat ominously, Microsoft debuted its new word processing system in Sydney on Friday, May 13. Betraying its total innocence of Australian vernacular, Microsoft has called it the "Multi-Tool Word" (some might be more kind and refer to the name as simply "clumsy").

The program appeared in prototype form primarily in order to demonstrate the power of the new US$195 mouse. Microsoft explained its function: "It is used to move quickly or reposition a cursor on the screen. When the user moves the mouse across a flat surface, the cursor will track across a screen. No special prepared surface is required. Two buttons are provided to select decision alternatives or commands from the screen."

Dave Woodruff, Product Marketing Manager at Microsoft continued: "As personal computers move towards a graphics based display, you'll find more and more application programs where the mouse functions as the primary user interface. It is simply much easier to point to a box on the screen than it is to type in a command.

"This mouse is designed for the business environment," Woodruff said, "as it will make the personal computer easy to use with the next generation of end-user software productivity tools."

Despite Microsoft chairman Bill Gates' assurance that Multi-Tool Word running on the IBM PC was "better than many dedicated word processing systems," there is a school of thought that the mouse is not a natural tool for word processing, even if it showed promise for editing.

Two versions of the mouse will be available for use with a wide range of computers. The first will be will be for the IBM PC and includes a plug-in board for the PC. All the interface hardware is contained on the board that fits into any slot in the IBM's motherboard.

The second version is for any MSDOS-based computer. Microsoft is putting all the hardware for this version inside the mouse itself using low-power CMOS technology. It will interface to a micro using a standard RS232C interface and is portable across any MSDOS machine.

This mouse is self-contained and does not require an external power supply, special plug-in boards or separate packages.

The IBM PC specific mouse will be available from dealers in the US in May with the MSDOS version ready in June.

Multi-Tool Word itself is seen by Microsoft as an extension of its "Multi-Tool Family" (prior to 'Word there was only one member of the family —Multiplan — which was reveiwed last month in *APC).* The program uses a series of windows, reminiscent of the display of the *Lisa,* and advanced screen graphics to generate a wide variety of characters —italic, bold and so on — but this inevitably slows down its display speed.

"It is currently being developed, so that version is written in our own pseudo-code Pascal, for debugging reports. When we compile it into native code it will run four times as fast," Gates said.

The most notable features of 'Word are the provision (obviously) for an electronic mouse, an "undo" command, an extensive context-sensitive online help system, multiple windows, multiple fonts and formats and a horizontal scroll for text that is wider than the screen.

Gates told us that Multi-Tool Word was the second in the Multi family, of which there were to be at least five before the end of this year, all using increasingly innovative "artificial intelligence" methods. Most of them will use the mouse as an option.

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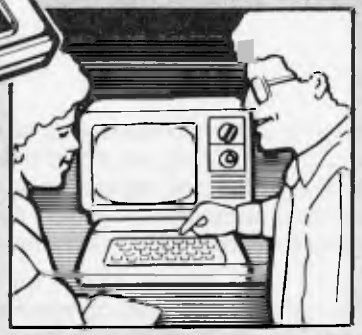

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OCTAVES PER CHANNEL	8	4	4	9	9	3
A.D.S.R. ENVELOPE	YES	NO	NO	YES	YES	NO
PERIPHERAL SPECIFICATIONS						
CASSETTE	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	1 CHANNEL	1 CHANNEL
AUDIO IO	YES	NO	YES	NO	NO	NO
BUILT-IN MIC	YES	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	143K	96K	170K	190K	156K
(LOW PROFILE)	YES	NO	NO	NO	NO	NO
CP/M COMPATIBILITY (80 column programs)						
CP/M® 2.2	YES	NO***	NO	NO****	NO	NO
CP/M® 3.0	YES	NO	NO	NO	NO	NO

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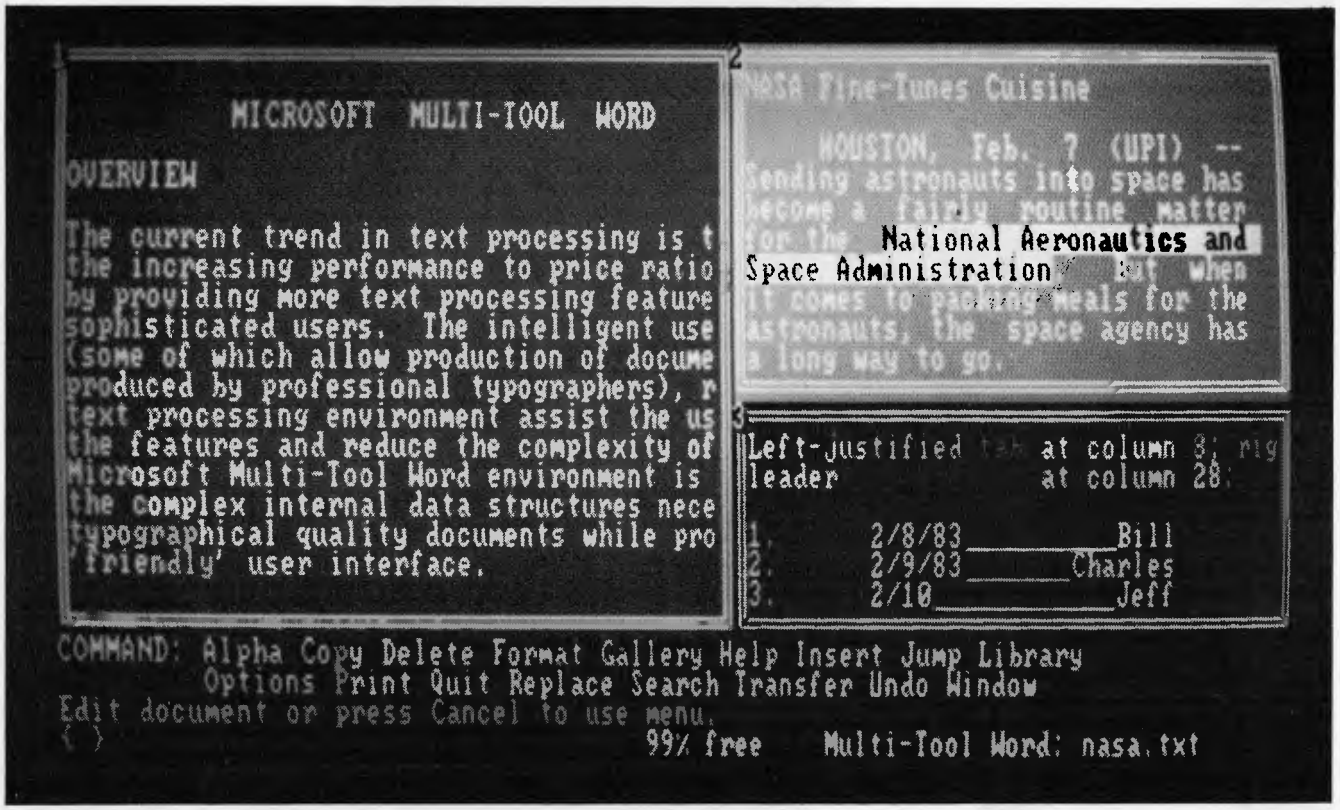
Is is all worth it?

Guy Kewney ponders at the West Coast Faire: One of the big crazes at the Faire was for mice.

Since the announcement of *Lisa,* with its graphics screen and mouse, everyone has decided that they must have a mouse and, of course, making mice for the IBM PC is particularly popular. I tried a mouse and was puzzled; it worked just fine but I couldn't quite see why it has become so prevalent. It's supposed to make it easier for laypersons to select from a menu or generally move around the screen. Positioning the mouse takes a little practice and you then have to press a little mouse-mounted button to tell the computer that you've arrived at your chosen location. I'm puzzled because I think a touch-sensitive screen or light pen would be far more sensible for several reasons: you make your moving and selecting in one go; there are no moving parts to wear out; the software is far simpler; and you don't need to keep an area clear on your desk top. The situation is especially silly when you consider that many modern display controller chips contain built-in light pen interfaces anyway.



An example of a Multi-Tool Word screen in window mode . . . note the similarity of the command line to that used in Multi-Plan.

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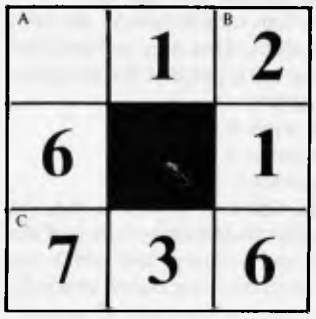
4/83

CROSS-FIGURES

Philip Lewis describes how he stumbled into the world of creative cross figures nine years ago. Since then his enthusiasm has remained unabated. Here he eagerly imparts his knowledge to those mathematical freaks among us.

It was summer 1974, and I had just arrived in Malta. Browsing in the hotel's bookshop, I picked up a faded and dusty paperback called 'Cross-Figure Puzzles'. What on earth. . .? I opened the book and was transported into a miniature new world. Unfortunately, this little world was and still is sparsely populated. Colonists are very welcome and there are golden opportunities for explorers!

But before you rush to join the queue, let me tell you what cross-figures are all about. First of all, they are not to be confused with (what I call) cross-*numbers*. These you may have met in school text-books or puzzle magazines. As with (normal) crosswords, the clues in cross-numbers are *independent*. Here's a sample 3x3 cross-number to show you what I mean:

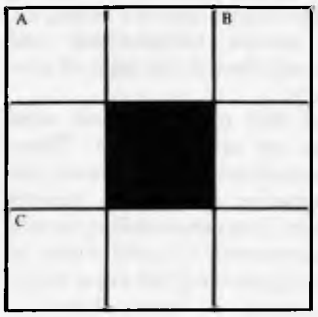


Across
A 2^9
C 592 + 609 - 465
Down
A 27x21
B 299808÷1388

In this sort of 'puzzle', you can start where you like, because the clues are independent. Cross-numbers are useful in the classroom because they look more interesting than lines of 'sums' and also because the answers are largely self-checking; for example, if your answer to A-across is wrong, then it probably won't fit with your answers to A-down and B-down. You will doubtless agree with me that cross-numbers can have little appeal to adults, except for dedicated calculator-punchers.

Now let's get on to cross-*figures*. Have you ever seen a crossword with clues like 'This is what a 5-across might give you if you asked him for a 10-down'. So you look up the clue for 5-across but only when the weather is 1-down.' And so on. Exasperating! How do you begin? The clues are *interdependent*. You have to find a way in.

Cross-figures present much the same sort of problem in the mathematical field. As the clues are interdependent, where does one start? Here's a sample 3x3 cross-figure to practise on:



Across
A C-across x 3
C Multiple of 3
Down
A A-across + 6
B C-across x 5

(Don't get confused by the letter-labelled clues. After all, if you have number-labelled clues for crosswords, it makes sense to have letter-labelled clues for cross-figures. The letters are not variables but simply labels.)

Now let's take a look at those four clues:

C-across is a multiple of 3. That's no great help. We shall need to know more about A-down or B-down first.

A-down is A-across plus 6. Here we obviously need to pin down A-across first.

A-across is three times C-across. Yes, that we could use. Cross-figures do not have 'leading zeros' any more than crosswords have 'leading blanks', so C-across must be between 100 and 333, while A-across must be between 300 and 999. This means that we could pencil in '1 2 3' in the bottom left box and '3-9' in the top left box.

But let's not be hasty. The last clue tells us that B-down is five times C-across. And we have of course spotted that B-down and C-across share their final digit. What digit, multiplied by five, produces the same final digit? 5 is the only one. Or is it? How about 0? Yes, we mustn't forget 0! So we pencil in '05' in the right box. The door is now open.

As A-across is three times C-across, which we know ends in 0 or 5, the last digit of A-across must also be 0 or 5. But 0 is impossible, because B-down cannot have a leading zero. That makes B-down 525. And as C-across must have a factor of 5 (5 'goes into' all numbers ending in 5), B-down (= five times C-across) has a factor of 5x5, or 25. So B-down can only be 525 or 575, because if a number has a factor of 25, the last two digits must be 00 or 25 or 50 or 75. Dividing by 5, we get C-across as 105 or 115. Ah, hah! 105 is a multiple of 3, being

3x35, and 115 is not divisible by 3. So. . . C-across is 105, and B-down must be 525. We're nearly there! A-across must be 3x105=315, and hence A-down is 315+6=321. Victory!

Incidentally, this particular cross-figure has been solved by several children in the 9-12 age group.

One day I completed a puzzle and noticed with surprise that I had not used one of the clues. That particular clue was clearly redundant.

Now, information redundance — or, rather, its absence — is an essential aspect of mathematical elegance. To illustrate this idea at its simplest level, no one grappling with a problem like 'Find the value of X when X+2=5' needs the additional information that 2X=6!

So, with this in mind, I kept a sharp lookout as I worked my way through the book and managed to eliminate a clue in several other puzzles. That whetted my appetite, and when I got to the end of the book I went back and tackled all the puzzles again with new analytical ideas. This time I succeeded in cutting out two or three clues from most of the puzzles, and on a third attempt I found at least five clues could be trimmed from the 25 to 35 clues provided.

This was all very well, but the big problem remained: how to determine the maximum number of clues which could be squeezed out of each puzzle so as to leave it in a state of perfect mathematical elegance without compromising its unique solution. It seemed that I was stuck on an exponential slope of difficulty, where the elimination of every clue made it progressively more difficult to eliminate a further one.

In the summer of 1976 I acquired a pocket calculator and tackled the whole business again — this time with the application of elementary Information Theory. By the October of that year I had reached an average elimination level (for standard 9x9s) of 31 per cent of the given clues — not far short of the absolute maximum, I thought. (Wrong again!).

With this method I eventually reached an elimination level — mainly in the 40- 50 per cent range.

That brings us to the main purpose of this article. I had been wondering for some time whether cross-figures could be programmed, so that autumn I joined a course to study assembly code with only 200 addresses. As soon as I had acquired all the code words and run a few simple programs, I tackled the problem of programming a 4x4 cross-figure, without even knowing whether 200 addresses would be enough for the job. That turned out to mean two months' hard work, wih the final instructions just squeezing in under the 200-address limit. The cards were fed into our old IBM 1440 and out came the correct solution. My first cross-figure program was born. . .

And that was as far as I could go. I programmed another 4x4, but the language was inadequate for larger cross-figures. So the following autumn I took up Fortran and Cobol. Within a few weeks I had run successful programs for 4x4s in both languages, although it became painfully clear that using Cobol for that purpose was rather like taking a sledge-hammer to a nut! To my surprise (given that Fortran was developed for mathematical problems) Cobol was the more efficient in run-in time, even if not in terms of program-writing time!

So far so good. . . It was but a short step to writing successful programs for 9x9s. Or so I thought. . . Computers laugh at number-crunching problems involving something like 10^8 possible configurations (3x3s) and cope quite well with magnitudes of the order of 10^{12} to 10^{14} (4x4s), but even the bravest computer quails when confronted with huge numbers like 10^{60} (9x9s). My first 9x9 program drafts looked good and may well have been logically sound, but all they produced when fed into the computer was deep silence. (I had not yet cottoned on to the idea of intermediate printouts.) After appealing for help I worked out that my otherwise adequate program was due to run for 100,000 years before it got to the printout stage. . . This was a bitter blow, as the old IBM 1440 I was using obviously wasn't going to last that long!

After more hard work over a period of months and a lot of trouble with nesting limitations, I managed to reduce the prospective run time for a 9x9 program to a mere month or so. The chance of testing such a program remained nil. Then I gained access to an ICL 2903 and I hopefully rewrote my programs with some new angles. A test run, printing intermediate results, suggested a total run time of 8 to 15 hours.

Some time later I started working with programmable calculators, and devised a 3x3 (my first stab at actually compiling a cross-figure) in Basic which just fitted into the available memory. I had no time, however, to do cross-figure programs in Basic: there were more urgent matters to be considered, like four-dimentional rotating cubes, Fibonacci-type modules series, the relationship betwen infinitesimals and Cantorian transfinites in the light of probability theory.

In the last half of 1982, there were breakthroughs on several fronts. Time-absorbing subroutines were eliminated and I started measuring run time in minutes instead of hours. I am now satisfied that any further improvements *I* could make in cross-figure programming technique would be strictly marginal — unless there is a whole new strategy waiting to be discovered.

The end of the story? Not quite. During all these years, I have found very few people who had ever tackled a cross-figure. Nevertheless, I am convinced that (somewhere out there) thousands of potential enthusiasts are ready and waiting for the chance to use their computers and their brains on something more demanding and amusing than destorying alien spaceships or sorting customers into alphabetical order.

Cross-figure puzzles provide entertainment and instruction for one and all in many different ways. Is there anyone without a pathological hatred of figures who can resist the temptation to try his hand at solving a 3x3? Why, it's literally child's play!

For programming beginners, writing a successful program for a 3x3 is a quite attainable initial target. Achieve it, by whatever methods, and you have won your initiation into the Society of Cross-Figure Programmers!

Do you find 3x3s too easy? Then, there are many different sorts of 4x4s on which you can develop your skills in both 'manual solutions' and 'programmed solutions'.

I also hope that professional mathematicians and experienced programmers will see in cross-figures a fertile field for investigation: Ultimate Elegance proofs; Information Theory applications; and much more.

The 3x3 at the beginning of this article makes a tasty little *hors d'oeuvre* for hungry programmers. When you've got that one under your belt, try the puzzles printed below.

You will find that cross-figures can be programmed in several ways. I think I have tried most of the possible approaches under my general strategy, but you may come up with a new approach or even win fame and fortune by developing a completely new strategy!

For the sake of standardisation and comparability, I suggest the following 'ground rules':

1) Lower and upper limits of grid numbers may be determined by inspection of the grid. A three-digit number, for example, obviously lies betwen 100 and 999.

2) In order to remove subtraction, division and root operators, clues may be 'switched around' before being put into the program. In algebraic terms,

$a = b - c$ becomes $b = a + c$

$a = b / c$ becomes $b = ac$

$a = \surd b$ becomes $b = a^2$

3) The clues, taken as a whole, may be analysed in order to determine which of the grid numbers are 'primary' and which are 'derivative', in terms of ascending order. In the clue 'A-down is seven times C-across', for example, C-across is primary and A-down is derivative.

4) Apart from the above, *no mathematical calculations or deductions are to be made outside the actual program.*

5) The program must not only find a solution but also show that there is only *one* solution or (horrors!) show that the compiler has made a mistake and there is more than one solution.

Do any of these cross-figure puzzles have

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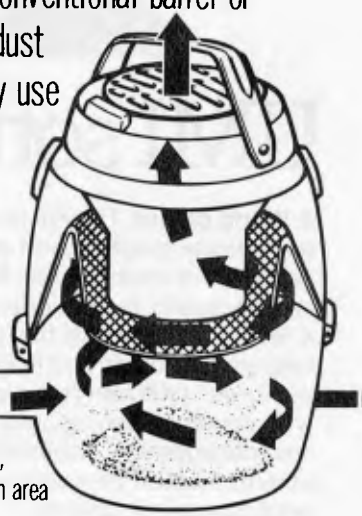

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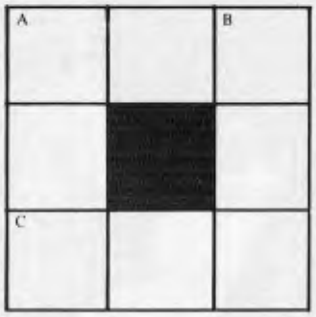
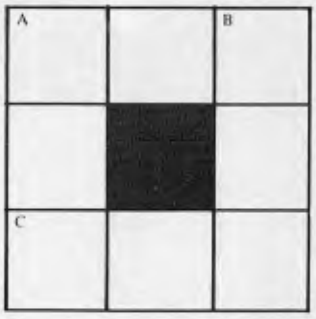
CROSS-FIGURES

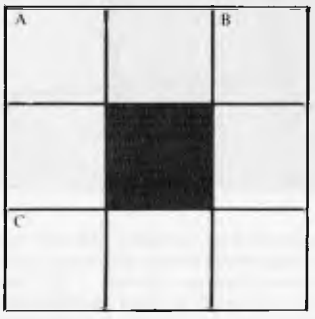
redundant clues? If so, what are they?



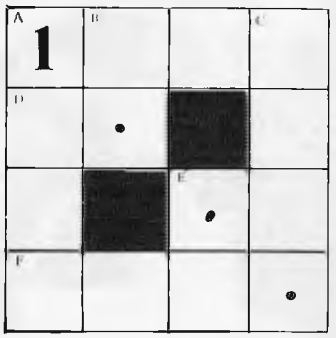
Across
A B-down minus A-down
C Seven times A-down
Down
A Prime number
B Square number



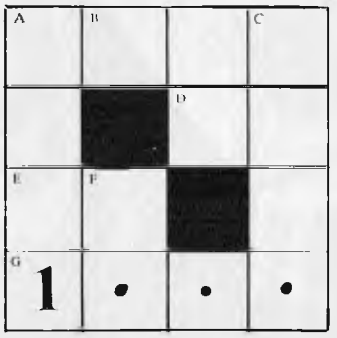
Across
A Three consecutive digits in ascending order
C Three consecutive digits in descending order
Down
A Square of prime number
B Three identical digits



Across
A square of first two digits of B-down
C Square of last two digits of A-down
Down
A Sum of digits is 12
B Prime number



Across
A (Four) Digits total 19
F Square of E-across
Down
A D-across x B-down
C Twice A-across
E See below (*if* you must!)
First theatre in England opened in year 1. . . (see dotted squares). Puzzle can be solved without the extra clue: use a calculator!
E-down is multiple of 11.



Across
A G-across x 3
D Square number
E Prime number
G Bismarck appointed Prime Minister of Prussia.
Down
A Digits total 18
B One more than E-across
C E-across x B-down
F G-across ÷ D-across
Six of the eight numbers in the puzzle have a common factor. Of the nine clues, how many are redundant?

PS Solutions will be printed in the August issue

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NEC SPINWRITER —One with the lot!

When entering an existing market where there are established products there are two basic ways of capturing a share of that particular market — sell an equivalent product for less or sell a better product for the same price. With their Spinwriter thimble printer Nippon Electric Company Information Systems Australia (NECISA) have gone against the current trend and decided on the second option — to provide more for the same price. This direction is particularly interesting considering the current perspective of many cheap word-processing quality printers becoming increasingly abundant. So why should a printer buyer consider a NEC Spinwriter when there are cheaper alternatives available?

Taken at surface value there is very little to commend the Spinwriter over alternatives. The print speed is rated at 35 characters per second, it is *not* particularly quiet and there are no obvious features that stand out. Assessing the printer beyond the obvious does bring to light features which do bear consideration, especially if the unit is intended for use beyond the normal run of the mill word processing type applications. It appears that NEC have designed the Spinwriter not only as a word-processing printer (as with most daisywheel printers) but have also identified a market requirement for a high-quality printer capable of the type of forms handling used in every day business. As an example of this, there is a front inserter to handle ledger cards and invoices which can be used in conjunction with the tractor feed.

Apart from being a high quality robust unit the available options appear to be the Spinwriter's greatest strength. NEC in fact produce distinct models for several different computer systems. Probably the best known of these is the model 3550 which has an IBM PC interface. Another is the model 3530 which is identical apart from the fact that it has an NEC-APC interface. Irrespective of the model or options that are added, the basic operation of the printer remains unchanged.

NEC decided to provide more for the same price.

The character set is carried on a thimble which is similar to a conventional daisywheel with the petals folded at right angles. NEC offer a total of 72 different character sets with up to 128 characters in any set, The print operation is controlled by an 8039 microprocessor. This controls the stepper motors, print hammer and ribbon advance. Through the use of some extremely clever trickery called "movement minimisation", which is controlled by the microprocessor, the actual throughput time of producing a document is reduced. This means that although the printer is only rated at 35 characters per second it is possible, and probable, that it would beat the pants off a printer rated at twice the speed. The other 'nicety' that is provided as a result of clever use of the microprocessor is the printers ability to utilise eight different impact intensities giving an even print result over the entire character set.

Further to the sophisticated features and options of the NEC Spinwriter there are a number of simple features which make the Spinwriter a very usable printer. The select switches for changing baud rates and other variables are all located on the front panel. It is not until you have used a printer with the dip switches hidden inside the machine that you fully appreciate this point. The same also applies to the micro-switches used to ensure the lid is closed. Unless you have worked in an office where someone consistently leaves the printer lid open it is difficult to relate how important this may be. Another area which some printer manufacturers ignore is that of paper-feed. The Spinwriter has a slot in the bottom through which to feed the paper. Unlike some other printers with paper slots, NEC has taken the trouble to ensure that the 'feet' the printer sits on do not interfere with paper slots.

The point that I have been trying to make is that although the Spinwriter may appear to be similar to a similarly priced daisywheel printer there is a lot more value than is at first apparent. If you are considering purchasing a document quality printer and you are expecting more than s simple letter printer, have a good look at the Spinwriter.

Machine:	NEC Spinwriter
Manufacturer:	Nippon Electric Company
Distributor:	NECISA, 99 Nicholson Street, St Leonards NSW 2065 Tel: (02) 438 3544
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Interface:	Optional
Options:	7 form handling attachments, 72 print character sets
Documentation:	Comprehensive manual included
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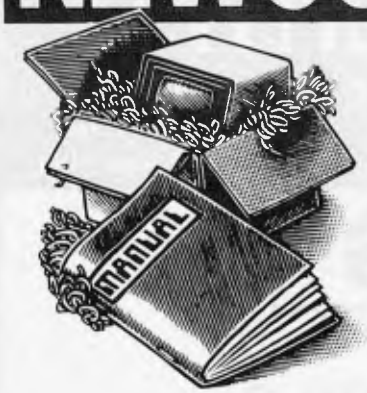

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in APC. While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten to 15' when instead we can simply say 'hex'. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, *APC* will be publishing this guide — every month.

We'll start by considering the microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them elsewhere. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary.** Binary is a system of numbering which uses base 2 instead of the more familiar decimal — or, to be more accurate, denary-system of base 10. In binary notation there are only two digits — 0 and 1 — which the computer recognises as the absence or presence of an electric current. The easiest way to visualise this is to think of each binary digit **(bit)** as being a switch which can be either off or on. Each binary digit stands for a power of 2. The right-most digit, the least significant, is $2^0=1$, the next $2^1=2$, then $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$, $2^7=128$, $2^8=256$. So decimal 24, for example, is represented in binary as 00011000. A set of eight bits is known as a **byte** and, to make things easier for humans, a third system of numbering, **hexadecimal** or **hex** for short, is used as a sort of 'halfway house' between binary and denary. Hex uses numbers to base 16, with denary numbers between 9 and 16 represented by the letters A-F. The hex equivalent of a byte is obtained by giving each half a single character code: 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ... E=1110 and F=111. Our example of 24 is therefore 18 in hex.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). This allocates a numerical code to each digit and letter. For example, the number 5 is given the ASCII code 35 hex, 53 decimal, whereas a capital A is represented by ASCII 41 hex, 65 decimal.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex **(machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic.** Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter,** which is usually built into the machine's ROM (see later paragraph on this page). The interpreter picks up each Basic instruction, translates it into machine code and then feeds it to the **processor** for execution. It has to do this each time the same instruction has to be executed. A much faster method is to use a **compiler,** which accepts each instruction in turn, waits until the program has been entered, then turns each instruction into machine code before running the program. This means that each instruction has to be translated once only — consequently the speed of execution is considerably improved.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE.** They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to **hardware,** this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit **(CPU),** a single microprocessor chip with supporting devices such as **buffers,** which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board **(PCB)** or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100.**

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — **static** and **dynamic;** all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks,** each of which is in turn subdivided into **sectors.** Using a program called a **disk operating system,** the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface, and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for microcomputers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU),** which looks like a TV screen with a typewriter-style **keyboard;** sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computer's output, you'll need a **printer.**

The computer can send out and receive information in two forms — **parallel** and **serial.** Parallel input/output **(I/O)** requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

The ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone system, allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need Telecom's permission; instead you could use an **acoustic coupler,** which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — Telecom isn't so uppity about the use of these.

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APC can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

Variable search

Thinking that most people who do any programming of a reasonable length sometimes lose variables, I hope this routine will be of some help. It searches through the variables section in the memory of any ZX Spectrum, and will print out the names and types of every variable used in the program. If you know what variables should have been used, then coming across an odd one should point out a bug. If you need a list of variables to aid conversion to a different machine, this will provide them. Running short of memory? Pruning a few variables will save some. The uses are numerous.

The whole routine fits into 185 bytes of machine code. Running the program shown stores it in a REM statement; POKE 23756,0 will prevent it from deletion. The rest of the program can be removed by typing in the line numbers — do not use NEW. Then PRINT; :RANDOMIZE USR 23760

```
    1 REM .....
.....
.....
.....
.....
.....
   10 FOR g=23760 TO 23944: READ
a: POKE g,a: NEXT g
   90 DATA 42,75,92,126,203,127,2
02,230
  100 DATA 92,203,119,202,238,92,
203,111
  110 DATA 202,64,93,195,92,93,20
3,111
  120 DATA 202,115,93,195,246,92,
203,111
  130 DATA 202,36,93,195,7,93,230
,31
  140 DATA 71,62,96,176,215,17,6,
0
  150 DATA 25,62,13,215,195,211,9,
2,230
  160 DATA 31,71,62,96,176,215,35
,126
  170 DATA 203,127,32,3,215,24,24
7,230
  180 DATA 127,215,17,6,0,25,62,1
3
```

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T.J.'s Workshop

```
 190 DATA 215,195,211,92,230,31,
254,0
 192 DATA 200,71,62,96,176,215,6
2,40
 194 DATA 215,62,41,215,35,94,35
,86
 200 DATA 25,35,82,10,213,195,21
1,92
 210 DATA 230,31,71,62,96,176,21
5,62
 220 DATA 36,215,62,40,215,62,41
,215
 230 DATA 35,94,35,86,25,35,62,1
3
 240 DATA 215,195,211,92,230,31,
71,62
 250 DATA 96,176,215,62,235,215,
62,243
 260 DATA 215,17,19,0,25,62,10,2
15
 270 DATA 195,211,92,230,31,71,6
2,96
 280 DATA 176,215,62,36,215,35,9
4,35
 290 DATA 66,25,35,62,10,215,195
,211
 300 DATA 92
```

will list all the variables that have been set up on the screen.

For example:

n FOR NEXT FOR NEXT loop variable;	
a()	Numeric array;
time	Ordinary numeric variable;
x$	String variable;
c$()	String array.

If there are too many to fit on one screen, the computer will ask 'scroll?' in its usual annoying fashion. The REM statement will MERGE into any program that leaves enough memory, so you can use it with existing programs that you want to modify or send off to a magazine.

Bill Longley

Better PET graphics

As a teacher of science, one of the major facilities which I require from a microcomputer is that of graph plotting. It is also most useful to be able to label and put scales on graph axes.

This facility is most important, both in the context of simulated experiments (e.g. simulation of the decay of radioactive isotopes), and in direct experimental applications. An example of the latter might be taking readings from a temperature probe connected to the microcomputer via an A-D converter, and plotting the results in graphical form. (I feel sure that other microcomputer users can

```
10 REM THIS PROGRAM PLOTS A MEDIOCRE
   GRAPH
20 REM PLOTTING A GRAPH OF Y=2*X
30 FOR Y=0 TO 30
40 PRINT "  ";
50 NEXT Y
55 PRINT
60 FOR X=1 TO 15
70 PRINT TAB (0) "I" ; TAB (2*X-1) "*" ;
80 NEXT X
```

Fig 3

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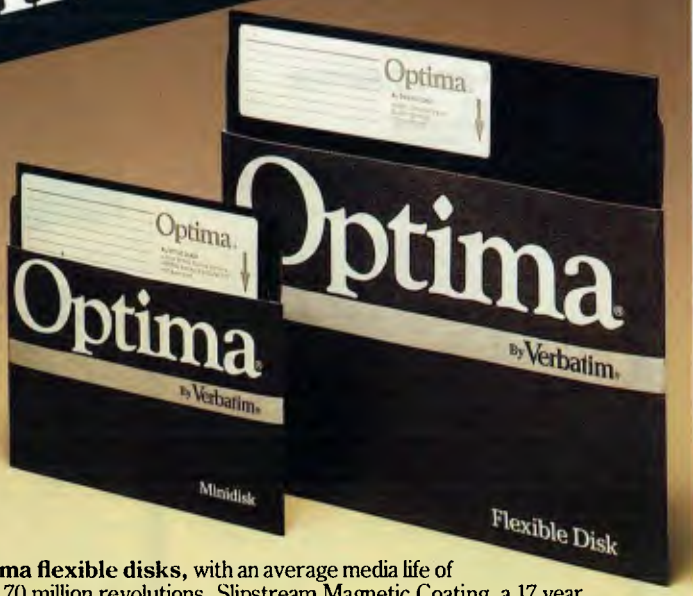

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Functional Specifications

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Printing format — Alpha-numeric — 7 x 8 in 8 x 9 dot matrix field. Semi-graphic (character graphic) — 7 x 8 dot matrix. Bit image graphic — Vertical 8 dots parallal, horizontal; 640 dots serial/line
Character size — 2.1mm (0.083")-W x 2.4mm (0.09")-H/7 x 8 dot matrix
Character set — 228 ASCII characters; Normal and italic alpha-numeric fonts, symbols and semi-graphics
Printing speed — 80 CPS, 640 dots/line per second
Line feed time — Approximately 200 msec at 4.23mm (1/6") line feed.
Printing direction — Normal — Bidirectional, logic seeking. Superscript and bit image graphics — Unidirectional, left to right
Dot graphics intensity — Normal — 640 dots/190.5mm (7.5") line horizontal. Compressed characters — 1,280 dots/190mm (7.5") line horizontal
Line spacing — Normal — 4.23mm (1/6"). Programmable in increments of 0.35mm (1/72") and 0.118mm (1/216")
Columns/line — Normal size — 80 columns. Double width — 40 columns. Compressed print — 142 columns. Compressed/double width — 71 columns. The aboves can be mixed in a line.
Paper feed — Adjustable sprocket feed and friction feed.
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Character size — 2.0 (W) x 2.6 (H) in mm in case of 80 columns/line
Character space — 2.54mm (1/10 inch) in case of 80 columns/line
Line space — 1/6, 1/8 or 1/12 inch
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PRINTER SPECIALISTS

instance many important applications of graph plotting other than in science teaching.)

The science department owns a PET 4016 computer. Other 4016 users will know that one of its major drawbacks is its limited graphics. The PET Basic provides only the TAB function for use in graphical displays. The usual solution to this problem is to plot the graph with the Y axis across the top of the screen and then plot the X axis and the graph points together, line by line, down the screen; an altogether unsatisfactory procedure (see Fig 3).

Labelling and putting scales on the axes is even more unsatisfactory. (Try it for the function above.)

How much simpler this whole business would be if the PET was equipped with the PLOT and PRINT AT functions which are now available on some other, often less expensive, microcomputers.

Of course these facilities are available for the PET (as, too, are high-resolution graphics) at a price. However, one is loath to spend extra money, especially at a time when school funds are under considerable pressure.

After hearing of my dissatisfaction, Graeme, a former student of the college waiting to go to university, took two days to come up with Basic routines which, when included in program, give the PET a full PLOT facility and a full PRINT AT facility. At the same time, the plotting density of the screen is doubled, i.e. the 40 x 25 screen is converted to an 80 x 50 plotting area with full cursor mobility. The Basic versions of these two routines are listed below.

PET double density plotting routine (Basic): The variables XX and YY hold the x and y co-ordinates respectively of the point to be plotted.

```
10 REM DOUBLE DENSITY PLOTTING
20 GOSUB 50090
30 XX=5
40 FOR YY = 0 TO 49
50 GOSUB 50000
60 NEXT YY
70 REM ** THE NEXT 13 LINES DO
     ALL THE WORK **

49999 STOP
50000 IF XX <0 OR XX>79 OR YY<0 OR YY>49
        THEN RETURN
50010 VA = 33728 − INT (YY/2) * 40 + INT(XX/2)
50020 VB = 2 ↑((YY − INT(YY/2)*2)*2
      + XX − INT(XX/2)*2)
50030 PP = PEEK (VA) : VC = 1
50040 IF PP = SY (VC) THEN PP = VC : GO TO
   50070
50050 VC = VC + 1 : IF VC < 16 THEN 50040
50060 PP = 0
50070 POKE VA, SY (PP OR VB)
50080 RETURN
50090 DIM SY (15) : FOR VC = 1 TO 15 : READ SY
   (VC) : NEXT VC
50100 RETURN
50110 DATA 123, 108, 98, 126, 97, 127, 252, 124,
   255, 225, 254, 226, 236, 251, 160
```

Fig 4

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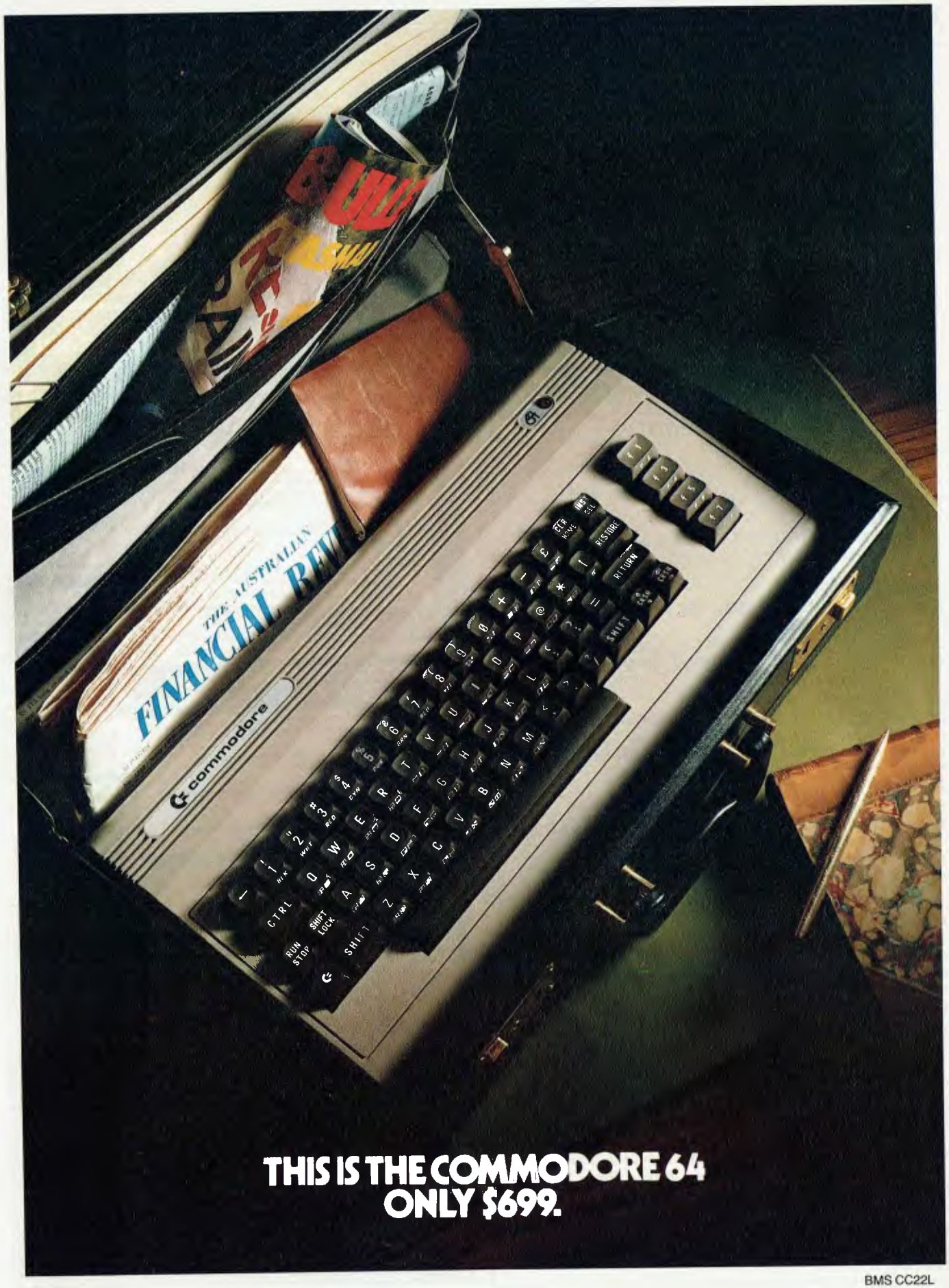
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The co-ordinates (O,O) lie at the bottom left of the screen and the x and y co-ordinates must lie in the ranges of 0 to 79 respectively on a small-screen PET. If co-ordinates outside these ranges are supplied to the routine, it will simply return them to the main program without attempting to plot them.

Before the routine can be used in a program it must be initialised by performing a GOSUB to line 50090. This need only be done once, before the routine is used for the first time.

The routine itself is accessed by setting up the XX and YY variables and executing a GOSUB to line 50000.

As a simple example, the program below plots a vertical line UP the screen from (5.0) to (5,49) (see Fig 4).

PET "PRINT AT" routine: A much more straightforward, but nevertheless useful little facility. This now returns to the normal screen size of 25 lines (0 to 24) and 40 columns (0 to 39) with (0,0) at the top left-hand corner, for example, this program prints EARL starting at line 20 column 12 (see Fig 5).

The only disadvantage of the PLOT routine is that being in Basic it is rather slow. Graeme soon became dissatisfied with this and within another two days had produced a machine-code version of the routine and a version in data statements.

Gerry Spalton and Graeme Baird

```
10      GOSUB 55030
100     AX = 12
110     AY = 20
120     GOSUB 55000
130     PRINT "EARL" ;
55000 IF AX<0 OR AX>39 OR AY<0 OR AY>24
THEN RETURN
55010 PRINT "cursor home"; LEFT $ (AT$,AY) ; TAB
(AX) ;
55020 RETURN
55030 AT$ = "24 cursor downs"
55040 RETURN
```

Fig 5

Extended Memory on the HP41C

I was recently surprised to discover that one can run programs that have been stored in extended memory (using SAVEP) in the HP41C without recalling them back into normal program memory. This can save quite a bit of memory space.

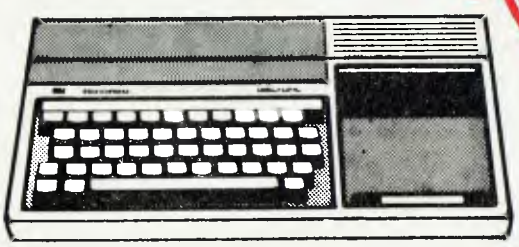
I found, first by accident and then by further experimenting with my 41C, that the RAM in the extended functions/memory module and the extended memory modules occupies addressable memory as does the normal HP41C/CV memory. I located the address at which the program was stored, then generated an artificial pointer for that address, and finally stored the new program pointer in the program counter register and ran the program.

My HP41C is one that

Hexadecimal address	Registers
0 — F	Status registers
40 — BF	Extended functions RAM
CO — 1FF	Normal addressable memory for fully extended HP41C or HP41CV
201 — 2EF	Extended memory module in Port 1 or 3
301 — 3EF	Extended memory module in Port 2 or 4

Table 1. Memory Map for HP41C/CV with Extended Functions/ Memory Module and Two Extended Memory Modules.

TEXAS INSTRUMENTS



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contains Bug 2, which allows you to recall the register numbers 704 to 999 without getting an error message (e.g. 999 RCL IND .X is valid). These registers address the program memory (a knowledge of these registers allowed the development of the book "Synthetic Pro-gramming on the HP41C" by W.C.Wickes). Bug 2 helped me discover the information contained in this article, but it is not essential for using it.

Using the new extended functions/memory module and two extended memory modules and Bug 2, I was able to map some new areas in the HP41C memory (Table 1).

The first program stored in extended memory goes to location BF. The first few bytes are taken up with information for the extended memory directory (EMDIR). By using the program called CODE from Wickes' book I was able to create the program pointer BF, which displays on the 41C as "0.0000000;?", then used the synthetic function STO b to store the new pointer. I could then either switch to program mode and single step through the program, or run the program using R/S.

Programs stored in extended memory using SAVEP are executable by the above method if you avoid subroutines and alpha labels within the program. If you use these you will get some peculiar behaviour out of your HP41C. Such crashes can usually be remedied if you remove the battery pack for about 30 seconds, then replace it again. Some crashes require you to leave the batteries out overnight but these are (fortunately!) rare.

If you have Bug 2 you can directly recall information from extended memory using Table 2. However the information stored by SAVEP in these registers is thereby damaged for some reason. The direct method can however be used if you need a lot of data memories. (But stay away from addresses that contain extended memory files.)

Addresses (decimal)	Registers
0 — S*	Data memory
(1+S) — (239+S)	Extended memory (Port 1 or 3)
(257+S) — (495+S)	Extended memory (Port 2 or 4)
(576+S) — (703+S)	Extended functions RAM
(704+S) — 999	Program memory

* "S" = SIZE (size of data memory)

Table 2. Direct Access Memory Map for HP41C Calculators with Bug 2.

VIC Keyboard

In many cases the VIC 20 keyboard buffer can be more of a problem than an aid. To my knowledge there are two simple ways of eliminating this. The first is to PEEK address 197[00C5 hex] to find the current key being pressed. Shown is a table of character codes

If no key is pressed 64 will be in location 197. The second way, and by far the simplest is to eliminate the keyboard buffer. Location 649 defines the length of the keyboard buffer, by POKEing this with one only

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0	1 [one]	16	NONE	32	SPACE	48	q
1	3	17	A	33	Z	49	E
2	5	18	D	34	C	50	T
3	7	19	G	35	B	51	U
4	9	20	J	36	M	52	O
5	+	21	L	37	.	53	@
6	£	22	:	38	NONE	54	[up arrow]
7	DEL	23	CRSR[right]	39	FI	55	F5
8	[back arrow]	24	STOP	40	NONE	56	2
9	W	25	NONE	41	S	57	4
10	R	26	X	42	F	58	6
11	Y	27	V	43	H	59	8
12	I	28	N	44	K	60	0
13	P	29	,	45	;	61	-
14	*	30	/	46	=	62	HOME
15	RETURN	31	CRSR[down]	47	F3	63	F7

one key will be stored. This is useful for existing software. Location 649 should not have a value of over 10 or some vital pointers will be destroyed. A value of 0 in location 649 disables the keyboard.

Cassette drives can hold more data than disk drives in many cases. The three main problems with cassette drives are speed, ability to rewind and speed of finding files. Not a great deal can be done about the first two problems, but the third can be slightly improved by the use of this tip. Files can be found rapidly by fast forwarding the tape, timing done by the computer. Of course the exact location of the tape must be known. It may be an idea to leave a leader between each file to ensure accuracy. Often the speed of a tape will vary.

Peter Johnson

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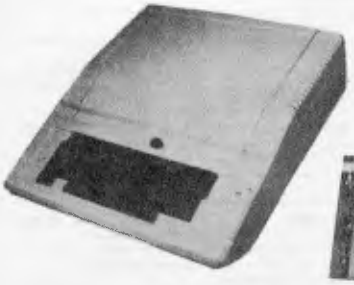

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PSYCHOANALYSIS USING LISP

There's nothing to worry about when Eliza is there to share your problems. David Johnson-Davies lies back and reveals all . .

The following article describes a complete Lisp program that illustrates, in an entertaining way, how a computer can be made to appear intelligent by the application of a few simple rules. The program, called Eliza, plays the role of psychoanalyst to a human patient, and gives rise to the following type of dialogue (the human's input is in bold):

How do you do. Please tell me your problem
My relations are all alike
In what way?
They're always getting at me about something or other
What incident are you thinking of?
Well, my mother made me come here
Who else in your family made you come here?
No one
Tell me more about your mother
She treats me like a child
What exactly do you mean?
etc

The Lisp program presented here is a simplified version of the original Eliza which was developed by Joseph Weizenbaum in 1966, and which has since become well known as an example of computer 'intelligence'. The program's name derives from the character in Bernard Shaw's Pygmalion conversation. This version will run on a fairly small Lisp system and should act as an amusing demonstration of Artificial Intelligence. Although not intended as a serious clinical tool, the program nevertheless demonstrates a possible application of computers in medicine; indeed, patients appear to prefer to communicate with a computer than with a human doctor when they are being asked simple diagnostic questions.

The Eliza program works by 'pattern matching', using Lisp lists to represent the sentences being manipulated. First the program looks for certain keywords in the sentence that the user types in; it then tries to match certain patterns of sentences which contain that keyword. The main function used by Eliza to perform this pattern-matching is called MATCH. The first argument to MATCH is a 'pattern' which is compared with the sentence that has been typed in. The second argument is the 'data'; ie, the actual sentence.

The simplest facility MATCH provides is to test two sentences to see if they are the same; for example:

(MATCH '(ONE TWO) '(ONE TWO)) = T
(MATCH '(ONE TWO) '(ONE THREE))= NIL

However, the real power of MATCH is its ability to cope with more sophisticated rules for matching, and these are implemented by means of special symbols, such as '★', '=', '?' and '@', which can occur in the pattern list:

★ matches any sequence of words, and

= Q matches any sequence of words and assigns the matching list to Q (or any other symbol).

Thus: (MATCH '(ONE ★ TWO) '(ONE THREE FOUR TWO)) = T
(MATCH '(ONE = R) '(ONE TWO THREE)) = T and R = (TWO THREE)

? matches any single word.

Thus: (MATCH '(ONE ?) '(ONE TWO)) = T

(...) Q (where (...) represents a list) matches any of the alternatives in the list (...) and assigns the matching word to Q.

@ Q evaluates Q and replaces it by its value.

```
(DEFUN MATCH (P D (CP))
   (COND
      ((NULL P) (NULL D))
      (T (SETQ CP (CAR P))
         (COND
            ((NULL D)
               (COND
                  ((EQ CP '*) (NULL (CDR P)))
                  ((AND
                     (EQ CP '=)
                     (NULL (CDDR P)))
                     (SET (CADR P) NIL)
                     T)))
            ((LISTP CP)
               (COND
                  ((MATCH
                     (CONS (CAAR P) (CDDR P))
                     D)
                     (SET (CADR P) (CAR D))
                     T)
                  ((MATCH
                     (CONS (CDAR P) (CDR P))
                     D)
                     T)))
            ((EQ CP '@)
               (MATCH
                  (CONS
                     (EVAL (CAOR P))
                     (CDDR P))
                  D))
            ((OR (EQ CP '?) (EQ CP (CAR D)))
               (MATCH (CDR P) (CDR D)))
            ((EQ CP '*)
               (OR
                  (MATCH (CDR P) D)
                  (MATCH P (CDR D))))
            ((EQ CP '=)
               (COND
                  ((MATCH (CDDR P) D)
                     (SET (CADR P) NIL)
                     T)
                  ((MATCH P (CDR D))
                     (SET
                        (CADR P)
                        (CONS
                           (CAR D)
                           (EVAL (CADR P))))
                     T)))))))
```

Fig 1

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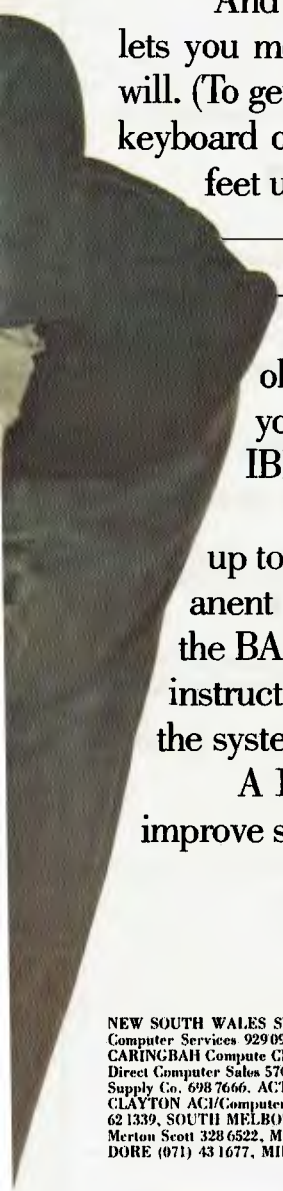

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```
(DEFUN GETSEN ((L) (M) (J) (K))
  (LOOP (UNTIL (SETQ K (EXPLODE (READLINE))))
  (LOOP
     (UNTIL (NULL K) J)
     (SETQ L NIL)
     (LOOP
        (SETQ M (CAR K))
        (SETQ K (CDR K))
        (UNTIL (EQ M BLANK))
        (SETQ L (APPEND L (LIST M)))
        (UNTIL (NULL K)))
     (SETQ J (APPEND J (LIST (IMPLODE L))))))
```

Fig 2

```
(DEFUN APPEND
   (HEAD TAIL)
   (COND
      ((NULL HEAD) TAIL)
      (T (CONS (CAR HEAD) (APPEND (CDR HEAD)
                                  TAIL)))))
```

Fig 3

```
(DEFUN PRL (L)
   (COND
      ((NULL L) NIL)
      ((ATOM L)
         (SETQ LEFT
            (DIFFERENCE LEFT (ADD1 (CHARS L))))
         (COND
            ((GREATERP 1 LEFT)
               (SETQ LEFT 35)
               (PRINT)))
         (PRINC L BLANK))
      ((EQ (CAR L) '=)
         (PRL (EVAL (CADR L)))
         (PRL (CDDR L)))
      ((EQ (CAR L) '$)
         (PRL (EVAL (CADR L)))
         (SET (CADR L) NIL)
         (PRL (CDDR L)))
      (T (PRL (CAR L)) (PRL (CDR L)))))
```

Fig 4

```
(DEFUN LOOKUP (S (J))
   (COND
      ((NULL S) NIL)
      ((NUMBERP S) S)
      ((ATOM S)
         (SETQ J (EVAL S))
         (COND
            ((EQ UNDEFINED J) S)
            ((OR (SUBRP J) (FSUBRP J)) S)
            ((NULL J) S)
            ((ATOM J) J)
            ((NUMBERP (CAR J)) (FIND J) S)
            (T (FIND (CDR J)) (CAR J))))
      (T (CONS
            (LOOKUP (CAR S))
            (LOOKUP (CDR S))))))
```

Fig 5

```
(DEFUN FIND (P (J))
   (COND
      ((AND
         (NUMBERP (CAR P))
         (GREATERP (CAR P) MAX))
         (SETQ MAX (CAR P))
         (SETQ RMAX (CDR P))
         NIL)))
```

Fig 6

the pattern, and D the data. Its operation is as follows: First, a null pattern always matches null data. Otherwise, set the local variable CP to the first item in the pattern and test for other possibilities. If there is no more data (NULL D), only match it if the pattern is '★', or '=' followed by a variable. If the first item of the pattern is '@', replace it by the next item's value. If the first item of the pattern is the same as the first item of the data, or a '?', they match, so call MATCH recursively for the ramainder of the pattern and data. If the pattern begins with '★' it matches anything. Finally, if the pattern begins with '=' it matches anything, and assigns the matching words to the following variable.

The MATCH function can be used in a wide variety of applications relying on the manipulation of sentences, such as 'intelligent' interfaces to problem-solving programs, or adventure-type games.

Next, Fig 2 shows the function that reads the user's input; GETSEN. It reads in a sequence of words, up to a RETURN, and makes then into a list. For example:

(GETSEN)
THIS IS A SENTENCE
will return (THIS IS A SENTENCE).

This function uses APPEND which, if not already present, can be defined as shown in Fig 3.

Next, Fig 4 shows a function PRL which will print a list of words with all brackets removed, inserting a new line if the sentence will not fit neatly on the screen. Thus:

(PRL '(THIS (IS) ((A)) SENTENCE))
prints THIS IS A SENTENCE

In addition, the following special symbols may be used in PRL:

= Q prints the value of Q
$ Q prints the value of Q, and sets Q to NIL.

```
(DEFUN ELIZA (( /FAMILY)
      (/MEMORY)
      (/WISH)
      (/DESIRE)
      (/HAPPY)
      (/SAD)
      (/STOP)
      (/VICE)
      (FN.0)
      (LEFT.0))
   (PRL
      '(HOW DO YOU DO!. PLEASE TELL ME
                                 YOUR PROBLEM))
   (PRINT)
   (LOOP
      (UNTIL /STOP 'BYE)
      (SETQ RMAX ZILCH)
      (SETQ MAX -1)
      (PRINT)
      (SETQ S (LOOKUP (GETSEN)))
      (SETQ LEFT 40)
      (PRINT)
      (PRL
         (LOOP
            (WHILE RMAX (FLANNEL))
            (UNTIL
               (MATCH (CAAR RMAX) S)
               (CDAR RMAX))
            (SETQ RMAX (CDR RMAX))))
      (PRINT)))
```

Fig 8

sentence containing a keyword that has already been matched. The keyword is set to NIL to record that it has been used.

Database format

The Eliza program is driven by a database of keywords, and patterns. The keywords are recognised by the Eliza program in the sentence that the user types in. For each keyword in the database the following information is stored:

1. A replacement for the word if it needs to be exchanged.
2. A value giving the significance of that word.
3. A list of patterns to be tried against the sentence containing that word, together with the corresponding replies.

The format for each database entry is:
(replacement value ((pattern) (match) (pattern) (match))
Thus, the entry for AM in the database is:

(SETQ AM
'(ARE O

```
(DEFUN FLANNEL NIL
  (COND
  (/FAMILY
  '(TELL ME MORE ABOUT YOUR $ /FAMILY))
  (/MEMORY
  '(DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR $ /MEMORY ?))
  (/DESIRE
  '(PERHAPS WE SHOULD CONSIDER WHAT WOULD ENABLE YOU TO = /DESIRE))
  (/WISH
  '(WHY DON!'T YOU TELL ME WHAT YOU WOULD DO IF $ /WISH))
  ((AND /SAD /VICE)
  '(PERHAPS YOU WOULD FEEL $ /SAD LESS IF YOU WERE ABLE TO $ /VICE))
  (/SAD
  '(TELL ME MORE ABOUT WHEN YOU FEEL $ SAD))
  (/HAPPY
  '(DOES THIS AFFECT WHETHER YOU FEEL $ HAPPY ?))
  (/VICE
  '(WHAT DO YOU THINK WOULD HELP YOU TO $ /VICE ?))
  (T (SETQ FN (ADD1 FN))
    (COND
      ((EQ FN 1)
        '(WHAT EXACTLY DO YOU MEAN ?))
      ((EQ FN 2) '(TELL ME MORE))
      ((EQ FN 3)
        '(HOW DOES ALL THIS RELATE TO YOUR TROUBLES))
      ((EQ FN 4)
        '(PERHAPS YOU SHOULD TAKE LIFE LESS SERIOUSLY))
      ((EQ FN 5)
        (SETQ /STOP T)
        '(SORRY YOUR TIME IS UP!.))))))
```

Fig 7

Thus: (SETQ LI '(ALPHA BETA GAMMA))
(MATCH 'ONE @ LI Q) '(ONE BETA)) = T and Q = (BETA).

The full definition of MATCH is shown in Fig 1. It is a function of two arguments, P

Thus, (SETQ Q '(NEW LONGER))
(PRL '(THIS IS A $ Q SENTENCE))
prints THIS IS A NEW LONGER SENTENCE and sets Q to NIL.

This last facility is used to make Eliza hark back to an earlier topic by printing a

(★ ARE YOU = R)
giving the value (GOING MAD) to R, and the reply:
DO YOU BELIEVE YOU ARE GOING MAD
would be given. The second pattern (★) will match any input sentence and result in

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((★ ARE YOU = R))
(DO YOU BELIEVE YOU ARE = R))
((★) (I DON'T UNDERSTAND THAT)))

This specifies that each occurrence of AM in the sentence typed in should be replaced by ARE, and that the value of AM is O. Finally, if AM is selected as the highest-value word in the sentence, an attempt will be made to match the two pattern strings. Thus if the sentence were:

AM I GOING MAD

this would first be converted into

ARE YOU GOING MAD

(because each occurrence of I is also converted into YOU), and this would then match the first pattern:

the catch-all reply 'I DON'T UNDERSTAND THAT'.

Thus, the Eliza program is to perform the following steps:

1. Look up all the words in the sentence typed in by the user. Keep a record of the word with the highest value, and the corresponding list of patterns for that word.
2. Replace all those words for which a substitute is supplied.
3. Try the patterns one by one on the input sentence and return the match string for the first one that matches.

The first operation is performed by the function LOOKUP, shown in Fig 5. It looks up each word in the input sentence, and, if found in the database, it calls another function, FIND.

FIND, shown in Fig 6, takes the database entry of a word and tests its value against MAX, which contains the value of the best word so far found. If greater than MAX, RMAX is set to the list of patterns and matches for that word.

If no match is found, the function FLANNEL is called which gives a non-commital reply, or harks back to a subject mentioned at an earlier time; see Fig 7. Calling FLANNEL more than five times terminates the interview with the message

```
    ((* YOUR * @ MFBS /FAMILY = Q) (WHO ELSE IN YOUR FAMILY = Q ?))
    ((* YOU @ FEEL Q * YOUR = /MEMORY) (WHY DO YOU SAY YOUR = /MEMORY ?))
    ((* YOU = R YOUR = Q) (WHY DO YOU = R YOUR = Q ?))
    ((* YOUR = /MEMORY)
       (WHY DOES IT MATTER TO YOU THAT YOUR = /MEMORY ?)))
    ((= R)
       (WHY DOES IT MATTER TO YOU THAT = R ?)))

(DEF ALWAYS (1
   ((*) (WHAT INCIDENT ARE YOU THINKING OF ?))))

(DEF GOODBYE (9
   ((= /STOP) (DO COME AGAIN))))

(DEF NOONE (2
   ((* (NOBODY NOONE) Q = R)
      (SURELY YOU CAN THINK OF SOMEBODY WHO = R ?))))

(SETQ NO-ONE NOONE)

(SETQ NOBODY NOONE)

(DEF EVERYBODY (2
   ((* (EVERYONE EVERYBODY) Q *)
      (CAN YOU THINK OF ANYONE IN PARTICULAR ?))))

(SETQ EVERYONE EVERYBODY)

(DEF BECAUSE (0
   ((* BECAUSE YOU ARE = Q) (WHO ELSE SAYS YOU ARE = Q ?))
   ((* BECAUSE YOU = Q) (DO YOU = Q FOR ANY PARTICULAR REASON ?))
   ((*) (IS THAT THE ONLY REASON ?))))

(DEF LIKE (10
   ((* (AM IS ARE WAS) Q * (LIKE LOVE) Q *)
      (WHAT DO YOU SUPPOSE THAT RESEMBLENCE MEANS ?))
   ((* YOU WOULD * (LIKE LOVE) Q TO = /DESIRE)
      (WHY WOULD YOU = Q TO DO THAT ?))))

(SETQ LOVE LIKE)

(DEF YOU!'RE (I'M D
   ((* I'M = R) (PERHAPS YOU WOULD LIKE TO BE = R ?))))

(DEF BELIEF WISH)

(SETQ MFBS '(MOTHER FATHER BROTHER SISTER))

(DEF MYSELF YOURSELF)

(DEF YOURSELF MYSELF)

(DEF ARE (0
   ((* ARE I = R) (WOULD YOU PREFER IF I WEREN'T = R ?))
   ((* ARE = R) (POSSIBLY THEY ARE = R))))

(DEF AM (ARE 0
   ((* ARE YOU = R) (DO YOU BELIEVE YOU ARE = R))
   ((*) (I DON'T UNDERSTAND THAT))))

(DEF MACHINE (50
   ((*) (WHY DO COMPUTERS WORRY YOU ?))))

(SETQ MACHINES MACHINE)

(SETQ COMPUTERS MACHINE)

(SETQ COMPUTER MACHINE)

(DEF HELLO (0
   ((*) (HOW DO YOU DO!. PLEASE TELL ME YOUR PROBLEM))))

(DEF I!'M (YOU!'RE 0
   ((* YOU'RE * (SAD UNHAPPY DEPRESSED SICK) /SAD *)
      (CAN YOU EXPLAIN WHAT MADE YOU = /SAD ?))
   ((* YOU'RE * (HAPPY ELATED GLAD BETTER) /HAPPY *)
      (WHAT MAKES YOU = HAPPY JUST NOW ?))
   ((* YOU'RE = Q) (DO YOU ENJOY BEING = Q ?))))

(DEF NAME (15
   ((* YOUR NAME IS = R) (PLEASED TO MEET YOU = R !. MY NAME IS ELIZA))
   ((*) (I'M NOT INTERESTED IN NAMES))))

(DEF MAYBE (0
   ((*) (YOU DON'T SEEM QUITE CERTAIN))))

(SETQ PERHAPS MAYBE)

(DEF ALIKE (10
   ((*) (IN WHAT WAY ?))))
```

Fig 9

```
(SETQ SAME ALIKE)

(DEF CAN (0
   ((* CAN I = R) (PERHAPS YOU WOULD LIKE TO BE ABLE TO = R YOURSELF ?))
   ((* CAN YOU = R) (DO YOU WANT TO BE ABLE TO = R ?))
   ((*) (WHAT ?))))

(DEF DREAMS (4
   ((= DREAM) (CAN YOU DESCRIBE ONE ?))))

(DEF DREAMED (DREAMT 4
   ((* YOU DREAMT = DREAM) (HAVE YOU DREAMT = DREAM BEFORE ?))))

(SETQ DREAMT DREAMED)

(DEF I (YOU 0
   ((* YOU (WANT NEED) Q = R)
      (WHAT WOULD IT MEAN TO YOU IF YOU GOT = R))
   ((* YOU ARE * (SAD UNHAPPY DEPRESSED SICK) /SAD *)
      (I'M SORRY TO HEAR YOU ARE = /SAD))
   ((* YOU ARE (HAPPY ELATED GLAD BETTER) /HAPPY *)
      (HOW HAVE I HELPED YOU TO BE = /HAPPY ?))
   ((* YOU @ FEEL BELIEF YOU = R) (DO YOU REALLY DOUBT YOU = R ?))
   ((* YOU @ FEEL BELIEF * I ARE = R) (WHAT MAKES YOU THINK I'M = R ?))
   ((* YOU @ FEEL BELIEF * I = R) (WHY DO YOU WANT ME TO = R ?))
   ((* YOU ARE = Q) (HOW LONG HAVE YOU BEEN = Q ?))
   ((* YOU (CAN'T CANNOT) Q = /VICE)
      (HOW DO YOU KNOW YOU CAN'T = /VICE ?))
   ((* YOU DON'T = R) (WHY DON'T YOU = R ?))
   ((* YOU FEEL *) (TELL ME MORE ABOUT SUCH FEELINGS))
   ((* YOU = R I *) (PERHAPS IN YDUR FANTASY WE = R EACH OTHER))
   ((WELL = R) (DO YOU SAY = R FOR SOME SPECIAL REASON ?))
   ((= R) (YOU SAY = R ?))))

(DEF REMEMBER (5

   ((* YOU REMEMBER = R)
      (DOES THINKING OF = R BRING ANYTHING ELSE TO MIND ?))
   ((* DO I REMEMBER = R) (DID YOU THINK I WOULD FORGET = R ?))
   ((*) (GO ON !.!.!.))))

(DEF WHEN (0
   ((*) (WHY DO YOU ASK ?))))

(SETQ FEEL '(FEEL THINK BELIEVE WISH))

(DEF WHY (D
   ((* WHY DON'T I = R) (PERHAPS I WILL = R IN GOOD TIME))
   ((* WHY CAN'T YOU = /VICE)
      (HAVE YOU ANY IDEA WHY YOU CAN'T = /VICE ?))
   ((*) (PERHAPS YOU SHOULDN'T ASK))))

(DEF YOUR (MY 0
   ((* MY = R) (WHAT ABOUT YOUR OWN = R ?))))

(DEF ME YOU)

(DEF WHAT (D ((*) (WHY DO YOU ASK ?))))

(SETQ HOW WHAT)

(DEF WERE (WAS 2
   ((* WAS YOU = R) (WHAT IF YOU WERE = R ?))
   ((* YOU WAS = R) (WHY DO YOU TELL ME YOU WERE = R NOW ?))
   ((* WAS I = R) (WHAT SUGGESTS THAT I WAS = R ?))
   ((*) (CAN YOU EXPLAIN ?))))

(SETQ WAS WERE)

(DEF IF (3
   ((* IF * (WERE WAS) *) (HDW WOULD THAT HELP ?))
   ((* IF ONLY = /WISH) (WHAT WOULD YOU DO IF = /WISH ?))
   ((* (IF = /WISH) (DO YOU THINK IT'S LIKELY THAT = /WISH ?)))))

(DEF YOU (I O
   ((* I * (FOOL TWIT IDIOT BERK) Q *) (PERHAPS YOU ARE THE = Q))
   ((= I ARE = R) (WHAT MAKES YOU THINK I AM = R ?))
   ((* I = R YOU) (WHY DO YOU THINK I = R YOU ?))
   ((*) (WE WERE DISCUSSING YOU - NOT ME))))

(DEF SORRY (0
   ((*) (PLEASE DON'T APOLOGISE))))

(DEF BYE (9 ((= /STOP) (DO COME AGAIN))))

(DEF ZILCH
   (((* (PISS BUZZ) Q OFF *) (WHY DON'T YOU JUST SAY GOODBYE ?))))
```

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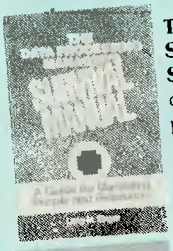

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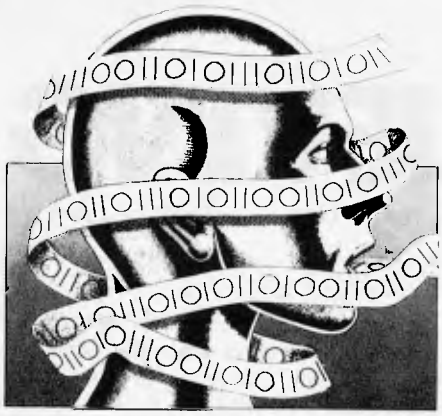

'SORRY YOUR TIME IS UP'! The global variables/FAMILY, /MEMORY, /DESIRE, /WISH, /VICE, etc are set to a non-NIL value if the user has mentioned a particular subject.
Finally, the main routine that runs the ELIZA program is called ELIZA and is shown in Fig 8.

The Eliza database

Finally, the most important part of the Eliza system is the database, which determines the replies it will give in different situations. The following definitions illustrate one possible set of words and patterns that can be used for the Eliza program; the possibilities are unlimited, and with some ingenuity there is probably much scope for improvement.

First a function DEF is defined, such that: (DEF A B) is equivalent to (SETQ A 'B):

```
(DEFUN DEF X (SET (CARX) (CADR X)))
```

Entries in the database have three formats:

1. (DEF A B) gives B as the word to replace every occurrence of A.
2. (DEF A (B N (P1 M1) (P2 M2)...)) gives for word A the replacement word B, value N, and the patterns and matches P1 M1, P2 M2, etc. B can be omitted if no replacement is required.
3. (SETQ A AA) makes A behave in exactly the same way as word AA.

The database is shown in Fig 9, and the keyword definitions are not in any particular order.

Postscripts

There are several possible ways of improving the realism of Eliza's responses. One serious drawback is that the program will usually give the same reply if given the same sentence twice. In Weisenbaum's original program this was avoided by marking each pattern every time it was used; a marked pattern would only be used again if no other possible match was found. A second simplification present in this version of Eliza is that once the highest-valued keyword has been chosen, only patterns supplied under that keyword are matched against the input sentence. If none of these match, all attempts are abandoned and a call to FLANNEL is made; a better approach might be to try another keyword.

Finally, a more adventurous project might be to make Eliza learn from its encounters with humans, so that the database of keywords would be expanded as more people used it.

END

CHECKOUT

HEARING IS BELIEVING

Peter Rodwell checks out a new piece of audio hardware — the Compact Disc — which will be beneficial to the computer industry.

What, you may well ask, is a chunk of audio hardware doing being reviewed by *APC?* It has, after all, nothing at all to do with computers.

Well, that's a fair comment in a way but the latest revolution to hit the audio industry in fact owes its existence to the computer industry and may well become a vital computer peripheral in the near future. And, in any case, the whole thing is such a neat piece of technology that it ought to interest any technofreak simply because it's such a good idea.

For decades, people have been spending an awful lot of money trying to reproduce recorded sound as faithfully as possible in the comfort and privacy of their own homes. The last great revolution was the development of the LP record and shortly after that the widespread introduction of stereo sound. Both brought immense improvements over the previously popular medium, the 78rpm record, in terms of frequency response, dynamic range and reduced noise. Corresponding developments to other parts of the audio chain – microphones, tape recorders, amplifiers and loudspeakers, for example – have brought reasonably good sound into the ordinary home.

But good though these methods are, they still haven't given us really good sound – there's always some degree of distortion and background noise introduced at the various stages in the process.

A new technology has now emerged which does allow the capture, storage and reproduction of sound without such massive risks of degradation. By digitising the sound as near to its source as possible and then storing it in digitised form, it's possible to reproduce it with no audible difference to the original; the method which has been developed to do this is the Compact Disc (CD hereinafter).

How it works

Sound is transmitted through space in the form of variations in air pressure; these cause our eardrums to vibrate in sympathy and we perceive this as a sound of one sort or another. Variations in pitch and other qualities which allow us to recognise the difference between, say, the sound of a violin and that of a randy tomcat are caused by variations in the pattern of these pressure waves.

The diaphragm in a microphone acts like our eardrum – it vibrates in sympathy with the pressure waves which make up sound, but it converts these to an electrical signal, the voltage of which varies as the sound varies. The signal produced by a microphone is quite weak but if we strengthen it sufficiently with an amplifier, we can reverse the process by feeding it to a loudspeaker, which converts the signal back into pressure waves. Unfortunately, the three components in the system – microphone, amplifier and loudspeaker – never produce an *exact* copy of the input signal and the result emerging from the loudspeaker will always be distorted to some degree. In the recording/playback processes used to produce an LP, there are many more stages than this and therefore many more stages in which distortion can occur.

The digital techniques used in the CD system allow a far more faithful level of sound reproduction. To digitise sound, the analogue signal is 'sampled' as soon as possible after it has been obtained. To get an accurate digital representation of an analogue signal, you need to sample it at a rate of at least twice its frequency. The audible frequency range is from 20 to 20,000Hz so the CD system uses a sampling frequency of 44.1 kHz which is more than adequate, and each measurement results in a 16-bit binary number.

The digitised signal is stored and distributed on a 12cm diameter disc quite unlike the LP record. One side of it is covered by a label while the other, the playing side, has a silvery sheen. Although you can't see it, what you're looking at is in fact a spiral track of pits in a thin aluminium disc, contained in a protective, transparent plastic covering. The disk is read by a small laser in the player and the pits cause the reflected laser beam to effectively flash on and off in sympathy with the pits' binary pattern. A photo detector captures this and a digital to analogue converter turns the signal into audio.

This is of course a grossly simplified description of the way a CD player works. There are plenty of complications, such as keeping the laser aligned with the track, and – the CD's strongest point – error correction, which not only maintains the fidelity of the resulting sound but helps reduce background noise such as scratches or minor imperfections on the disk. Small scratches or fingerprints on the transparent coating do not affect the sound quality at all, for the laser is focused on the aluminium surface behind them and doesn't even 'see' them. Short scratches which are deep enough to affect the laser beam can be dealt with by the error correcting circuitry, but of course there is a limit to what can be compensated for by electronics and a really bad scratch will give problems. Generally, though, the CD discs themselves are far more robust than LPs and, because they

Pictured here is the Philips CD 100 player.

are not in contact with anything like a stylus, have an almost indefinite lifespan. Because it is so robust, the same disc will be usable in other types of CD player: car stereos and portable players are expected to appear in due course.

In use

I first came across a CD player in a department store in Tokyo and was astounded at the sound quality it produced. In fact, it was only the presence of my determined friend which stopped me from buying one on the spot — we had previously agreed to prevent each other (forcibly if necessary) from spending any money while we explored the Tokyo equivalent of the *APC* Show.

To check on whether that first impression was accurate, I borrowed a Philips CD 100 player, the bottom of that company's proposed line of CD players, with a suggested retail price of $1099 (the Sony player in Tokyo was selling at about $700!).

Yes, my first impression had been right: the sound quality from these players is staggering, with a depth and realism which immediately make the LP obsolete. In fact so enthusiastic was I that I rushed out and bought another couple of discs (they're about $20 each, rather cheaper than a high-quality conventional LP and providing considerably better sound) on the grounds that I'm sure to end up buying a player one day.

Like all the other CD players now being sold, the Philips model plugs straight into your existing amplifier. All you are in effect doing is adding a second turntable — there's no need to junk your hi-fi system and buy a new one.

The selection of discs available now is quite good, although a little thinly distributed around record shops, and most record companies will be producing recordings on CD format as well as LPs from now on. The exception is EMI, which isn't convinced that the CD will catch on, but EMI wasn't convinced that the LP would catch on either, and had to scramble hard to catch up with the rest of the world when the truth finally dawned.

I am convinced that the CD system will destroy the LP just as the LP did the 78. If you think that $1100 for a newfangled record deck on which you can't play your existing LPs is too much, well, my guess is that while there might be some cost-cutting in the discount stores, the price will probably stay pretty much the same in figures, and the effect of inflation will be to make it cheaper in real terms — rather in the way that colour TV prices have behaved. The revolution won't happen overnight, either, but I would be prepared to bet that within five to seven years, we'll see a CD player in as many homes as now have colour TV sets. Which brings me on to the real reason for sneaking a piece of audio equipment into the pages of *APC*.

When (not if) CD players reach the same level of penetration that conventional audio equipment now has, we will suddenly have a unique and fairly inexpensive medium on which to publish computer software and electronic data of all sorts. Conventional optical disc wisdom says that the laser video disc, currently enjoying a mini sales boom in the US, will be *the* way for distributing computer-readable information. A video disc can hold, typically, 2 gigabytes of data, compared with the CD format which I estimate can store about 30 megabytes or so — it's difficult to tell because information isn't held on them in as straightforward a way as on a computer disk. But although read-write video disks are already in the laboratory stage and expected to hit the stores one day, it will be the CD which gains widespread acceptance first and which gains the widest-spread acceptance.

Because it is so much more robust than a computer disk, a Compact Disc offers a very rugged, low cost-per-bit medium for distributing software and large databases of information such as encyclopaedia, books, knowledge bases for expert systems, etc. All that is needed is an output from the player which allows a computer to tap into the digital signal stream before it gets converted to analogue form. The Philips player has no such outlet but this is hardly surprising: the CD market has only just begun in Australia (it's booming in Japan, apparently) and it will take time to gain acceptance and become familiar on the audio scene. Only then can we computerists get our hands on it, but if I were a software house or an electronic publisher, I'd be looking hard at CDs right now.

In the meantime, if Santa Claus is an *APC* reader, you know what I want for Christmas!

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FAIRE FADES

The ubiquitous Peter Rodwell crossed the Atlantic for the great Californian non-event of the year; otherwise known as the West Coast Faire.

Hot air

'You should be writing an obituary, not a report,' said one exhibitor, surveying the crowds slowly ambling around San Francisco's 'gaunt Civic Auditorium, venue for the 8th West Coast Computer Faire. 'All the fun has gone out of it.'

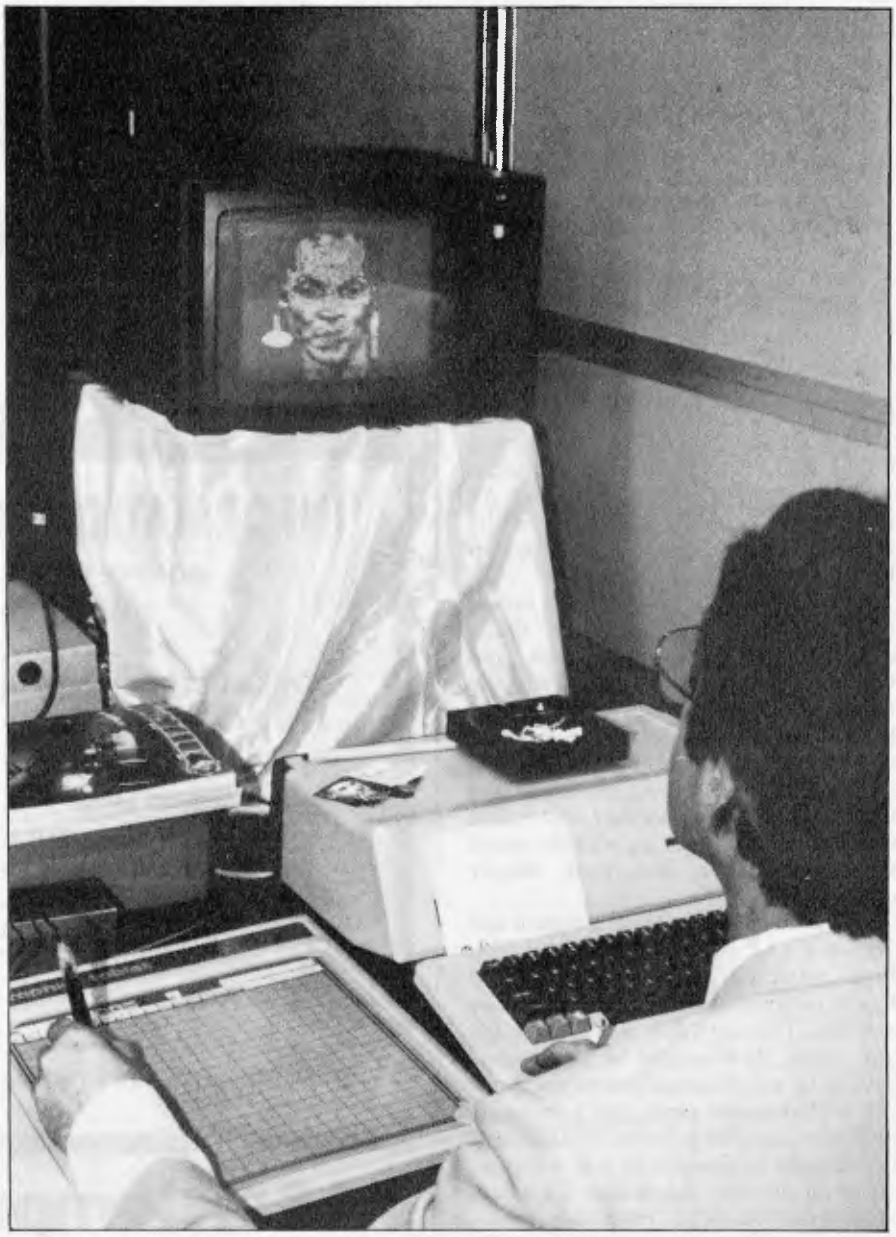
And indeed he was right. There was no shortage of exhibitors (400-plus) or visitors (46,900 — only about twice as many as this year's Show) and could be counted a success numberwise. But there was something missing. There was nothing *new*, nothing that made you stop in your efforts to squeeze past vast Californian stomachs and gasp with astonishment or think, 'Wow! This is where it's all happening!' In short it was — dare I say it — rather boring.

In case you think that I'm so jaded by international jet-setting that not even a trip to California can get the adrenalin flowing, let me explain. I have in the last year attended shows in Britain (several), Amsterdam, Madrid and Tokyo and, with the expection of Amsterdam (Comdex, a terrible show), found something of interest, novelty, originality and/or amusement. Tokyo gave a fascinating insight into the Japanese home market and provided a preview of what we can expect to see pouring over here in the near future. Madrid had little in the way of innovation but made up for this with all the enthusiasm and vigour of what must be one of the fastest-growing micro markets in Europe. Travelling to California to visit the major micro show in the very heart of the industry, one expects even greater things. After all, this is where the industry started and where a lot of the innovating — in hardware if not in software — still happens these days. Perhaps I was expecting too much — although I don't think so — but I certainly left a rain-sodden San Francisco at the end of the Faire with a feeling of disappointment.

IBM PC monopoly

Oh, there were new products all right, dozens of them, but new in being fresh on the market place rather than fresh in concept. And there were some enormous pointers to the way the American and European markets are diverging, mainly thanks to IBM.

Everywhere you looked at the WCF you found yourself staring at an IBM PC. Or at an add-on for the PC. You don't even have to talk of the 'IBM PC' in the States now — it's simply the 'PC', and at times you feel that there might as well not be any other micros around. The popularity of the IBM in the States actually poses a problem for us in some ways. It was obvious at the Faire that any software producer will now turn out his



High technology has hit the instant portrait world – this artist was using an Apple III with graphics tablet, colour monitor and colour printer to churn out portraits.

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FAIRE FADES

product for the PC first and for other machines later, if at all. But because Californians are, mostly, hardly aware of the existence of the rest of the USA, let alone the rest of the world, they seem to assume that the dominance of the IBM extends to cover the entire globe in exactly the same manner in which it now seems to dominate the States. In America, the starting price of the IBM is so low that the machine appeals to the middle of the home market right up to the upper half of the business world and, of course, it has been on sale for the last 18 months or so. As we all know, in Australia, things are very different: the machine has only just gone on sale and is grossly over-priced, putting it firmly at the top end of the business market. That the Americans don't appreciate this was made obvious by the number of software houses at the Faire who seemed keen to sell their IBM games in other markets and by the American books which have appeared here since IBM's launch, on subjects like *Games Programming on the IBM PC* or *Programming Your IBM For Fun and Profit.* There will even be an IBM PC Faire in San Francisco this year (26-28 August), apparently organised by the WCF organisers.

Some diversions

But enough of this negative talk. There were, in fact, a few things of interest at the Faire, even if they weren't revolutionary advances in computer science. My personal 'best in the show' award went to the Vectrix Corporation for its spectacular colour graphics add-on subsystem powered by its own 68000 and producing some really spectacular displays. It can, apparently, be used with virtually any microcomputer and can easily be controlled from whatever high-level language you like. Regrettably, a pretty impressive collection of Californian beer guts insisted on jostling my camera and prevented my getting a sensible photo of the demo display, so you'll have to wait until we Benchtest it.

Nearby, a small stand was attracting attention by showing a small computer called the Humdinger. The Americans seemed very impressed by its lowish resolution colour graphics, its 4k of RAM and — most of all — by its $129.95 price tag. I, too, was impressed, although as a Spectrum owner slightly less so, as I couldn't but wonder why they hadn't put the price up very slightly and given it a lot more RAM. But — name apart — there's nothing to sneer at about the Humdinger and the large range of add-ons which include disks and CP/M as well as memory expansion and extra I/O ports should make it a popular machine. Don't know if we'll ever see it here though; the girl on the stand appeared not to have heard of us when I asked.

Quite a few of the big industry names were there, including Commodore, Apple, IBM (of course) and Osborne. The last name was said to be launching a new machine and although it was eventually announced, it wasn't on the stand. Adam Osborne was, though, when he could shake off the entourage of sycophants who seem to follow him permanently these days; word was out that he'd been the victim of a boardroom battle but he was still smiling. One big name noticeably missing was Digital Research. The company booked (and paid for) a stand but pulled out at the last moment, to the obvious embarrassment of Faire supremo Jim Warren, who went so far as to explain this and re-print Digital's booking form in the catalogue, adding

Cruising down El Camino

It's a standing joke in the *APC* office that West Coast Faire reports always start off with 'As I was cruising down El Camino Real...', a reference to the road which snakes down from San Francisco through Silicon Valley. As it happens, I did eventually cruise along it, in pouring rain, searching for the Palo Alto Hyatt (which turned out to be booked solid with Apple sales reps – I ended up in a sordid motel next door). But I started my expedition by heading in exactly the opposite direction, across the Oakland Bridge to the University of California's Berkeley campus to visit the Instructional Technology Unit.

The Unit is an offshoot of the Humanities Computing Service and aims to spread technology awareness among members of the Humanities Department and to provide access to microcomputers. Currently, the Unit is pretty small but has big plans: a classroom full of micros, networked together, is what director Ann Hernandez aims for, to allow teacher and students to work using computers as tools, rather than to learn *about* computers.

A primary use is, of course, word processing and work is under way teaching students to write their papers with Wordstar. But more exotic tasks have been tackled, including the invention of a way of computer typesetting ancient Icelandic characters.

While on the campus, I took a nose around the computer building, the interior walls of which are decorated with examples of computer graphics printouts, including a floor-to-ceiling blow-up of the RISC (Reduced Instruction Set Computer) microprocessor. This chip, developed at Berkeley, is designed to eliminate microcode. Currently, most microprocessors (and the CPUs of most other computers, too) use the binary machine code instructions as addresses to look up a much lower-level code, held in ROM on the chip; it is this microcode which opens and shuts the various networks of logic gates on the chip to carry out the actual instructions. The RISC chip cuts out microcode and instead requires special high-level language compilers which effectively produce the microcode directly. The result is said to be a speed increase of three to five times over conventional microcoded processors.

Berkeley's Professor Brian Barsky is one of the leading experts in computer graphics, and I called in to see him. Quickly masking his obvious annoyance at this unscheduled visit, he demonstrated an example of the sort of work being carried on there. A tiny room housed four research students, four terminals and a colour graphics display, all (except the students) connected to a VAX with some fancy graphics hardware hung onto it. One of Prof Barsky's achievements has been the development of a special branch of maths for use in the representation of three-dimensional objects. To describe an object, a series of points about its boundary are defined; linking these up gives a 'faceted' representation and Barsky has introduced a system for 'smoothing out' the facets, incorporating a 'tension factor' which allows you to vary the amount of smoothing, from very angular to completely smooth. He demonstrated this with a very impressive display of several objects, including an irregular one, each with varying tension factors; as always, they had a strange, unearthly look to them which, it later occurred to me, was because they were 'too perfect' – real-world artefacts have slight imperfections, but introducing this to a computer graphics system would, I imagine, be far from trivial. The Berkeley graphics work is very, very impressive and I can't wait for hardware prices to fall to the point where we can achieve this sort of thing on personal computers. I left promising that next time I was there I'd make an appointment and go into the subject in greater depth – and I will.

nastily, ' . . . we sincerely hope that nothing is seriously wrong at DRI . . . ' Well, he had been using Digital's booking as a selling point and its non-appearance must have caused him a few awkward moments.

The Apple stand was interesting. A few people gave the IIe an interested glance or two and nobody seemed to have time for the III. No, they all wanted to see Lisa and there she was, out of reach at the centre of a 20-deep crowd, showing off her fancy displays to the accompaniment of a dreadful stand-up comedian. I never did manage to get close enough to see whether they'd corrected the now-famous spelling mistakes . . .

Commodore's stand had little of interest other than a 700 with real, working disk drives (as opposed to the cardboard mockups they've been using in some of their ads and brochures — what, you hadn't noticed?). Likewise, IBM had the new XT model but not much else to rave about. Texas Instruments had a large stand, too, and was showing off its new home machine, the TI-99/2, an under $100 micro with 4.2k of RAM (expandable to 36.2k), TI Basic in ROM and a black and white display. The display gives 24 lines of 28 characters and there's a promised range of peripherals which include a printer/plotter, a 'Wafertape' mass storage device and an RS232 interface. I also picked up a brochure on — but don't remember seeing — the TI Compact Computer 40, aimed obviously at the Epson HX-20 with a built-in 31-character LED display (single line), 6k RAM expandable by 16k, 32k of ROM and the same peripherals as the '99/2. It can also take software in the form of ROM cartridges and its suggested retail price of $249.95.

Portability

It took the full three days of the Faire to visit every stand, look at whatever was on show, and, where necessary, talk to the relevant people. Before long, the two big trends in current hardware became apparent. Everywhere there were IBM lookalikes, portable computers and, in quite a few cases, portable IBM lookalikes from those riding both bandwagons. I must confess that I have long suspected that the success of the Osborne owes more to its price and bundle of software than to its portability; despite the very large number sold, I have never actually seen anyone using a portable machine in anything other than the sort of environment — office or home — where mains power is available and where a proper business machine would serve them far better. I am prepared to admit that some people need — and might even use — a truly portable computer, but I see no evidence that the success of the portable is due to its portability. Surely, though, I must be quite wrong for everybody is producing portables, often costing much more than the Osborne and offering less software, although, to be fair, they are usually better made and have larger screens. Given that the portable is selling well and that the IBM is moving in telephone number quantities in the States, it's hardly surprising that IBM-compatible portables should be the machine to make. Most seem similarly priced to the IBM and offer slightly more, particularly in the way of I/O ports. The nicest looking at the Faire was the Canadian-made Hyperion.

There were also several 8-bit portables, of which the best, in terms of portability and aesthetics, remains the Otrona Attache, (which is now sold in Australia).

Mice mania

The other big craze at the Faire was for mice. Since the announcement of Lisa, with its graphics screen and mouse, everyone has decided that they must have a mouse and, of course, making mice for the IBM PC is particularly popular. I tried a mouse and was puzzled; it worked just fine but I couldn't quite see why it has become so prevalent. It's supposed to make it easier for laypersons to select from a menu or generally move around the screen. Positioning the mouse takes a

A roomful of Victors and Sirius is undergoing soak testing and generating an amazing amount of heat at the same time...

Down in the valley

'You are now on the world's most beautiful freeway' said the sign on Interstate 280, leading south from San Francisco; well, it was quite spectacular but I can think of at least three which are more beautiful. It lead, eventually, to Scotts Valley, well south of Silicon Valley, where Victor – manufacturer of the Sirius – inhabits several stylish buildings in the middle of a deeply-forested and very attractive piece of California.

The production facility at Victor is surprisingly small, but it is really only an assembly operation. All the PCBs and the keyboard unit are manufactured by outside contractors and the various parts are simply slotted together at Victor. Perhaps the most impressive part of the operation is the testing room, where every machine is soak tested for 24 hours in the case of floppy-based machines and 48 hours for hard disk machines. The room is crammed with computers – all in various stages of testing – and is *hot* – the air conditioning simply can't cope with the heat generated by 200 or more computers, it seems. Regrettably, the software guru I principally wanted to talk to had been called away urgently and a tight schedule prevented my waiting around to see him. I did get to talk to the hardware vice-president, though, and was pleased to learn that the 8087 maths co-processor board and the clock-calendar board are ready and should be here soon. There is still no apparent progress on a colour display for the Sirius, though; it seems that there isn't a reasonably-priced tube which can handle such high resolution graphics in colour and Victor would rather go this route than immediately offer either a lower-resolution display at a reasonable price or a high-as-monochrome resolution display at an extortionate price...

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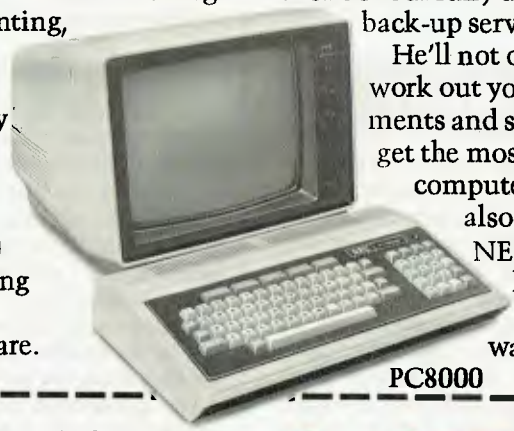
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little practice and you then have to press a little mouse-mounted button to tell the computer that you've arrived at your chosen location. I'm puzzled because I think a touch-sensitive screen or light pen would be far more sensible for several reasons: you make your moving and selecting in one go; there are no moving parts to wear out; the software is far simpler; and you don't need to keep an area clear on your desk top. The situation is especially silly when you consider that many modern display controller chips contain built-in light pen interfaces anyway.

Colourful display

In many areas of microcomputing, the hardware has kept well ahead of the software, simply because it takes time for programmers to learn their way around new chips and systems. One area in which the hardware is definitely lagging is in really high resolution colour displays at affordable prices. Thus, while there were many spectacular games at the show, the Tempest machine in my hotel outshone all the micros in the quality of its graphics and it looks as though we'll have to wait another couple of years or more for the price of RAM chips and the 16-bit processors to address them to fall sufficiently to make their use in home machines economically worthwhile. Meanwhile, it's quite possible to produce some pretty impressive stuff on Apples (especially the IIe), Tandy Color Computers, Ataris, Commodores and, again, IBMs, as was amply demonstrated at the Faire. More than amply, in fact, for the games market Stateside is booming just as it is here and the sounds of

One of the host of new portables around was this one, the Access, which comes complete with a dot matrix printer welded onto its top, making it even less portable (because of its weight and power requirements) than most.

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FAIRE FADES

electronic zapping, crashing and exploding filled the air. Most of the games were ones we have already seen here (apart from a few on the IBM).

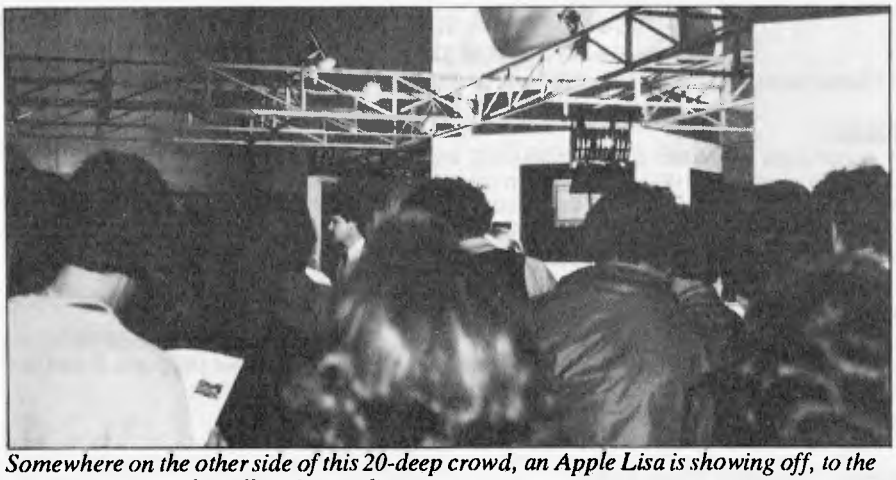
Light relief

If the Faire was lacking in novelty and originality productwise, it still provided occasional flashes of entertainment in the form of the people there. There were of course the usual promotional gimmicks: I spotted a caveman, a penguin, several robots, an ET and a gorilla (or he might have been a bear — it was difficult to tell). And of course the Great American Computer Nerd was out in force, bedecked in long hair, lumberjacket shirt and small, flaccid rucksack. The GACN could be found everywhere, but seemed particularly prevalent around stands like the one promoting the use of micros to advance world peace, or near what the Americans called catering facilities: booths selling foul-looking Mexican-style things to eat and the usual replusive, diuretic fluid they call coffee. Even King's Cross or the worst excesses of Vic Rail produce better food than the villians who have the Civic Auditorium catering concession; the Faire organisers collaborated by providing no alternatives for us pampered press people, either. In fact the press 'facilities' were the worst I've ever seen: a stark room with hard chairs and a few trestle tables for press releases. Smoking was banned in the press room, too — a measure which would provoke an immediate walk-out at any Australian show!

Conclusion

In summary, then, was it an event worth flying half-way around the world to see? My answer would have to be a qualified 'No'. Had I gone to California just to see the Faire in the expectation of great things, I would have been even more disappointed. Fortunately, the presence of Silicon Valley just down the road meant I could make up for the Faire by visiting one or two interesting places (see the box elsewhere in this report) and generally mooch around some computer shops to see how things are done there. If this year's Faire is a guide, there would seem to be little point in going to next year's event. And it appears I'm not the only one to be disillusioned with the Faire: organiser Jim Warren is said to be negotiating for the sale of the whole thing and may even have sold it by the time you read this, in which case some sort of an era will definitely have come to an end. Personally, I feel that the rest of the industry has changed but the Faire has tried to stay the same, and that the traditional gap between the USA and the rest of the world in computing developments has narrowed almost to insignificance.

You really know it when you're in Silicon Valley – this car licence plate was spotted just outside the Faire.



Somewhere on the other side of this 20-deep crowd, an Apple Lisa is showing off, to the accompaniment of an alleged comedian.

Bird's eye view of the Faire

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other people said it had to happen, but SIGMA/OKI made it happen with the SIGMA/OKI IF800 personal computer

Model 10
Personal Computer
$1495*

Model 20
"All-in-one" Professional Computer
$4390*

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Standard capabilities 64K RAM, 10 programmable function keys (no shift needed), Z80A processor (no extender board needed), 4MHz cycle speed, 640 x 200 dot **bit** addressable graphics, eight foreground **plus** eight background colours, full 99 station keyboard, upper/lower case, separate numeric & cursor pads, RS232, light pen, audio cassette, composite video, 40/80 columns, ROM cartridge, **and** 80 cps 80 column microline printer (fully integrated).

Standard Model 20 capabilities All the above, **plus** high resolution colour monitor, 10 super function keys, dual 384KB diskette drives. Fully integrated desktop package.
Options available **now:** Centronics, IEEE, A/D and D/A, light pen, ROM pack, monitors, 8" diskette and much more.

Software available now CP/M (standard), BASIC (interpreter and compiler), COBOL, FORTRAN, Pascal, PL/1, Wordstar, Supercalc, Spellstar, FMS-80, Supersort and much more.
Applications available **now:** Padmede fully integrated, simple to use invoicing, Debtors, Stock, Creditors, General Ledger. Other applications from IMS, Boulevard, John F. Rose, Cyres and the whole CP/M world. Ready to use on the Australian Beginning.

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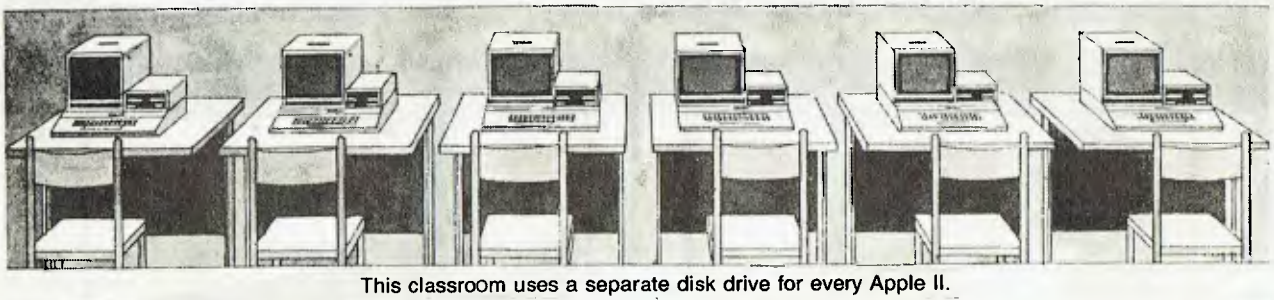
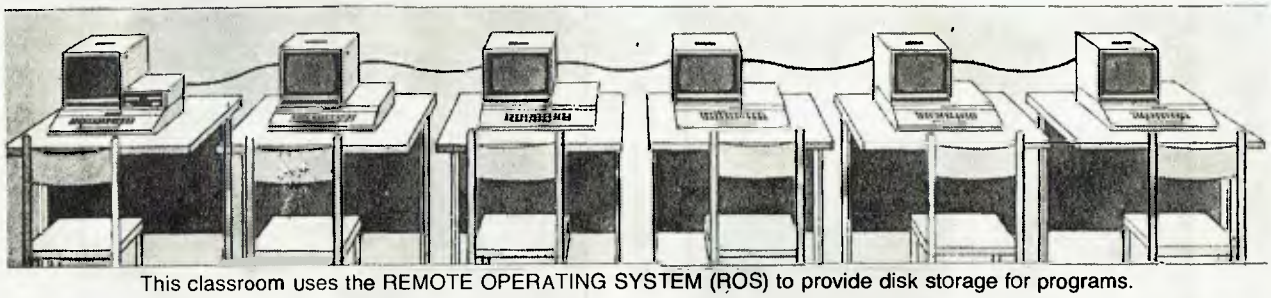
THE R.O.S. NETWORK for the Apple II Computer

The difference between these two classrooms could save you $2,000*



This classroom uses a separate disk drive for every Apple II.



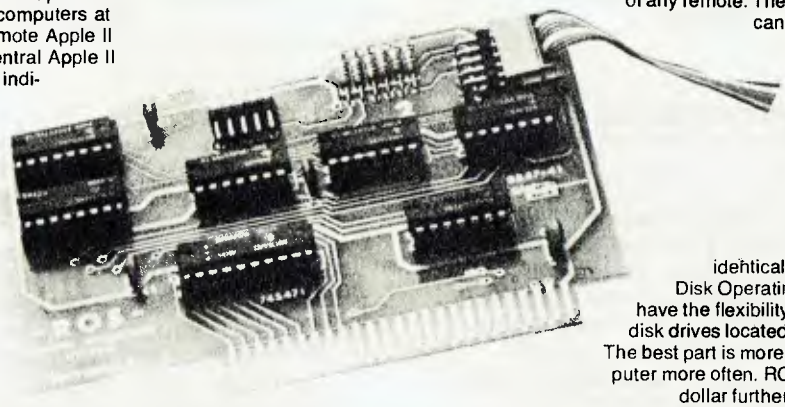
This classroom uses the REMOTE OPERATING SYSTEM (ROS) to provide disk storage for programs.

ROS IS EASIER ON THE BUDGET.

ROS replaces floppy disk drives on up to 127 independently run Apple II computers at substantially lower cost. Two remote Apple II computers can be linked to a central Apple II disk system for half the price of individual disk drives. ROS can be expanded for less than one third the cost of an additional drive. The savings on four remotes could buy another Apple II and monitor.

ROS IS EASIER ON THE EDUCATOR.

ROS simplifies instruction when using more than one Apple II. One diskett can supply all programs to the remotes instead of loading multiple copies into each separate system. ROS also allows the central computer to monitor the activity of any remote. The progress of any student can be tracked while seated at central Apple II.



ROS IS GREAT FOR STUDENTS.

Students will find ROS very simple to use. ROS allows loading and saving of Applesoft and Integer programs using identical commands as the Apple Disk Operating System. Students can have the flexibility of accessing up to eight disk drives located at the central computer. The best part is more students can use a computer more often. ROS stretches your budget dollar further to buy more computers.

Features

- Password Protection.
- 127 Remotes may be connected to Central.
- Up to 8 Floppy Disk Drives on Central.
- R.O.S. uses identical command words to Apple DOS.
- Auto start compatible for turn-key system start up.
- Special R.O.S. "FEED" command for simultaneous loading a program.
- Special "WAIT" message tells the remote user when the network is busy.
- Special "HELP" command provides user assistance.
- Special error messages clarify network operation.
- Complete listing of valid network commands displayed on remote at start up.
  - LOAD program name, disk drive letter
  - SAVE program name, disk drive letter
  - VERIFY program name, disk drive letter
  - RUN program name, disk drive letter
  - INT (change to integer language)
  - FP (change to floating point language)
  - CATALOG, disk drive letter
  - KAT (special command) — quick reprint of last catalog
  - HELP (special command) — explanation of R.O.S. commands
  - FEED (special command) — receive program simultaneously
- Future expansion of system capabilities through software only.
- Hard disk interface software available.
- Central board may be installed in any slot, except 0.
- 12,500 + baud rate transmission.
- Full reset, dataline error and system error recovery.
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A real computer with quality and functions far beyond its class

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*** DISK OPERATING SYSTEM COMPATIBLE WITH TRSDOS, NEWDOS VER 2.2**

$439
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PREMIUM FEATURES

* Real typewriter keyboard with spare keys for future expansion.
* 16K RAM expandable to 32K on empty sockets of present board and to 64K by extra circuit board, ROM expandable to 16K.
* Low price and economical to use, simply use your existing TV set for monitor and audio cassette for mass storage.
* If you want fast access, you can have optional disk drive, colour interface and expander.
* Machine is designed as a general purpose computer & when expanded into 64K in conjunction with dual disk drive this machine is capable of executing other language on disks.

SPECIFICATIONS:

Model	: KOMTEK I
CPU	: Z80 microprocessor at 2.0 MHZ clock
Memory	: 16K RAM with 8 sockets on board in situ expansion to 32K
Basic interpreter	: 12K standard basic I or II
Colour Interfaces	: PAL-compatible. 8 Colours
Provision	: Plug-in program cartridges Max. 12K
Keyboard	: Real keyboard typewriter style : Graphic pattern : Multi-function
Display	: Both monitor and home TV compatible : RF modulator built-in : High resolution graphics 256 x 192 : Graphics
Sound	: Soft-ware control : Built-in speaker
I/O facilities	: Port for serial I/O e.g. for RS232C devices. : Port for parallel I/O e.g. printer, keypad. : Audio cassette as mass storage
Time	: Real time clock

Model Configurations:

Komtek I	: as specifications with provision for conversion to colour and control functions
Options	: 64K RAM expander : Disk controller : 5.25" or 8" disk drive : Serial I/O e.g. for RS-232C devices : Alarm & automatic turning on/off appliance

Dealer enquiries invited.

PERIPHERAL COSTS (incl. sales tax)

Expander board with disk controller/16K RAM	$264
Colour interface	$99
RS-232C interface	$104
Double density adaptor	$209
5¼" floppy disk drive	$549
Floppy cable	$88
12" green or amber monitor	$210
Home control interface	$66
Control and switching box	$72
Printer interface	$104

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1. SPECIFICATIONS

Printing method	Serial impact dot matrix.
Printing format	Alpha-numeric 7 x 8 in 8 x 9 dot matrix field
Character set	228 ASCII characters; Normal and italic alpha-numeric fonts, symbols and semi-graphics.
Printing speed	80 CPS, 640 dots/line per second.
Line feed time	Approximately 200 msec at 4.23mm (1/6") line feed.
Printing direction	Normal; Bidirectional, logic seeking. Superscript and bit image graphic — Undirectional, left to right.
Columns/lines	Normal size — 80 columns Double width — 40 columns Compressed print — 142 columns Compressed/double width — 71 columns The above can be mixed in a line.
Paper feed	Adjustable sprocket feed and friction feed.
Number of copies	Original plus 3 copies by normal thickness paper.

2. Interface specifications

Interface	Standard Centronics parallel. Optional RS-232.
Data transfer rate	4,000 CPS max.

COST: $595.00 (ex-sales tax)
$695.00 (with sales tax)

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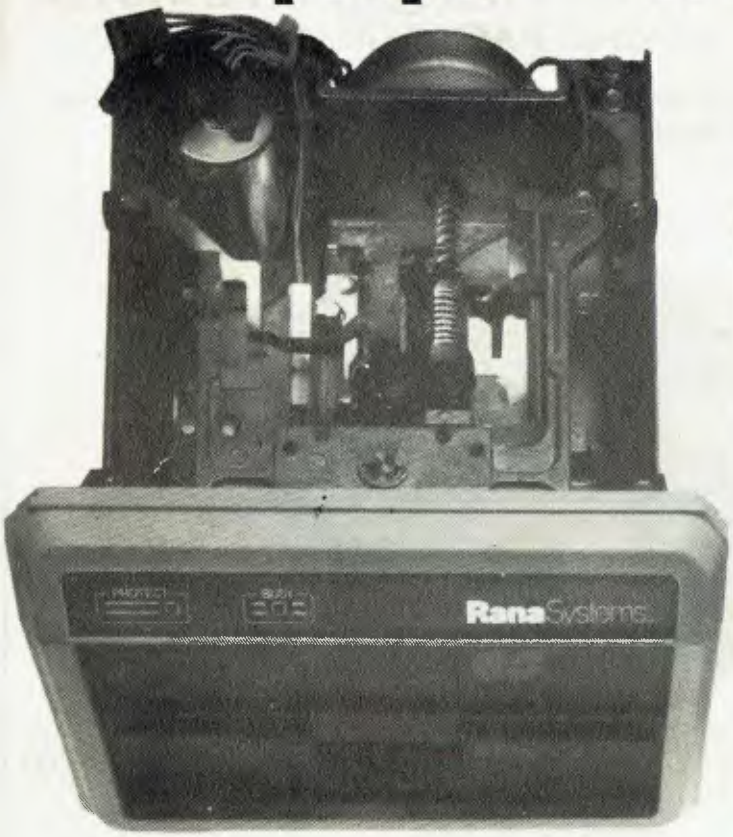
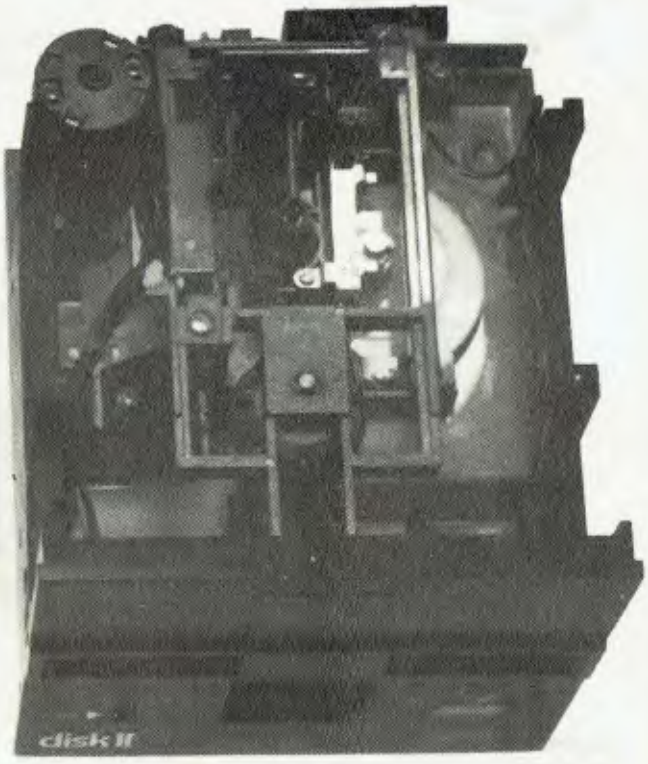
When you say your disk drive has more juice than Apple's, be prepared to cut one open.





Your Apple computer can grow from ordinary to awesome in a matter of minutes.

The Elite disk drive series by Rana Systems gives you that kind of magic. Quickly, easily and cost-effectively.

This superb family of sophisticated floppy drives was designed and perfected by a team of industry-respected engineers expressly for Apple computer owners who have long been demanding more disk drive for their money.

Now they *have* a drive that makes an Apple perform the way it should. For example:

Elite One, the most economical Rana drive, delivers 15% more storage capacity than Apple's drive. The top-of-the-line Elite Three will provide an astonishing *four-times* more storage, approaching hard disk performance. It's done through exclusive high-density single and double-sided disks and heads.

ELITE 1	$699	(163kb) with Controller . . .	$869
ELITE 2	$899	(326kb) with Controller . . .	$1089
ELITE 3	$1199	(652kb) with Controller . . .	$1375
Controller only	$176	All prices include Sales Tax	

All Models Available Ex-Stock

Here's a tantalising taste of just how formidable your Apple can become.

Next to enormously increased disk space, Apple buyers are most excited about Rana's fingertip Write/Protect feature. A pushbutton on the LED-lit panel gives you a new measure of failsafe control.

While Elite drives are all plug-compatible with Apple's controller, Rana's vastly superior controller card is a *must* for those with growing data processing demands. With it, you control up to *four* floppy drives using only one slot . . . while still utilising your Apple computer to achieve dramatic new heights of system flexibility and processing power.

A specially programmed Rana utility disk assures you of far-reaching compatibility, and extra dimensions of business, leisure and learning applications with your Rana-enhanced Apple computer.

There are many, many more operating refinements: Uncanny head-positioning accuracy, 300% faster track-to-track speed, better operating economy, and gentler clamping action through an all-new diskette centering cone, to name just a few.

A disk drive package like this doesn't grow on trees, so write or call today for more information about the Elite series.

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LETTER QUALITY PRINTER AND TYPEWRITER IN ONE PACKAGE

The BYTEWRITER is a new Olivetti Praxis 30 electronic typewriter with a micro-processor controlled driver added internally.

$895
plus shipping ($20)

Keyboard
Alphanumeric and function keys:
44 alphanumeric keys (100 printable characters) and 17 function keys.
REPEAT key (for repetitive use of any key).
Two shift keys.
Shift lock.
Automatic repeating space bar.
Automatic repeating return and vertical spacing.
Return without vertical spacing.
Tabulator setting key.
Tabulator clearing key.
Alphabetic tabulation key.
Cancel key (automatic for the last ten characters typed).
Automatic repeating backspace key.
Right-hand margin setting key.
Left-hand margin setting key.
Margin release key.
Forward half-space key.
Automatic relocate typing point key.

FEATURES
* Underlining
* 10, 12, or 15 characters per inch switch selectable
* 2nd keyboard with foreign grammar symbols switch selectable
* Changeable type daisywheel
* Centronics-compatible parallel input operates with TRS-80, Apple, Osborne, IBM and others
* Cartridge ribbon
* Typewriter operation with nothing to disconnect
* Service from any Olivetti dealer
* Self test program built in.

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Standard capabilities 64K RAM, 10 programmable function keys (no shift needed), Z80A processor (no extender board needed), 4MHz cycle speed, 640 x 200 dot **bit** addressable graphics, eight foreground **plus** eight background colours, full 99 station keyboard, upper/lower case, separate numeric & cursor pads, RS232, light pen, audio cassette, composite video, 40/80 columns, ROM cartridge, **and** 80 cps 80 column microline printer (fully integrated).

Standard Model 20 capabilities All the above, **plus** high resolution colour monitor, 10 super function keys, dual 384KB diskette drives. Fully integrated desktop package.
Options available **now:** Centronics, IEEE, A/D and D/A, light pen, ROM pack, monitors, 8" diskette and much more.

Software available now CP/M (standard), BASIC (interpreter and compiler), COBOL, FORTRAN, Pascal, PL/1, Wordstar, Supercalc, Spellstar, FMS-80, Supersort and much more.
Applications available **now:** Padmede fully integrated, simple to use invoicing, Debtors, Stock, Creditors, General Ledger. Other applications from IMS, Boulevard, John F. Rose, Cyres and the whole CP/M world. Ready to use on the Australian Beginning.

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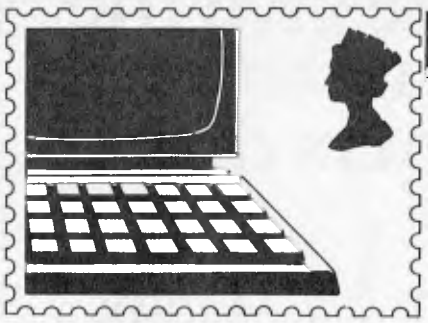


COMMUNICATIONS

APC welcomes correspondence from its readers but we must warn that it tends to be one way! Address letters to: 'Communications', APC, P.O. Box 298, Clayton , Vic 3168.

Babbage rules OK

As my original article was concerned with Charles Babbage only, I feel that I must reply to L Weavers appraisal of Ada Lovelace (March 1983 Communications).

The role of Ada Lovelace in the development of the Analytical Engine has until recently been over emphasised. In 1840, Babbage travelled to Turin to present a series of seminars on his Analytical Engine to a group of Italian scientists. It was his intention that one of them would publish an account of the machine. This role was performed by a young military engineer, L F Menabrea, who published his account in 1842.

The account was subsequently translated from French into English by Ada Lovelace (she became interested in the Analytical Engine in 1841). Under the consultation and guidance of Babbage, extensive notes were added to the translation. The translation and notes formed the most important paper in the history of computing predating the modern era.

It was in direct consequence of this, that Ada Lovelace's role in the development of the Analytical Engine has been over estimated. The programs she discusses were developed by Babbage (by as much as 5 years beforehand), and taken to Turin.

Ada Lovelace did, however, perform her role as a publicist extremely well indeed, but her influence on the development was not as much as had been supposed.

It is worth noting that the naming of the (new!) computer language by the United States Department of Defence was performed before the true role of Ada Lovelace was uncovered.

For those interested, there is a major reprint series currently in progress of major works in the history of computing, published by the Charles Babbage Institute in the United States. One of these is *Babbage's Calculating Engines*, a collection of Charles Babbage's works assembled by his son, Major General H P Babbage, which was published originally in a limited edition in 1889.

Queries concerning the series should be directed to the publishers – Tomash Publishers, PO BOX 49613, Los Angeles, California 90049.

N Holder

Satellite tracking 1

I refer to the letter written by Mr John Evans in your feature 'Communications' in the April issue of *APC.* wherein he complains that most micros leave out the inverse trigonometric functions Arc sine and Arc cos. Moreover, in order to remedy this apparent deficiency, he has kindly supplied a very crude iterative subroutine which calculates Arc sine.

I am surprised that he has not delved more deeply into advanced mathematics books since in them he would find the necessary formulae for Arc sine and Arc cos.

The following formulae show the necessary relationships:-

```
ARC SINE(X) = ATN(X/
SQR(ABS(1 - X^2)))
ARC COS(X) =
ATN(SQR(ABS(1 - X^2))/
X)
```

The complete solution for Arc tan (and hence for Arc cos and Arc sine) can be performed with the following program:

```
1000 REM SUBROUTINE
FOR ARC TAN
1010 IF X1 > 0 THEN
THETA = 180 × ATN(Y1/
X1)/3. 14159
1020 IF X1 < 0 AND Y1 > 0
THEN THETA = 180 ×
ATN(Y1/X1)/3. 14159 + 180
1030 IF X1 < 0 AND Y1 < 0
THEN THETA = 180 ×
ATN(Y1/X1)/3. 14159 − 180
1040 IF ABS(X1) < 0.000001
AND ABS(Y1) < 0.000001
THEN THETA = 0
1050 IF ABS(X1) < 0.000001
AND Y1 > 0 THEN THETA
= 90
1060 IF ABS(X1) < 0.000001
AND Y1 < 0 THEN THETA
= −90
1070 RETURN
```

where in this subroutine X1 = SQR(1 − X^2) and Y1 = X for Arc sine and X1 = X and Y1 = SQR(ABS(1 − X^2) for Arc cos

Thus programs for finding Arc cos and Arc sine are as follows (using the above subroutine):-

If N is the sine of THETA then:-

```
10 Y1 = N:X1 = SQR(ABS(1
− N^2))
20 GOSUB 1000
30 PRINT THETA
```

If M is the cosine of THETA then:-

```
10 Y1 = SQR (ABS(1 −
M^2)):X1 = M
30 PRINT THETA
```

The main problems with Mr Evans procedures are that they take too long to perform and that there is no differentiation between, say, sine (45 deg) and sine (125 deg)

Ian Pardington

Satellite tracking 2

John Evan's letter (Communications, April '83) provides an interative method of determining arc sin, arc cos, and arc tan on computers without those functions.

The obvious disadvantage of his routine is the time taken to step to the required angle, especially where large angles are involved. (For an angle of 84.5°, arc sin will require 995 cycles, while arc tan will require 10,390 cycles.)

Similarly an increase in accuracy of one decimal point will increase the run time tenfold.

The following program requires one tenth of the time at values of N=0.5:

```
10 INPUT N
20 A=45:H=A:C=0
30 X=A/57.296:C=C+1
40 IF C}25 THEN 80
50 Y =SIN(X)
60 IF Y{N THEN
  A=A+(H/2^C):GOTO 30
70 IF Y}N THEN
  A=A-(H/2^C):GOTO 30
80 PRINT A
```

For arc tan, change:

```
50 Y=TAN(X)
```

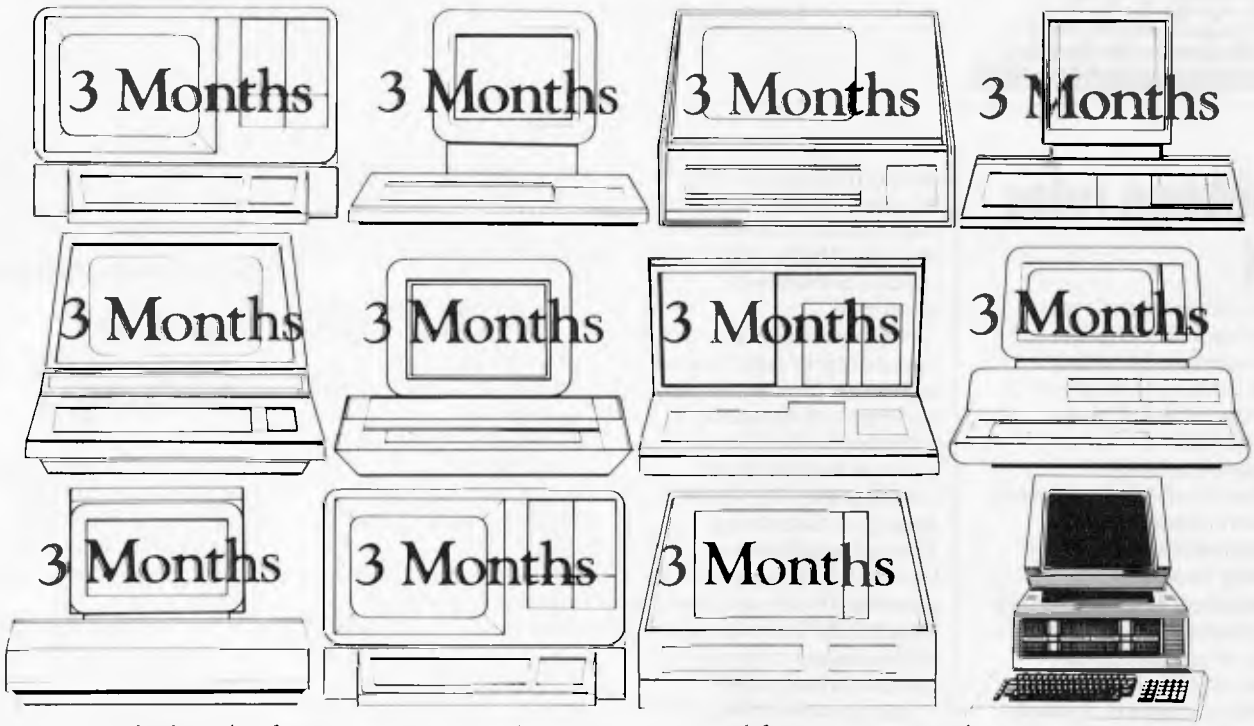
For arc cos, change:

```
50 Y=COS(X)
60 IF Y}N THEN
  A=A-(H/2^C):GOTO 30
70 IF Y{N THEN
  A=A+(H/2^C):GOTO 30
```

Twenty five or twenty six iterations in line 40 is sufficient for accuracy to 8 decimal places.

If speed is important in

Don't ask yourself why we give the Sirius 1 a 12 month warranty. Ask yourself why the others don't.



The length of warranty is a manufacturers way of expressing faith in the reliability of a product. A short warranty means he doesn't have a lot of faith. So why should you!

On the other hand, at Barson Computers, we know our Sirius I is the most rugged micro made, so naturally we give it the industry's longest warranty. Its failure rate? A tiny .007%.

But the Sirius I is special for many other reasons. To begin with, it should more properly be called a mini. Its Central Processor has a massive 128K bytes of Random Access Memory. And this is quickly expandable to 896K and beyond. On the other hand the much vaunted new IBM PC has only 64K bytes of RAM upgradable to 544K.

The Sirius I has superb graphic resolution giving 50 lines of 132 characters as well as half tones. It has ports which enable it to be simultaneously connected to a printer, plotter and other computers.

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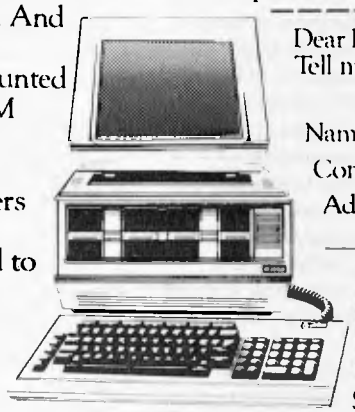

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your particular application, you should use a mathematical formula to allow a one pass calculation. If your computer has an arc tan function, you can use a derivative of the formula $\sin^2 + \cos^2 = 1$ to calculate arc sin and arc cos, as follows:

To find the arc cos of N:

```
10 INPUT N
20 X=ATN(((1/ N^2 )
  -1)^0.5)
30 PRINT X*57.296
```

To find the arc sin of N, modify line 20, viz:

```
20 X=ATN(1/(((1/ N^2 )
  -1)^0.5))
```

If you don't have an arc tan function, use the following routine instead:

```
10 DEFFNX(N)=(((
  (5*N^2)/7+1)^-1*21+4)*
  (N^2/-75)+1)*N
20 INPUT N
30 IF N}0.5 THEN 50
40 X=FNX(N):GOTO 80
50 IF N}1 THEN 70
60 Y=(((2/N)+1) ^1*5-1)/2:
  X=FNX(Y)+0.4636476:
  GOTO 80
70 X=(-2*FNX(1/N)
  +3.14159)/2
80 PRINT X*57.296
```

These one pass routines will run at about one tenth of the time of the iterative routine, above.

Chris Hatcher

More directory space

I have a problem with files on my TRS-80 Model 1 disk system, which has 2x40 track and 2x80 track drives running under NEWDOS 80 V2. I have a time sheet system which creates a file for each client on the 80 track drives. I have some 110 files on the disks, which now have zero FDES but about 108 grans left. Is it possible to reserve more directory space, as this would appear to be the problem?
T R Martin

You are quite right; the trouble is due to having filled up the available directory space before running out of disk space. This is a common problem when using a lot of small files.

A similar problem occurs with CP/M systems, where I often run out of directory space on 8-inch double density disks well before reaching the maximum capacity of some 650 bytes.

It is not easy to solve this problem, as a specific track is reserved on each disk for the directory: this has a maximum capacity of 48 files on a 35 track disk, 55 on a 40 track and 110 files on an 80 track. While I believe it is possible to circumvent this by locating the directory elsewhere on the disk, the result is a very great slowing of disk access speed. This might be acceptable for loading a program, but it would be out of the question for running a program which accesses files often.

You do not mention whether you are using sequential or random files in your application. A relatively simple solution is to use random files, with each file holding data for two or more clients. You would then use the FIELD function to split the file up into separate parts, once it has been loaded from disk.

CP/M users have the advantage of being able to join and split files at operating system level using PIP.

P L McIlmoyle

Printer parameters

I also have a problem using the new DMP400 printer, which I would like to force to produce 80 columns instead of the normal 132. This is for program listings, so I cannot alter the program output.
T R Martin

Your printer problem is also a fairly common one, so I will give a general answer to help as many readers as possible. There are two approaches; both depending on the printer having the necessary features. Read your printer handbook to see if either is supported.

One way is to set a switch selectable option to force an automatic new line after 80 columns. The switch is usually inside the printer, so changing back and forth is inconvenient.

The other method depends on your printer responding to various control codes sent to it before the text to be printed. Find the 'escape sequence' of codes which will set the line to 80 columns. Since the printer will keep this setting until you choose another, you can run a small Basic program to PRINT CHR$(), the codes needed, before you print your 80 column file.

P.L. McIlmoyle

Pat on the back

I applaud the recent moves in the editorial of this and other magazines to expose some of the blatant techniques used to market products that are by no stretch of the imagination ready. This is obviously a step in the right direction, but would it not be a giant leap in the right direction if this and other magazines refused to publish some of the more obvious transgressions?

Iain Worthington

We do, or rather, we don't — Ed.

Tape storage

I Know that the structure for system tapes is:

255 bytes	— Leader
OOH	
A5H	— Sync
55H	— Start of file ID
6 Bytes	— Filename
3CH	— Start of data record
1 Byte	— Number of data bytes in this record
2 Bytes	— Starting address for data block
1-256 Bytes	— data bytes
1 Byte	— Checksum byte
.	
.	— More data records as needed
.	
78H	— End of file ID
2 Bytes	— Starting address for program

but how does Edtasm structure its source files on tape?

Also, I have a query concerning 'Gobbleman' (a TRS-80 version of Pacman) which I bought from Compshop. When playing this game I found that it cannot handle scores over 999,999 and after "clocking" the game twice (or when the number of points per dot reaches 2500) the computer (a TRS-80 Model I, 16k with no modifications) will 'lock up' for a short period of time. When it does start again, it does so with a new, apparently random score.

G O'Callaghan

'Sooner or later, Clive, someone is going to find out.'

OCCAM OCCULT

PROGRAMMING IN PARALLEL WITH OCCAM

Dick Pountain unravels the fifth generation systems programming language, eponymously named Occam.

I take it as evident that most *APC* readers are smart enough to walk and chew gum simultaneously. Most microcomputers, however, are not. In the real world lots of things tend to happen at the same time, to the point that we take such behaviour for granted and seldom question it. When you make breakfast, it's quite natural to have the toast under the grill at the same time that the eggs are boiling and the tea is brewing in the pot.

In other words, concurrency is not an issue in the real world; it's the way that the space/time continuum which we inhabit operates. It becomes an issue, however, when we try to model this world using a computer because the CPU of a computer (at any rate of a microcomputer) can only do one thing at once. At the machine level it can only execute one instruction at a time in the order which the program counter dictates. When machine instructions are bundled together to form the statements of a high-level language such as Basic, this underlying linearity remains. The statements of a Basic program are executed one after the other and the working of a Basic program can always be understood by an imaginary 'finger of time' which runs through the source code and points to what is happening now (when you are debugging a program this is often your own finger in a listing).

Why concurrency?

Why should we want the computer to do more than one thing at once since it does things so fast anyway? Anyone who has tried programming games in Basic can give one reason immediately; while your program is updating the screen it can't be doing anything else. So, if you require constant inputs from the user, all you can do is program a loop in which the input and updating are done one after the other but repeatedly; the result is not very fast or smooth.

This demonstrates an important reason for desiring concurrent processing in a computer; in a 'real-time' system such as might be used to track Exocet missiles or to control a nuclear power station (our game is just a simulation of such a system), the computer must simultaneously receive inputs, process information and control outputs. The computer cannot ask the inputs to 'hold on a minute till I've finshed what I'm doing' since Exocets are notoriously bad mannered in this respect.

Another reason, more applicable to business and domestic uses of micros, is that the convenience of use of word-processors, databases and the like could be enormously improved if it were possible to run more than one application simultaneously. You could, for instance, order a search of a large database for a piece of text to insert into a document, and carry on typing while the search took place in 'background' without having to wait for its completion. Some word-processor packages already have the ability to print in background while you continue to type.

So how is concurrency achieved? Either by having more than one processor or by cheating on a single processor. By cheating I mean that a program is written so that the tasks which are to run simultaneously each get a share of the processor's time; the processor executes one instruction from each process in turn. It's cheating because instructions are still executed sequentially, though the overall result is the appearance of concurrency (and, of course each task executes more slowly than it would have on its own; if there are three, each will run at a third of its full speed). The proper name for such cheating is time-slicing; many real systems are more complex than this simple-minded scenario and use interrupts as well.

The approach of using more than one processor is used in big defence mainframe systems and in a more modest way in the Atari, the TI99 and the Commodore 64 which achieve their concurrent graphics processing ('player/missile' or 'sprites') by using 'smart' video chips.

To use the cheating method on a single processor by writing at the assembler level is a nightmarishly difficult programming task; each task must be conceptually isolated from the others and must leave all the registers used by other tasks in the correct state. One way of simplifying this job is to use a concurrent operating sysem such as the new Concurrent CP/M. This will have in it a real-time monitor which does the donkey work of separating tasks, allowing them to communicate by flags to achieve synchronisation and to transfer data between themselves through FIFO (first-in-first-out) queues. This still presupposes writing at the assembler level.

A quick note on terminology; concurrent, parallel and multi-tasking are all words with rather different shades of meaning which tend to be used interchangeably to describe the sort of programming with which we are dealing. Concurrent implies only the notion of simultaneity, parallel processing more usually refers to hardware architectures than to software, and multi-tasking is mainly reserved for describing operating systems.

To achieve concurrent programming in a high-level language, the facilities have to be built into the language. The most well known example is Ada, which has a program construct called the 'task' for this purpose. Tasks communicate by shared variables and by flags (often called semaphores). Some Pascals have a similar construct called a 'process'. A task or process is a piece of program which can be executed in parallel with other such pieces.

Occam's razor

Inmos, Britain's great white hope in the semiconductor industry, is working on a new computer called the 'transputer' which is due to be unveiled later this year. Few details of the machine are available beyond the fact that it will be used in networks and makes use of the concept of parallel processing.

Occam is a new systems programming language developed by Inmos' programmers specially for the transputer, though it's equally applicable to other machines. Occam is possibly the first language dedicated to the concept of parallel programming; the parallel constructs are part and parcel of its structure rather than

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optional extras. The intention of Occam is that the programmer should not have to care how concurrency is achieved as the same Occam program will run on a single processor (by cheating) or with multiple processors (a separate processor for each task).

The name Occam is taken from the 14th century Oxford philosopher of that name who gave us Occam's Razor; the principle that entities should not be multiplied further than necessary, which means that of competing equally likely explanations, take the simplest. One of the most cogent critics of Ada, the US Defence Department's adopted language, has been Dr Tony Hoare, who has been intimately involved in the design of Occam. Ada is a huge language with everything including the kitchen sink. Much of its size comes from the need for absolute security in defence related programming; Ada takes the Pascal style of protecting programmers from themselves to new heights, with minutely detailed restrictions on the scope and type of every object and a large number of objects. Occam on the other hand is very spare and elegant, having only 22 reserved words and five basic constructs from which all else is derived. Hence the name.

How Occam works

The sort of security required for real time systems is concerned with the isolation and synchronisation of concurrent processes; processes must not interfere with each other's data, they must not collide when competing for resources,and they must be ready at the right times if they are to communicate. Occam achieves these goals in a characteristically elegant way by completely separating the functions of storage and communication. The two fundamental data structures in Occam are the variable and the channel; variables store data and channels transfer data between processes. From a physical point of view these two may be identical as each consists of a one word memory location but they are logically distinct. (I tried Occam on the Sirius which has 16-bit words but this feature is implementation dependent; many Occam systems will be 32-bit.) Some channels will, however, be ports to the outside world, fixed in the particular Occam implementation, while others will be locations for exchange of data within the computer and can be declared as needed like variables.

The unit of Occam programming is the 'process'. A process performs a sequence of actions and then terminates. Note the time element creeping in here; in a Basic program you never think about a program terminating because it's so obvious that it must.

There are three fundamental types of process:- input, output and assignment.

I'll illustrate with a channel called 'keyboard' and 'screen' and a variable called 'store'.

Input transfers a value from a channel to a variable and is written:-
keyboard ? store

Output transfers a value from a variable to a channel and is written:-
screen ! store

Assignment puts the value of an expression into a variable as in most languages:-
store := store + 1

When a value is transferred down a channel, it is in fact only a copy of the value; the variable which performs the output retains its same value. This is one of the ways Occam (and many other modern languages) minimises the possibility of unwanted side-effects in a program; the only way to change the value of a variable is to consciously assign or input to it.

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Constructors

All Occam programs are built from these processes using a set of 'constructors' to string them together. Complete programs also need some declarations, similar to Pascal or C. Some wirthy (sic) citizens may have pricked up their ears at the word 'value' used above. Yes, it's true, Occam is untyped, a value being merely one word regardless of its meaning. Occam is intended for system programming and is lower level than Pascal in this respect, more like Forth. For instance, it only has integer arithmetic (16-bit in the Sirius version). A simple Occam program would look like this:-

```
CHAN comm1,comm2:
VAR temp:
SEQ
  comm1 ? temp
  temp := temp + 100
  comm2 ! temp
```

Notice the declaration of the channels and variable used. In Occam these are both always local declarations; the channels and variable are set up only when this process executes, and are deallocated immediately afterwards. Notice also the word SEQ; this is one of Ocam's constructors, and it declares that what follows will be executed SEQuentially as in an ordinary Basic program. The indentation is not optional but highly significant as it indicates the scope of the SEQ construct. Occam has a smart editor which, in addition to checking syntax, handles this indentation for you automatically. This program inputs on channel comm1, adds 100 to the input value and outputs it to comm2, doing this once only. (The assignment is actually redundant as I could just say comm2 ! temp + 100.)

Communication on a channel is one-way only between any pair of concurrent processes, and it's synchronous. Communication can only occur when both the input and output processes are ready; if either reaches its input/output stage before the other is ready, then it will wait. This waiting is automatic and transparent to the programmer; no flags or semaphores to worry about.

The program above could be made into a named process by declaring it so:-

```
PROC add100 (CHAN comm1,comm2)
=  VAR temp:
   SEQ
     comm1 ? temp
     comm2 ! temp + 100:
```

A semicolon is now needed at the end because this is a declaration; that and indentation are the only delimiters used in Occam. This process can now be used inside another so:-

```
add100(keyboard,screen)
```

The actual channels to be used are passed in place of the formal parameters comm1 and comm2.

Things start to get more interesting when we come to the other Occam constructors PAR,ALT,IF and WHILE. PAR states that the following processes should be executed in parallel, ie, simultaneously. WHILE is the way of producing looping until a condition is met.

```
PROC add100 (CHAN comm1,comm2)
=  VAR temp:
   WHILE temp <> 0
     SEQ
       comm1 ? temp
       comm2 ! temp + 100:
```

This process will now repeatedly read from comm1 until a value of 0 is input. To repeat indefinitely, which is often what is wanted, I could have said WHILE TRUE. From now on — for brevity — let's omit channel declarations and assume that they have been made earlier in the program.

An example of parallel processes is:-

```
PAR
  WHILE TRUE
    VAR x:
    SEQ
      comm1 ? x
      comm2 ! x

WHILE TRUE
  VAR y:
  SEQ
    comm3 ? y
    comm4 ! y
```

The first SEQ process continuously

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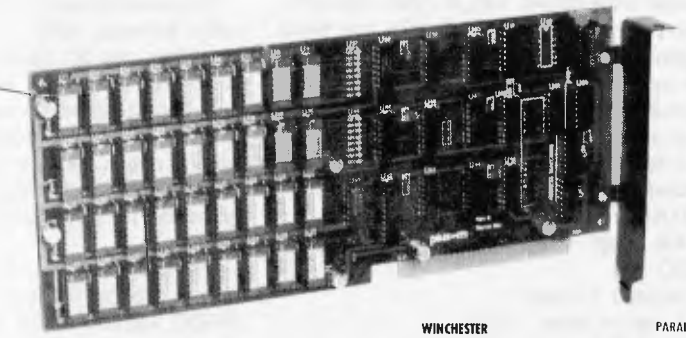

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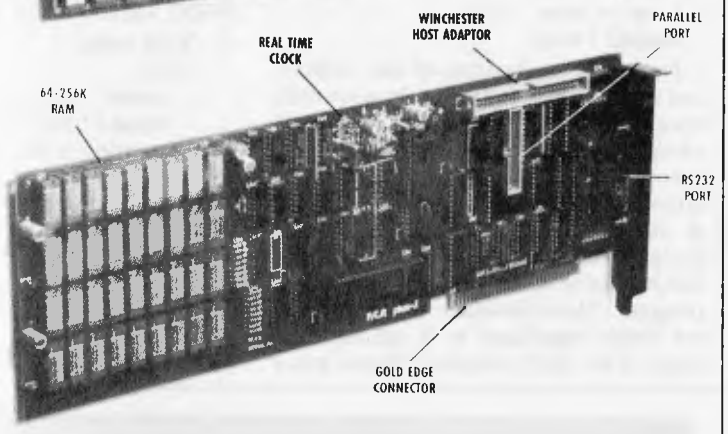

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monitors the input from comm1 while, at the same time, the second SEQ monitors comm3. Both then output to another channel. The two processes do not communicate with one another but if comm3 were to be replaced by comm2 then they would. Note that the order in which the two SEQ processes are written is totally irrelevant here; they execute together.

The ALT, for ALTernative, construct is absolutely central to Occam. It says that — of the list of processes which comprise its body — execute the first one which is ready:-

```
WHILE TRUE
  VAR x:
  ALT
    comm1 ? ANY
      SEQ
        x := x + 1
    comm2 ? ANY
      SEQ
        x := x + 100
```

This will add either 1 or 100 to x depending upon which of comm1 and comm2 produces its input first; the input processes which ALT selects from are called 'guards'. Should both guards come ready simultaneously, then Occam will choose one arbitrarily to execute. ANY is a dummy variable which throws away the input value; only its presence or absence matters as a signal. This is the stuff of which real-time control systems are made. The power of ALT is increased by the option to put a condition in front of the input process in a guard:-

```
CHAN values[n+1]:
PAR
  PAR i = [0 FOR n]
    WHILE TRUE
      VAR x, Estimate:
      SEQ
        values[i] ? x
        values[i] ? Estimate
        values[i+1] ! x
        values[i+1] ! (Estimate+(x/Estimate))/2
  WHILE TRUE
    VAR x:
    SEQ
      Sq.root ? x              -- input initial value
      values[0] ! x
      values[0] ! x/2          -- form initial estimate
  WHILE TRUE
    VAR root:
    SEQ
      values[n] ? ANY
      values[n] ? root         -- receive final estimate
      Sq.root.result ! root
```

Fig 1 Newton-Raphson calculation of square-root using parallel processing.

AFTER	FOR	TABLE
ALT	IF	TRUE
AND	NOT	VALUE
ANY	NOW	VAR
BYTE	OR	WAIT
CHAN	PAR	WHILE
DEF	PROC	
FALSE	SEQ	

Fig 2 The Occam reserved words

```
ALT
  x < 0 & comm1 ? ANY
```

Each guarded process can only execute if its guard is TRUE which means it must be both ready with a message and the condition must be TRUE.

Real time processes

Real-time can be introduced by using the WAIT process instead of an input process as a guard. NOW is a system variable which contains the time of the system clock. AFTER is an operator which compares times; time1 AFTER time2 is either TRUE or FALSE.. So one can write:-

```
VAR alarm:
SEQ
  alarm := NOW + 100

ALT
  comm1 ? ANY
    SEQ
      -- some action
  WAIT NOW AFTER alarm
    SEQ
      -- ring a bell
```

The action performed depends on whether a message is received on comm1 before the WAIT comes TRUE after 100 time units.

The IF construct is very simple, with no THEN or ELSE. Each following process begins with a condition and IF executes the first (in program sequence not time) one which is TRUE. If none is TRUE the process has no action:-

```
IF
  x=0
    screen ! y
  x=1
    printer ! y
```

Using these simple but elegant constructs it's possible to write virtually any program, but it will tend to be very long. A cunning device called the 'replicator' allows much better economy of expression. A replicator may be used with any of the constructors mentioned above to — well — replicate the process a stated number of times. The equivalent of a FOR. . .NEXT is created by:-

```
SEQ i=[1 FOR 20]
  screen ! i
```

This will output the numbers 1 to 20 to the screen. Used with PAR, it is possible to create an array of parallel processes:-

```
CHAN k[n+1]:
PAR i=[0 FOR n]
  WHILE TRUE
    VAR x:
    SEQ
      k[i] ? x
      k[i+1] ! x
```

This process creates a queue with room for n elements by passing the input value along to the next highest numbered channel in the array. A good example of the Occam style of programming, presented in the manual, uses such an array of processes as a pipeline to perform square-root evaluation by Newtons approximation on a list of numbers; calculation takes place in parallel, the next number on the list being input and the approximation cycle begun before the previous one has finished. This results in an overall improvement in throughput compared to the normal iterative solution even when using a single processor by time-slicing. For the benefit of those with the patience to unravel its workings, I reproduce the listing in Fig 1.

A replicator with ALT allows input from an array of channels to be concisely programmed:-

```
WHILE TRUE
  VAR x:
  ALT i=[1 FOR 100]
    chan[i] ? x
    out ! x
```

Input from the array of channels is funnelled into a single output channel; a sort of demultiplexer.

Data structures

You have just seen another type of Occam data object: the array. Arrays of channels or variables can be constructed by adding the upper bound in square brackets when declaring them, eg, VAR varieties[57]:. If the word *BYTE* is included, a byte rather than word array results, eg, VAR alphabet [BYTE 26].

String handling in Occam is performed by treating them as byte arrays, which will be familiar enough to Forth programmers. Constants and tables of constants can be set up with DEF, eg, DEF interval = 100: or DEF squares =TABLE[1,4,9,16]. (Hex values are introduced with a £, eg, £1c).

The inbuilt I/O facilities in Occam are minimal, as in C or Forth, so, to print a string to the screen, you need a routine like:-

```
DEF string = "what the hell"
SEQ i=[1 FOR string[BYTE 0]]
  screen ! string[i]
```

Note that the first byte of string contains its length. In practice, a routine to do this (called str.to.screen) and many other utilities — such as file I/O — are supplied in a library. PROC str.to.screen would be used in a program as:-

```
str.to.screen("what the hell")
```

Processes named with PROC can accept as parameters either variables, channels, values, or arrays of any of these. The size of an array need not be declared in the formal parameter list of a process so that arrays of variable size can be passed. For instance, the formal parameter list of str.to.screen is:-

```
PROC str.to.screen(VALUE string[] =
```

The compiler

The version of Occam on which this brief survey is based is a 'preview' product called 'proto-occam' which is meant only as a sample of the full language. It runs under

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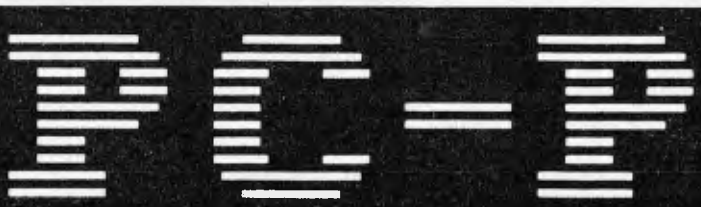

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OCCAM OCCULT

the UCSD p-system on Apple, Sirius, IBM PC, VAX and LSI-11/23.

Occam is a compiled language but the compiler is rather out of the ordinary. It is a single pass compiler with an embedded intelligent screen editor, and in use it's almost like an interpreter. The source program is written using the simple but effective screen editor which automatically indents by the correct two spaces every time you use a constructor like SEQ. Issuing the 'check' command performs the lexical analysis stage of compilation and reports syntax errors by placing the cursor at the site of the error. This can be performed after you enter each line, if so desired. Only when your program has checked ok, are you allowed to issue the 'generate' command which completes the code generation pass after which the object file (p-code in this case) can be written out to disk.

The main features lacking in the Evaluation version are any facility for separate compilation and linking of modules, and the ability to directly address memory locations. The latter is necessary if you wish to create new 'real-world', as opposed to internal, channels by, for instance, accessing an RS232 port. The sample version comes with just two such channels implemented, namely screen and keyboard; printed listings are only available by using the p-system utilities. Incidentally the Occam Evaluation Kit is reviewed in full in issue 1 of *Soft (That's enough of your plugs, Pountain — Ed).*

Occam is a very easy language to learn and use; its syntax is so simple and consistent that it can be learned in half an hour by anyone who is familiar with Pascal. It is cleverly designed to allow constructs of great power to be produced from a relatively small number of primitive entities. Many of the latest ideas on structured and applicative programming have been incorporated but not so many that they render it difficult or frustrating to use as a 'dirty' systems programming language. Its security features stem in an elegant and natural way from its control structures without the need for binding the programmer hand-and-foot with restrictive afterthoughts. If it has any serious shortcomings then I certainly do not have enough experience to have discovered them (I've no doubt that the *APC* mail-box will feel the strain if there are any!). As an educational tool to introduce the concepts of parallel processing it is superb, and it seems small enough to be effectively implemented on the latest generation of microcomputers; the p-system evaluation version is rather slow but native code versions would presumably be a lot faster. Don't lost sight of the fact though that there is no such thing as a free lunch; parallel processing on a single processor can rarely result in much overall speed gain. Multiple processors are what Occam is really all about.

Whether or not it is already too late for Occam remains to be seen; the US Defence Department's endorsement of Ada is a formidable obstacle but if there is any place left for aesthetics in computing, then it deserves to succeed. If you believe, as I do, the Bauhaus dictum that 'form follows function', then it is perhaps not such a bad criterion.

END

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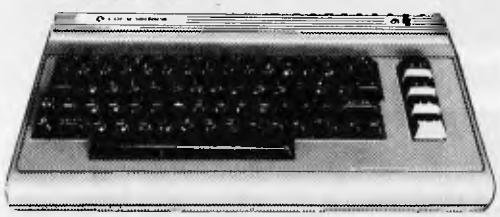

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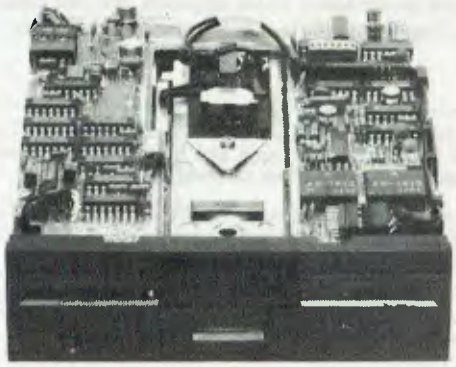

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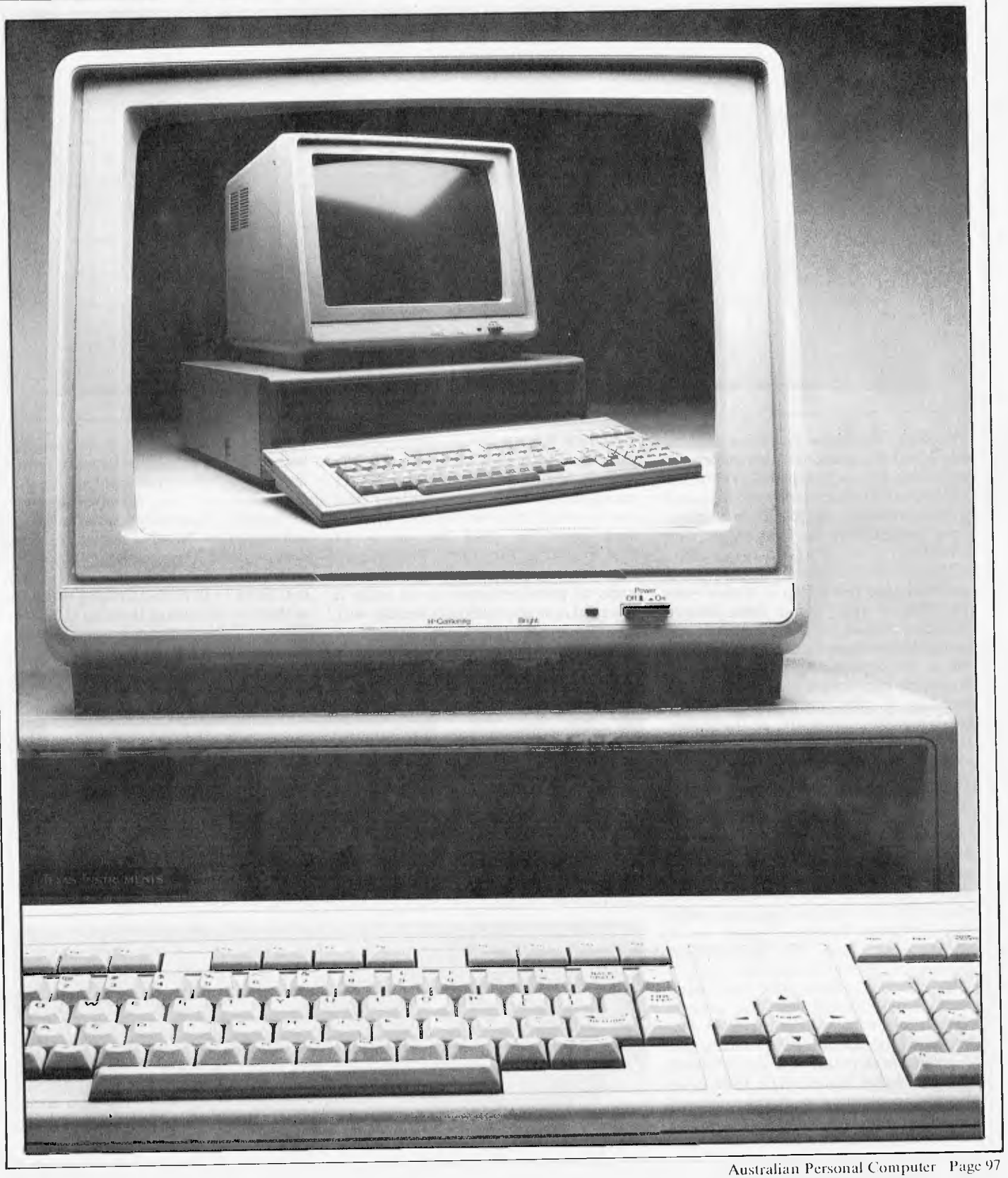


TI PROFESSIONAL

Robin Webster puts the latest IBM-compatible micro through its paces.

The profile of the new Texas Instruments Professional personal computer is surprising. It is *not* based on a TI chip, it is IBM Personal computer compatible, and it was developed by TI's Data Systems people rather than the Home Computer Division.

Despite the fact that TI already has a perfectly good 16-bit chip of its own —the TI 99000 — and various other designs lounging around on R & D shelves, the company has taken what might appear to be a self-deprecating route into the corporate microcopmputer business by building its new machine around the Intel 8088. TI's perspective on the matter, though, was that to try and counter the current software and hardware development trends would amount to financial suicide.

The Intel 8088 chip, while not the fastest or most feature-full device around, has acted as a powerful magnet, attracting significant attention from major computer manufacturers (IBM with its PC, and Digital Equipment with the Z80/8088 Rainbow), and, as a consequence, from the independent hardware/software developers as well.

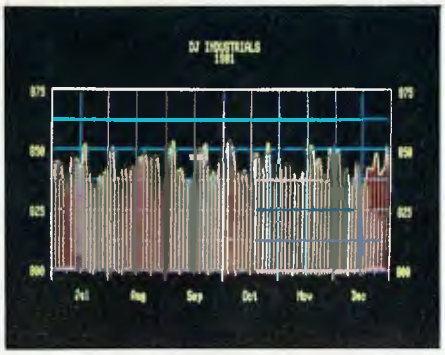
In the US, where there are many publications devoted purely to what is being done with and to the IBM PC, hundreds of specialised products are described each month. All sorts of weird and wonderful things which IBM in its dreams, or nightmares, never imagined could be done with its baby are on offer at ridiculously low prices.

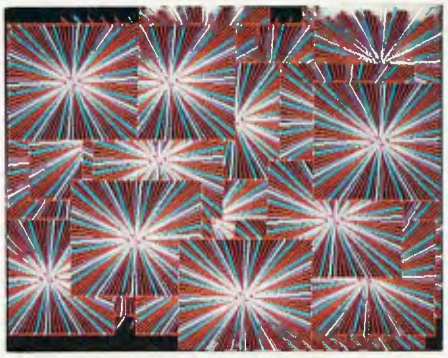
And it is this mass of already expended effort that TI is seeking to tap with the new Professional machine. But has TI managed to make it a trivial matter for a user to switch his software development work from an IBM PC to a TI Professional? Is the Professional a sufficiently tempting proposition in terms of price/performance to make a potential customer seriously wonder why the IBM machine should be considered by him at all?

As a package, the TI Professional is being pitched as 'The Answer'. It comes in the usual three-part package — processor/memory unit, video display, and keyboard. It is suitably neutral in colour (off-white) to be unobtrusive in most decors. And, emphasising the drip-coffee-maker simplicity of today's machines — in terms of taking them out of the box and setting them up at least — TI states that a customer needs merely the built-in diagnostics system, and, if

The disks are set off to the right side of the casing, as with the IBM PC.

A parallel printer port is standard instead of RS232.





A selection of screen graphics.

everything is OK, begin work.

This is TI's image of a "corporate" personal computer. So, how does it perform?

Hardware

TI has tried to mirror the IBM PC, but at the same time, add something new.

From the front. the design of the main processor unit closely resembles the IBM product. It appears to be a little wider, and may be a little lower. The disk drives are set off to the right side of the casing, as with the IBM PC, and the keyboard is attached by means of a coiled, telephone-like cable. While the keyboard is of a different layout, it has very much the same "feel" as IBM's. The TI video display sits on top of this main unit and. although moveable in a horizontal manner (left or right), it cannot be tilted vertically. While this may cause some problems to people with badly positioned overhead lights, I didn't find any reason to dislike this omission when using the benchtest machine.

The minimum system configuration consists of: a 128k main processor unit containing a basic video controller unit; a TI monochrome (green phosphor) video display; standard TI keyboard; a parallel printer port; five internal expansion slots; and a 320k disk drive. Prices haven't been set in Australia at this stage, but TI in Sydney quoted a figure for the basic configuration of less than $5000 (excluding sales tax). Larger versions can be supplied with integral 5 or 10 megabyte Winchester disks.

The observant reader may already have spotted one surprising thing about the standard machine: the common-or-garden RS232C input/output port is missing. The parallel printer port comes standard instead. For another $275 (again, all prices in this review are approximate at this stage), the user can get the optional async/sync communications card, but this will take up one of those precious internal expansion slots. The board is more than just RS232 circuitry, says TI, indicating that the Professional will be able to handle TTY, IBM 3780, IBM 3270 SNA (stand-alone) and IBM 3270 BSC and SNA cluster communications protocols towards the end of the year.

A second thing about the TI machine, which isn't being openly publicised by the company, is that it can read and write disks in the IBM PC format. This would seem to suggest that you can take a 5¼ inch disk from an IBM PC and use it directly on the Professional — well, you should be cautious before getting over-optimistic about this.

It would be an excellent situation for TI if all the software developed on the IBM PC could suddenly be handled as if it were TI Professional software, without any time or financial penalty to pay. Indeed, I was informed that this transfer was possible in 95% of cases, and there was some suggestion that TI had managed to come up with sufficiently smart circuitry and/or software to deal with any problems.

Owing to the short time I had access to the TI machine, it was not possible to make controlled performance tests with IBM PC software. What's certain is that in spite of TI's underlying decision to lock into the IBM PC marketplace, hardware differences do exist. The major obstacle in the way of the "put the disk in and run it" approach is the relevant screen resolutions and video circuit design. In the case of the IBM machine, it is possible to address a total of 640 x 200 pixels. On the TI machine the pixel resolution is 720 x 300. My perspective on this is that any customer who really wants to get the TI machine simply to run IBM software is barking up the wrong tree. TI is in the process of making deals with the major independent software vendors for TI compatible products — a little research in this department should give any potential user enough confidence to make the "buy" or "don't buy" decision.

With all slots occupied the inside would still not be crowded.

Keyboard

The Professional's keyboard doesn't really look like the IBM model — if you need a comparison, the closest would be the one offered with the Digital Equipment Rainbow — even though it is low-profile, has sculptured keys, and is attached to the system unit by means of a coiled cable. There are 97 keys in all (the Personal Computer has 83 and the DEC Rainbow has 103): 57 qwerty; 18 numeric pad; 5 cursor control, including HOME; and 12 user programmable function keys. The keys have what designers call "tactile feedback", which essentially means that you are easily able to tell when you have pressed the wretched things, instead of having the feeling that you are moving your fingers around in a bowl of jelly. All keys, except SHIFT, CNTRL (Control) and ALT (Alternate), have a repeat action when held down for more than half-a-second.

On many keyboards it can be very difficult to locate certain keys when you need them — and it is often the case that cursor control keys are buried somewhere unlikely or are only available when the keyboard is in some SHIFTed mode.

The Professional has the sensible arrangement whereby the four cursor direction keys are totally separate from the main keys and arranged in an easy-to-use diamond pattern. The HOME key nestles in the middle of the diamond (this positions the cursor at the top left of the display when pressed).

As with the IBM PC, the Professional keyboard can be adjusted so that it slopes at a particular angle — between 5 and 15 degrees. Two legs on the bottom of the unit can be extended or retracted by means of two inconspicuous buttons placed at the top left and top right.

A nice feature is the upper-case indicator light, a small green LED set into the CAPS LOCK key. This can help you avoid, or at least explain, those times when a character you were not expecting appears on the screen, or a particular command is rejected.

In use the Professional's keyboard doesn't ask much of the user. It is simple to comprehend, has a nice response and offers as good a selection of facilities as might be needed by a busioness user. 256 characters (ASCII) are generated as standard, but this can be doubled to 512 characters if special scientific or foreign language characters become necessary for applications work. (Occasionally, the benchtest machine would display a small heart-shaped character, but this wasn't documented anywhere.)

A 12 inch monochrome (green) and 13 inch colour monitor are offered by TI on the Professional. The pixel resolution and screen format is the same on both models.

The benchtest machine was a 256k main memory unit with two 320k floppy drives and a monochrome display. Standard memory size is 128k, and 256k is the current internal limit, but expansion up to 512k will be made available later this year. The Intel 8088 cpu has been set to operate at 5 Mhz — as opposed to the 4.77 Mhz of the IBM PC.

To see what the machine could do, I ran through a couple of demo packages that TI supplies. Demo A was designed for the full colour model and made use of the machine's sound generation facilities. Demo B was less ambitious and merely led the user through the various system features and future options.

Both demos ran under Microsoft's MD-DOS operating system, and one of the first things I noted was that the official TI operating systems instruction manual referred only to this product — CP/M-86 and UCSD p-System were nowhere to be seen. The reason for this wasn't totally clear, but probably had to do with making the initial start-up and use of the machine as simple as possible for the customer.

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COSMIC SOFTWARE

Graphics

Both demos were menu-driven and used the full graphics capabilities of the display. During the section on the system components, each modular unit (system/display/keyboard) was shown in a different colour along with explanatory text. It was a useful way of explaining the role of the bits and pieces.

On choosing the section dealing with the display/colour generation capabilities, I came across one of the problems to beware of in developing graphics program routines on a colour machine and then showing them on a monochrome version. At one point, the demo attempted to show the potential customer the different kinds of graphics that can be created. There were line, bar and pie versions. On running the demo on the monochrome machine, parts of the pie chart were almost totally invisible. This turned out to be because those parts were originally given a blue colour and this did not register well on the green phosphor.

A rather impressive part of the graphics display came in the image animation section of the demo. An aircraft engine turbine was drawn by the software and then rotated to the accompaniment of a sound not unlike a turbo-prop engine. At regular intervals the program would also change the colour of the blades. It was a good example of how graphics, sound and colour can be intermixed to great effect.

The Professional's ability to mix text and graphics on the same screen is a definite plus when compared to the IBM PC's rather less salubrious capabilities in this department.

Having raised your expectations as far as graphics are concerned, I shall now deflate them slightly. The problem in all this is that the Professional does not come with the full 720 x 300 pixel bit-mapping facility as standard — just as you have to fork out another $275 on the serial communications card, you must also buy the relevant graphics board as an optional extra.

The standard machine can only display alphanumeric characters and those jagged graphics as seen on most computers. To get into serious work you must buy either the 1-plane board (to sell for less than $500) which allows you to do two-colour or two monochrome shade graphics, or the 3-plane board (around $700) which provides up to 8 colours (black, red, blue, magenta, green, cyan, yellow,white) or 8 colour shades.

The video display draws its power from the main system unit, via a lead plugged into the back of the main casing. If the video display power switch is left on, it is possible to turn-on or shut-down both devices by means of the single on/off switch set in the righthand side of the main unit.

As mentioned earlier, the front of the system unit looks pretty much like the IBM PC design, and a peek around the back of the Professional doesn't contradict that.

To the left of the unit (rear view) there is the main AC power inlet with the video power outlet set a couple of inches to the right. Just off-centre to the left is a powerful, and fairly noisy, cooling fan. TI probably opted for the high-throughput fan since the system unit has a large internal transformer supplying all the pcbs, disk drives, and the video display. Although I feel that it could have been a little less noticeable, the fan noise never really became irritating.

Moving further over to the right, there is a DIN connection for the keyboard cable set alongside the 25-pin parallel printer port. The right side of the back is given over to the five expansion slots.

Inside

The benchtest machine came with the three left-most I/O ports empty, the fourth port allocated to a 3-plane video

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board (even though the display was monochrome), and the fifth slot was occupied by a serial communication board.

The whole arrangement was very neat and uncluttered. Each I/O slot in the casing that was not yet filled was blanked off by means of a formed aluminium plate, held in place by an easy-to-remove screw. To get access to these screws, or other components, the main casing must be removed. TI has really made this operation simple. Only two screws, located at the upper-left and upper-right of the back have to be undone whereupon the lid can be pulled off.

The review machine was fairly empty, but even with all slots occupied the inside would still not be overcrowded.

All five I/O slots are seated on a large motherboard about a foot square which contains the Intel 8088 chip. The motherboard lies flat on the bottom of the system unit: one end is hidden under the power supply and one of the disk drives. Simple snap-on elastic clips retain it in place. It is important to note that the TI boards are not the same design as those in the IBM PC, so don't expect to find bargains in that direction. Undoubtedly, the add-on vendors are busy making products to the TI board design specifications (see section on software).

The rugged-looking power supply is totally enclosed in a sheet metal casing. Nothing looked like it would take more than a few minutes to service, and no special tools are required.

Along with the launch of the Professional, TI has announced a new dot matrix printer called the Omni 850. This is a fairly low cost machine at $995, with a print speed pf 150 characters per second. It can print bi-directionally at 150 cps using a 9 x 9 character matrix, or it can give an enhanced print quality at 90 cps using a 15 x 9 character matrix.

Possibly its strongest recommendation is that it can reproduce the graphics images on the TI Professional's screen on a dot for dot basis by using a raster graphics technique.

The Professional can run the operating systems now expected on any corporate micro: CP/M-86, Concurrent CP/M-86, CP/M-80, MS-DOS and the portable UCSD p-System. Languages currently available under these operating systems include Basic, Pascal, Fortran, and Cobol.

The review machine came with the MS-DOS and CP/M-86 operating systems, an MS-Basic disk and a Digital Reserach CBasic disk which had met some unknown fate since it was blank!

Currently, TI is supplying MS-DOS version 1.25 on the Professional and has used MS-DOS as the "example" operating system in its operating manual for the machine.

To boot the system, you can either insert the system disk in drive 'A' and switch the power on, or you can do a restart by pressing the CNTRL, ALT and DEL keys at the same time. This three-key re-boot could be criticised as being excessively cautious, but I guess it's better than finding out you've hit a one-operation reset button accidentally.

After switching on, the Professional goes through a 10 or 20 second self-test routine before actually loading disk contents into memory. The diagnostics routine is held in ROM and is linked to three coloured lights (green, yellow and red) set in the left side of the machine, as seen from the front, and which flash on and off during the test.

If everything is OK, the lights go out at the end of the test — one or more will stay lit or not light at all if something goes awry. By noting the light activity or non-

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The Sigma/OKI library also includes software from suppliers such as Digital Research, Sorcim, Lifeboat and Australian applications from Padmede, Cyres, IMS, Software Source, John F. Rose and others.

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activity, it is possible to figure out what's going on.

A more detailed troubleshooting capability is made possible by inserting a TI diagnostics program disk. By doing a restart with the disk in the main drive,the user is provided with a number of test options to choose from (see Fig 1).

To use graphics commands in MS-Basic, the high-resolution graphics controller board must be installed. Once that's done, it is possible to create programs that use commands such as LINE, COLOR, PAINT, DRAW, POINT, and PALETTE, to create screen images.

The CP/M-86 disk supplied with the benchtest machine was marked "prototype version" but it nevertheless seemed to act the same as CP/M-86 on other machines.

One nice facility, though, was the Function Key Programmer routine which has been tailored to the TI Professional keyboard. After booting up the system, the user can type in the word FUNCTION which loads the key programming code. (Doing this on the review machine resulted in the screen as shown by Fig 2).

This kind of feature is a great time-saver especially when you are using CP/M's somewhat cryptic command sequence.

```
Texas Instruments Professional Computer DIAGNOSTICS Version 1.20 (C)
Copyright Texas Instruments, Inc. 1982.
    Overall Unit Test                      Yes No
    CRT Test                               Yes No
    CRT Graphics Test                      Yes No
    Diskette Verify Test                   Yes No
    Diskette Read/Write Test               Yes No
    Keyboard Test                          Yes No
    Memory Test                            Yes No
    Parallel Printer Test                  Yes No
    Communication Port(s) Test             Yes No
    Display System Configuration           Yes No
    Print Test Results                     Yes No

Select appropriate test(s) and press ENTER ...
```

Fig 1

```
CP/M-86 Function Key Programmer for the TI PC Version 1.0
    Type the Function Key you wish to program, or ESC to display the other set of
    keys, or Carriage Return to exit this program.

     F1: DIR A: OD
     F2: DIR B: OD
     F3: STAT OD
     F4: STAT
     F5: STAT A: *.* OD
     F6: STAT  B: *.* OD
     F7: PIP
     F8: PIP LST:=
     F9: FORMAT OD
    F10: FUNCTION OD
```

Fig 2

microhouse

WHAT'S A MOUSE, ANYWAY?

The most straightforward definition of a mouse is this: It's a cursor-mover . . .

Named for its superficial resemblance to a rodent, a mouse is a palm-sized little box attached to a computer via its "tail", which is actually a combination of a power and signal cord.

Most mice have three buttons, these buttons are programmed to control various actions on the screen simultaneously with the movement of the mouse.

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It may be noticed that while the keyboard has 12 function keys, the CP/M-86 function only shows features for ten keys. This is because the F11 and F12 keys are being reserved for the communications software that will be made available in the future.

For those users who want to use CP/M-80 programs on the Professional a small company called Xedex has done it again. When the IBM PC came out, Xedex quickly brought out the Baby Blue plug-in Z80 board which turned the PC into a CP/M-80 machine. Xedex has now brought out the Baby Tex card, which does exactly the same thing. Australian prices for the Baby Tex are not yet fixed.

Other than these specifics, there were no surprises in terms of how the two operating systems worked on the Professional. The benchmark programs were written in MS-Basic and gave the kind of results one would expect from a 5Mhz 8088, indicating that TI had done nothing unusual at the circuit level.

Documentation

Of the four manuals made available with the machine, only three were in their final form: The TI Professional Operating Instructions manual, the MS-DOS operating system manual, and the MS-Basic manual.

All were professionally printed in small-book format with page numbers, headings, and — most importantly — a contents index. While someone who was familiar with computers might find the Operating Instructions a little slow to inform, the first-time-user will welcome the attention to detail. If TI thinks there is something that must be noted carefully, a small doorkey symbol is placed in the margin next to the relevant text. The choice of subjects highlighted in this way (how to handle disks, what *not* to do if problems occur, etc) appeared to be sensible. Error messages, such as: **System Error** — 0020; or **Keyboard Error** — 0010, were generally explained in a simple manner, and MS-DOS error messages were covered at the back of the manual. Extensive use of high quality line drawings of the equipment and screen made the documentation quite pleasant to use. Naturally, the MS-DOS operating system and MS-Basic books were more comprehensive, but they still are unlikely to scare off a user.

The CP/M-86 system documentation was not a TI version, but a collection of Digital Research generic operating manuals and photocopies of TI specific information. This was less easy to work with, but the TI-produced version should be up to the MS-DOS literature standards when it becomes available.

Potential

To try and get a real feel for the TI Professional, we should probably think less about its contact points with the IBM PC, and more about its special features.

For example, later this year TI is intending to offer a natural language interface and speech I/O facilities that can be used in database query applications and programs input/output, respectively. I managed to get a look at a prototype of both products at the West Coast Computer Faire held in San Francisco during March.

Generally, I thought the natural language interfaces worked fairly well, if slowly. The display screen can be split up into many (six or seven is a reasonable number) different sized windows that contain specific types of words or phrases relating to the database information.

The software is sufficiently intelligent to remove those phrases or questions that are ruled out by prior selections so that you end up with a usable query. Once you have built a query that the system can execute it tells you so by displaying the word "Executable" at the lower right-hand side of the screen. By using the return key to move a reverse video block (rather like the option boxes in Multiplan) among various main menu selections, the query can then be processed and relevant database records selected for screen display.

TI has already demonstrated the natural language interface working with the Dow Jones online retrieval service, and has indicated that there will be database specific versions on the market in the near future. Also, it will be possible to combine the natural language facility with the voice I/O capability, so making possible some interesting program development projects.

Visicorp's version of the Xerox Smalltalk/Apple Lisa software offering is also to be made available on the Professional. Called VisiOn, it provides the user with the ability to create "windows" on the display screen which can be edited, moved, swapped, deleted, and generally altered in some way by means of a mouse — the in-vogue microcomputer companion which moves a screen cursor as it is pushed around on a desk.

Other products on the cards are two modem boards which can run at 300 bits per second or 300/1200 bps; an analogue interface board; a clock board; and an 8087 co-processor.

Conclusions

The TI Professional is a well made

Benchmark timings

Benchmark 1	1.00
Benchmark 2	4.20
Benchmark 3	9.30
Benchmark 4	9.70
Benchmark 5	10.50
Benchmark 6	19.00
Benchmark 7	29.50
Benchmark 8	31.00

All timings in seconds. For an explanation and listing of the Benchmark programs, see APC November 1982.

Technical specifications

CPU:	Intel 8088, 5Mhz
Memory:	64k RAM, expandable to 256k 8k ROM, expandable up to 16k
Keyboard:	97 keys (57 typewriter, 18 numeric pad, 5 cursor control, and 12 programmable special function keys). Upper/lower case character generation.
Screen:	12 inch monochrome (green phosphor) screen or 13 inch colour version, 80 cols x 25 lines display format. Both have 720 x 300 memory-mapped pixel resolution. 1-plane video board gives monochrome or two-colour generation. 3-plane video board gives 8 colours or shades.
Disks:	Standard unit comes with a single 320k, 5¼ inch drive. Options are 2 x 320k floppy drives, or one 5¼ drive plus a 5Mbyte or 10Mbyte Winchester unit.
I/O Ports:	Parallel printer port as standard. Optional Sync/Async RS232C communications board.
Software:	MS-DOS, CP/M-86, Concurrent CP/M-86, UCSD p-System. CP/M-80 (with plug-in Z80 Baby Tex board from Xedex).
Languages:	MS-Basic, C-Basic, Pascal, Fortran, Cobol as standard, but many others already on the IBM PC (Forth, for example) will probably be moved over too. A Natural Language interface for database applications is also on its way.

TI PROFESSIONAL

business computer system which has been designed with a specific purpose in mind — to capture a significant portion of the IBM PC microcomputer market and thereby put TI in a strong position with regard to the small business computer market. The Professional has a lot of compatible features. Furthermore, it has a number of innovative features; the kind of software and hardware products usually found on much more expensive machines.

And maybe that's where TI has got an image problem. Users generally like to work out for themselves whether or not a particular machine suits their needs. In the case of the Professional, a user might reject the machine and buy an IBM PC on the basis that it is the original and is already supported by a monument of software and hardware. There again, the Professional may be attractive because of the future products that will be released.

And we're back to the old situation of first deciding what your needs are and then buying a system to match, and not vice-versa.

I liked the machine as long as I thought about it as a new business machine from TI — I got a little worried about it when I thought of it as an IBM PC work-alike.

END

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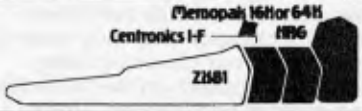

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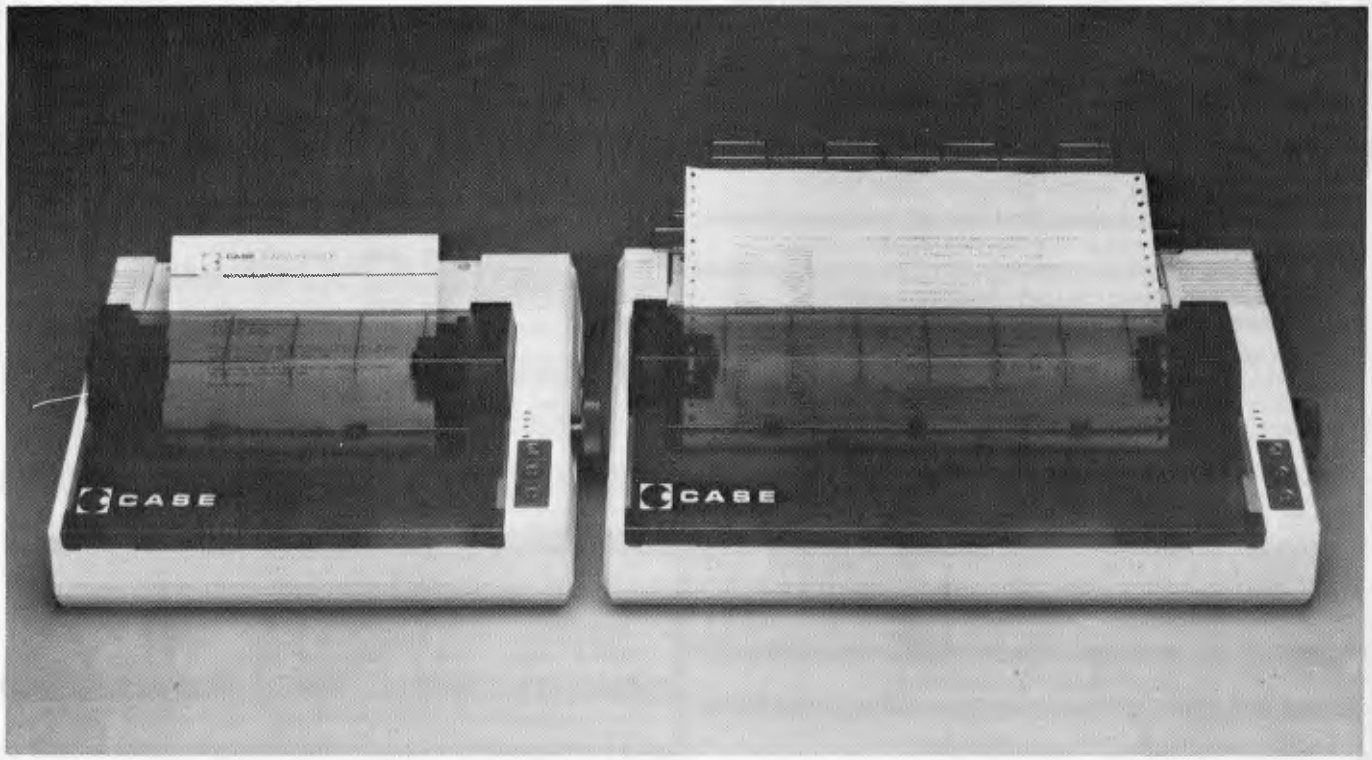

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CSY 5002R

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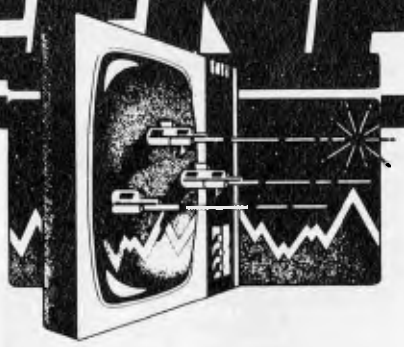
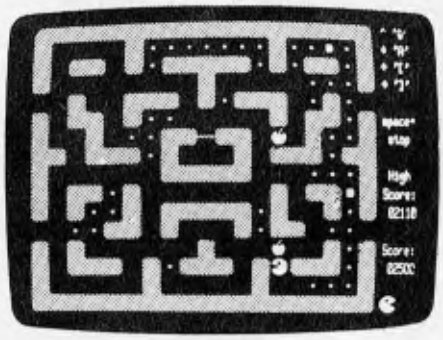


Ian Davies casts an eye over a selection of games for the all-Australian MicroBee.



GAME : Robot Man
PRICE : $14.95
SUPPLIER : Applied Technology (from Microworld

Despite its somewhat misleading name, this game is, in fact, the well known Pac-Man. Presumably the name change is to avoid copyright and trademark infringements. From Applied Technology's point of view, it's a pity that this sort of thing is necessary, as I am sure that the game would sell in much higher quantities if people knew it was a psuedo-Pac-Man.

The display is, of course, only black and white, but careful use of shading has made the screen quite convincing and clear. The rules of the game are identical to the traditional Pac-Man, except that there are less bonus targets. If anything, the Microworld version is more challenging than the real thing, as the safe period after eating a "power block" seems to be much shorter.

The use of graphics and quality of motion are excellent, and control through the keyboard is more than adequate. The only criticism is that the game does not take full advantage of the MicroBee's sound generator.

What more can one say about Pac-Man?

USE OF GRAPHICS : *******
ADDICTIVE QUALITY : *****
RESPONSE TIME : *****
PRESENTATION : *****
VALUE FOR MONEY : ******

GAME : Maths Adventure
PRICE : $14.95
SUPPLIER : Microworld

Maths Adventure is a combination of the traditional "adventure" style game (with wizards, dragons and the like) and educational maths quizzes.

The format of the game follows the original adventure idea in that you are tracking around a wonderland encountering challenges and discovering treasures. The difference is, however, all of the challenges are in the form of a mathematical problem. And it should be pointed out that these problems are by no means trivial. I was expecting basic four function arithmetic and was pleasantly surprised to find that application of techniques to real world situations was the pace being set — all the way up to trigonometry and statistics. In short, they were not easy.

The maths problems were well integrated into the game situation, so that failing in one question would take you the long way through a number of easier questions which may give you the answer to the harder question. Some really required careful thought, such as calculating the number of hours a princess has been asleep. Others called on computer knowledge, such as a frog who uses hexadecimal (frogs only have four toes).

The game is supplemented with good use of graphics and the occasional musical tune — always very appropriate. It gives you the ability to store your current position in the game and come back to it later.

Only two criticisms could be made. The first is that the scenarios tend to repeat themselves if you are playing badly. The second is that the values used in the maths problems are not generated randomly. Hence playing the game a second time is quite dull as all you need to do is remember the answers you gave the first time. Clearly this was done to ensure the problems always have "sensible" answers, but there are techniques around to randomly generate sensible questions, even involving trigonometry.

Despite these two minuses, the game has been put together quite well and looses very little of its attraction by being educational.

USE OF GRAPHICS : *****
ADDICTIVE QUALITY : *****
RESPONSE TIME : ****
PRESENTATION : ******
VALUE FOR MONEY : *****

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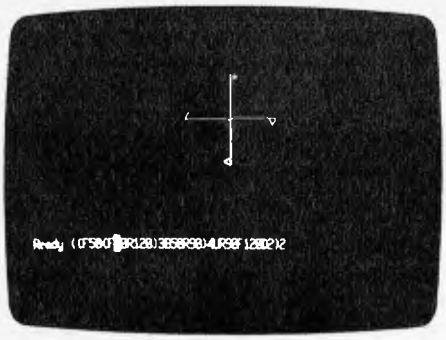


GAME : Turtle
PRICE : $14.95
SUPPLIER : Microworld

Turtle is a MicroBee implementation of a subset of Logo, the well known educational graphics system. It provides all the standard Logo commands, such as Forward, Backward, Pen Up, Pen Down, Left, Right and Clear Screen. It also allows you to define new Logo commands — all of which sounds pretty good on the surface.

The documentation provided with the tape is quite adequate, supplying numerous examples for the beginner. It is also somewhat daunting, admitting that it "sometimes gets confused for no apparent reason". I found this to be correct — Turtle did sometimes become quite irrational and ignore all inputs. Repeated use of the ESC key is required until the program regains its senses.

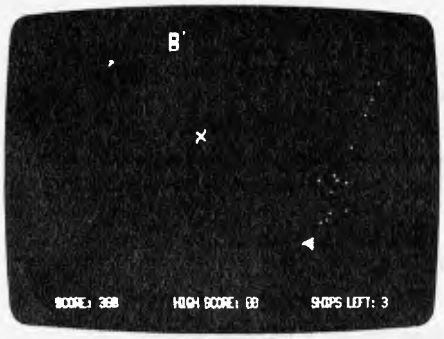
The program contains a number of severe restrictions, such as new commands being nested no more than once, no parameters on new commands and certain standard commands not being allowed in the new commands. Additionally, the user interface is rather inconsistent, for example, backspace is sometimes accessed through the 'backspace' key, sometimes through the 'less than' key, and sometimes doesn't work at all.

Although the tape loads as a machine language file, Turtle is actually a Basic program. This became obvious when it crashed at one point.

The poorest aspects of the program are its unfriendliness and limitations. The whole idea of Logo is that it demonstrates the ability to do complete tasks as a series of simpler tasks — presented in a readily understandable form. To achieve this, it is vital that the new commands are used exactly the same as the standard ones, and this is certainly not the case with Turtle. There are all sorts of complex and context dependant rules on how to call up the new commands you define.

Overall Turtle is a poor implementation of a Logo subset.

USE OF GRAPHICS : ***
ADDICTIVE QUALITY : **
RESPONSE TIME : **
PRESENTATION : ***
VALUE FOR MONEY : **



GAME : Asteriods Plus
PRICE : $22.50
SUPPLIER : Mytek Computing

Asteriods is another old standard in the area of video games, and Mytek's version is a particularly good implementation of it.

The game is played deep in outer space. You are a small triangular space ship positioned in the middle of the screen. Various types of asteriods are drifting towards you and it is your job to destroy them before they collide with you. The ship can be rotated to the left and right by means of the 'greater than' and 'less than' keys. The space bar fires the automatically repeating cannon, and the 'S' key brings up shields which will save you from anything except a black hole. The shields last for only 15 seconds at a time, and you cannot fire through them. The only other control is the 'A' key. This activates your engines and propells you in whatever direction you are facing. This has been implemented extremely well and allows you to set up quite complex vectors.

There are five types of asteriods (the manual refers to them as 'alien ships', which is pretty confusing considering the name of the game) which, when destroyed, give you between 20 and 300 points. Each time you destroy an alien/asteriod it will release a number of smaller ships. These can be destroyed reasonably easily by concentrating your fire for a prolonged period in the general area of the ex-alien. In later rounds, however, these smaller ships will release 'lethal space fish' which try to ram you. Each round finishes when you clear the screen of ships. The first round is relatively tame, as in later rounds you are confronted with space fish, black holes, vicious spirals and a greater number of small ships. All scores are doubled after the first round and there is a 500 point bonus for clearing the screen.

Included also is a demonstration mode and the recording of the top five scores for the session. Asteriods Plus is a pleasure to play and is a "must" for your games library.

USE OF GRAPHICS : *****
ADDICTIVE QUALITY : ***
RESPONSE TIME : ****
PRESENTATION : ***
VALUE FOR MONEY : ****

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GAME : Touch Type Tutor
PRICE : $20.00
SUPPLIER : Mytek Computing

Yes, I know it's not a game, but it is an excellent piece of software and bears a mention.

The tutorial consists of an introduction explaining where you should put your fingers etc, and then launches into a series of exercises after emphasising that you should not look at your fingers. The screen is split into two halves. The top portion contains a picture of the keyboard and lights up whichever key should be pressed next. The bottom half displays the character you have to type with a little pointer sliding along as you type.

The exercises are carefully designed to develop basic finger movement, and you can almost "feel" yourself learning as you go through them. Any attempt to press the wrong key is met with a beep and the appropriate flashes in the top half of the screen. At the end of each set a statistics screen is displayed showing number of characters typed, number of errors, percentage correct and words per minute rate. As a matter of interest, I found that I was able to achieve greater accuracy and higher speed in my old "two finger" mode — but that is a matter of practice. It was during one of my two finger stints that I got the surprise of my life — the damn thing spoke to me! Even without a speech synthesiser a quite understandable "very good!" emanated from the loud-speaker. It had me on the floor in stitches for about five minutes and, of course, the next thing I did was try to make it speak to me again. This sort of thing is not just cosmetic — it is the mark of quality educational software as it makes the student want to continue. This quality is essential in all CAI material to maintain student interest.

Mytek has a number of other CAI modules, all of which match the quality of typing tutor. The machine code tutorial, for example, splits the screen and places its educational text on the bottom half while allowing you to use a monitor in the top half of the screen. To do this, it actually uses smaller characters with more lines on the screen.

Although these CAI modules are not really games, they were more interesting and pleasurable to use than many of the games provided by other suppliers for the MicroBee. They are certainly well worth a look.

USE OF GRAPHICS : ***
ADDICTIVE QUALITY : ****
PRESENTATION : *****
VALUE FOR MONEY : ****

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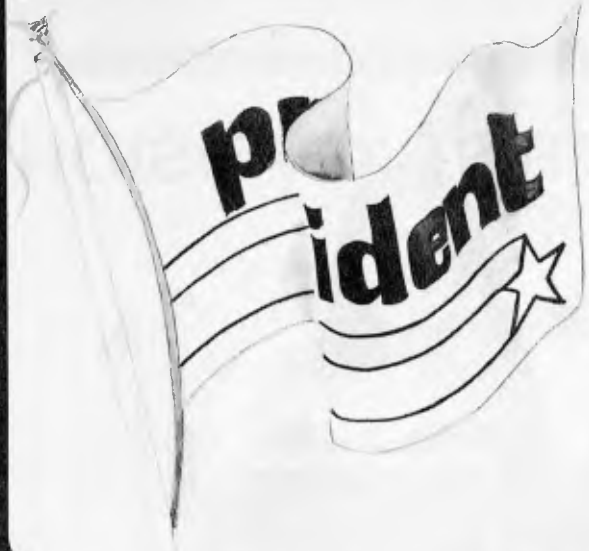

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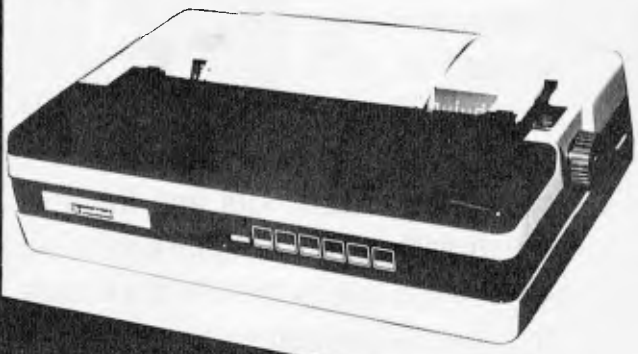

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BANKS' STATEMENT

Are we opting out of the real world into an illusory one? Martin Banks continues his invective against those inviolable invaders from space.

MICRO MACHISMO

Regular readers will be aware by now that I have a considerable suspicion of all video and computer games. I am also aware that such suspicion puts me into the minority.

I did, however, participate in a 'computer games' incident recently that intrigued me. To me it makes an interesting story, so I will bore you with it. After that, we can argue the toss about what it all means... you know, WHAT IT ALL MEANS...

Right, the story.

An acquaintance of mine popped round a couple of months ago to borrow a bottle of scotch or something. What he came for is now irrelevant, for while we sat chatting, he spotted it — a home computer sitting on my desk.

'Ere, wossat?' said my acquaintance (actually he doesn't talk a bit like that but it heightens the dramatic effect, don't you think?). 'That, my good man, is a home computer,' said I (ditto the last brackets).

Being as naturally inquisitive as the next man, he decided to investigate, and soon discovered the ROM cartridge plugged into it carried some mention of a game not totally dissimilar to Space Invaders. 'Cor, lesshavago,' quoth he, and reluctantly I plugged in the joy sticks.

He then proceeded to tell me all about his days at college where he had been, at one time at least, the *de facto* Space Invaders champion of the students' union bar. At the same time he was waggling the joystick and decimating the display, flying saucers and all.

Soon enough he had cleared the first screenful while still on his second rocket launcher or whatever the damned things are called: there was one more to go. His score continued to mount until it was several orders of magnitude greater than anything I had ever achieved in the half dozen times I'd played the game.

Suddenly, disaster struck. From nowhere, a treacherous Invader dropped a couple of sneaky bombs and the war was over. Not only did the televised Fatherland lay pillaged and in waste, but one ego sat before the screen vaguely crumpled and defeated. 'I used to be able to clear two screens every time,' the ego's owner confessed.

As it happened I was soon to be the source of redemption for that bruised and battered ego, for my neighbour insisted that it was now my go: that we were in some way in competition. So I took my turn against the invading hordes and, like many a battle commander before me, got completely wiped out.

Now this prompted quite a significant reaction in my acquaintance. His spirits immediately perked up because I had failed to clear the screen even once. (I must admit here that up until this point I had not even realised it was possible to clear the screen and continue the game, so badly do I play it.) Ego was at once restored, machismo came forth. Beating me at Space Invaders had somehow elevated him to some point where he perceived himself as definably 'better' than me.

Suddenly, disaster struck. From nowhere, a treacherous Invader dropped a couple of sneaky bombs and the war was over. . .

What made it all the more interesting to me was the fact that he was surprised, nay, almost horrified, that I didn't care about either the game or who won. The impression I gained was that I, in some strange way, was less of a. . . dare I say it?. . . man than he for not being good at Space Invaders and, even worse, not being interested in being good at Space Invaders.

Now my acquaintance is a good bit younger than me; he must be to have been able to play Space Invaders at college, so attitudes have changed about what is a good way to demonstrate one's machismo. In my young day it was silly things like drinking competitions and riding round town seven-up in an MGB; all very conventional and middle-class.

The personal computer and the games program seem to be changing all this, for — silly as they might have been (and in practice, as harmless as they were) — those older pastimes were at least real. We actually participated in them, ran the risk of being sick for a week or falling off the side of the car as it careered round a corner. With computer games it would appear that individuals are being removed from contact with reality. It becomes important to show that one is 'better' at unreality than someone else in order to prove that one exists and has a part to play in life.

So much has been written in the past by pundits, experts, genuine thinkers and the like about what the computer/micro-electronic/information technology revolution can offer dear old humanity (even I have made the odd mention of it in the past). Much has been made of how the bad aspects should be watched and controlled, or how the use of machines by unscrupulous individuals and governments could come to dominate the actions, even the thoughts of people. Much has also been made of how the computers can be used to advance knowledge, education and creativity to the point where a kind of Utopia could be made a practical reality.

Now, my own thoughts and aspirations tend to side with the latter school of thought. I cannot help but feel that the personal computer in all its many potential guises (most of which would probably not be seen as a 'computer' at all) is like manna from heaven. Almost as if there *is* a God somewhere that is saying 'OK, you guys have managed to cock up everything else I've tried, let's see what you can do with this gizmo; let's see if you can make this one work to your betterment.'

Even I accept that, in reality, this is a fond dream. I do not accept, however, that the hopes and aspirations that lie behind the dream should not be pursued; that all the goals are unattainable. That some are attainable can be seen now in music, where the 'computer' in the form of the synthesiser *et al* has opened up the possibility for individuals to display and develop their creativity without recourse to ten years or more of hard labour learning an instrument.

...so attitudes have changed about what is a good way to demonstrate one's machismo.

As a musician myself (and a poor one) I personally feel that coming to terms with an instrument is the best way, but I am not so

much of a purist as to condemn those whose urge to create *now* demands that they take whatever route is available to circumvent the drudgery. That, to me, is an excellent use of the computer as a tool, a justifiable means to to an end.

However, I cannot feel the same way about games. In fact, I feel that they achieve — maybe even deliberately achieve — the exact opposite.

Here comes the splendidly elitist point in the argument, for I cannot help but feel that the games programs help to push individuals down to some level of 'lowest common denominator' of intellectual activity or aspiration. It is elitist if only because, as was pointed out to me by an admittedly bitter teacher a couple of years ago, 'waffling on about what good the computer can do for individuals is rubbish. In reality the vast majority are ineducable.'

Bitterness is often an over-reaction to reality, but the essence of the reality exists. . . many people can probably be defined as ineducable; a lowest common denominator approach to dealing with them is probably sensible; the computer game is probably the best way of giving them something to do, something to 'be' in a way that is harmless.

The demonstration of a machismo in being the best blitzer of screen images with other screen images is probably better than exercising it by beating up one's fellow human beings in the flesh.

I can't help feeling that it shouldn't be so, that even the games approach can be used to better advantage, and that the personal computer can add more to human endeavour than it seems to be taking away at present. If that sounds elitist and/or evangelical, so be it.

Otherwise, it is going to be a rotten world we will live in, though most of us will never see it. I'm not sure I will want to. All I'll want is to be locked in my little cell with some nutrient tablets, a computer with speech synthesis and recognition, and a program called Eliza. At least that way I'll get a decent conversation.

END

'Poor Arnold — what he needs is an expansion interface for his brain!'

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Date: / /1983.

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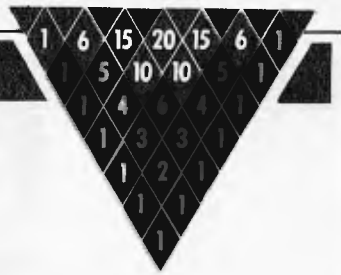
U-SEQUENCES

Mike Mudge muses mathematically.



An increasing sequence of positive integers consists of a list of such integers, separated by commas; it is read in the conventional way from left to right and each number is to be smaller than that which follows it.

This work is concerned with certain non-terminating (or infinite) sequences which will be written $\{u_r\}$ as 'short-hand' for $u_1, u_2, u_3, \ldots$ The first two positive integers u_1 and u_2 will be given and the sequence is to be continued by including only those integers which can be expressed in just one way as the sum of two distinct earlier members of the sequence. Such a sequence is named a U-sequence after Stanislav M Ulam. Details will be given for the fundamental U-sequence defined by $u_1 = 1$ and $u_2 = 2$ although obvious generalisations are possible.

$\{u_r\}$ =
1,2,3,4,6,8,11,13,16,18,26,28,36,38,47,48,53 ...

$u_{100} = 690$, $u_{500} = 5685$, $u_{1000} = 12294$

Questions

Note: These are based upon the work of Bernardo Recamán, American Mathematical Monthly Vol 80 1973.

(i) When is the sum of two consecutive terms of a U-sequence also a member of that sequence?

For the fundamental sequence
$u_1 + u_2 = 1 + 2 = 3 = u^3$
$u^{19} + u^{20} = 62 + 69 = 131 = u_{31}$

(ii) Which positive integers are not the sum of two terms of a given U-sequence?

For the fundamental sequence these include 23,25,33,35,43,45,67,92,94,96.

(iii) Which pairs of consecutive integers are to be found in a given U-sequence?

For the fundamental sequence these include (1,2), (2,3), (3,4), & (47,48).

(iv) Are there arbitrarily large gaps between consecutive terms of a given U-sequence?

Problem

Submit a program which investigates some of the above questions for the U-sequence generated by a prescribed pair of positive integers u_1 and u_2.

In particular, verify the results of P Muller, MSc thesis, University of Buffalo 1966 that up to u_{20000} for the fundamental U-sequence the only four pairs of consecutive terms are those given in (iii) above but that over 60 per cent of consecutive terms differ by precisely 2. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of $25 will be awarded to the 'best' entry received.

Entries, to arrive by 1 August to: Mr M R Mudge C/- *APC*, P.O. Box 298, Clayton 3168.

Note: Submissions will only be returned if suitable stamped addressed envelopes are included.

Lucky numbers winner

The 'best' entry has been chosen as that of K P Leary whose presentation deserves particular commendation both for its content and its appearance, attributed jointly to Tandy Scripsit software and an Anadex WP6000 printer in correspondence mode.

The prize-winning investigation provides further empirical evidence for the Goldbach-type conjecture relating to lucky numbers, also for distribution theorems analogous to those for primes relating to both luckies and twin luckies. At the time of writing, however, analytic proofs of these results seem as remote as they ever were.

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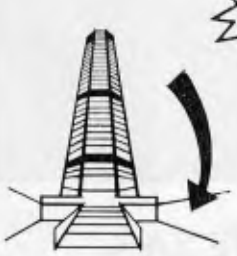
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BLUDNERS

Fallible beings that we are, we admit our culpability for some recent oversights.

In the April issue we apologize for the stir we caused with the PET Billy program. Quite how this error occurred is a mystery both to us and to the author, but somehow two lines went missing from the listing despite appearing on the screen ok. Anyway, the following lines should be added. But before you add these two lines we're extremely embarrassed to have to admit that *these* lines need changes: In both lines, there should be five, not three, spaces after the cursor-control at the beginning of the line, and you should also add five cursor-lefts to the end of each line.

```
1210 DATA"
1290 DATA"
```

Finally, two lines were inadvertently omitted from the Lisp database in this issue. Fig 9 should commence:

```
(DEF MY (YOUR 2
   ((YOUR @ MFBS /
FAMILY) (HOW WELL
DO YOU AND YOUR =
/FAMILY GET ON ?))
```

Meanwhile, we'll carry on striving for perfection. However, it's reassuring to know that you're all keeping on your toes!

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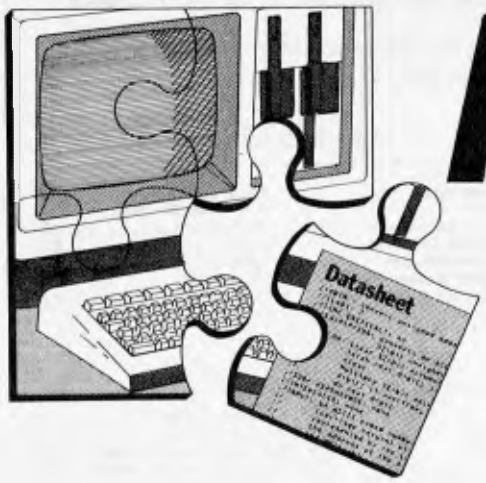

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This is your chance to help build a library of general purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve one already printed or translate the implementations of a good idea from one processor to another. APC will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET, APC, P.O. Box 298, Clayton, Vic 3168.

STANDARDS

It is clear from the letters we get that many of today's Sub-Setters were not around in the pioneering days of *APC*, when Sub Set's standards evolved. It is time then for the documentation standards, in their latest form, to be set out again:

1) The first part of the documentation, marked ";=", is a label and name to identify the routine.

2) The second part, marked ";/", contains a technical description, to enable the routine to be used in a system, without necessarily understanding the code:

Section 1 of the technical description gives the class of the routine. Class 1 routines are re-entrant (usable by a part of the program interrupting another part of the program that was using it), operate correctly wherever they are located in memory, do not alter their own instructions and return unaltered all registers and flags except those declared as being used to pass information to and from the routine. Other routines are class 2.

Section 2 declares whether or not the routine is time criticial.

Section 3 gives a brief description.

Section 4 gives the main actions carried out by the routine.

Section 5 lists any other routines on which the routine depends.

Section 6 gives any input/output interfaces, peripherals or local RAM areas needed.

Section 7 specifies flags, registers, 6502 zero page locations, parameters, stack or other areas assumed to have meaningful values when the routine is called.

Section 8 specifies flags, registers, 6502 zero page locations, and other areas containing results when the routine returns.

Section 9 gives the registers disturbed by use of the routine.

Section 10 gives the maximum number of bytes that could be added to the stack. This includes growth from the routine calling other routines but excludes the two bytes used by the main program call for its return address.

Section 11 gives the number of bytes occupied by the routine.

Section 12 is optional for routines not time critical and gives the exact total or maximum number of time states.

Section 13 gives the processor or processors that will run the machine code.

3) The third part is a complete listing of the routine, with assembler mnemonics, comments and machine code.

Sixteen bytes of zero page RAM are reserved for Sub Set 6502 routines. These are referred to as MO to MF in the documentation and mnemonics and as ZZ in the machine code.

6809 TOKENISED TEXT

People are beginning to ask why Sub Set includes nothing for the 6809 processor used by the Tandy colour computer. The fact is that we cannot publish what we don't receive; but to get the ball rolling Michael Kerry has sent in TOKN. We are prepared to pass on your 6809 Datasheets, untested for the time being, until we can determine the extent of your interest.

Michael Kerry is the first of what might be a new wave of 6809 coders and our first Datasheet this month is his translation of Bruce Tanner's Z80 text expansion routine TOKN (November 82).

In this application, non-ASCII single byte tokens are used to represent common phrases or combinations of letters. Michael uses tokens in the range FFH to 80H, reversing the sequence used by Bruce. To adapt the example given by Bruce, a first token for the letters TH is defined as hexadecimal 54 48 00 (the zero byte terminating the definition); a second for THE as FF 45 00; a third for THEATRE as FE 41 54 52 45 00. The token FF in the definition of THE represents the letters TH and the token FE in the definition of THEATRE represents THE.

'Tokenised' text, ending in a zero byte, consists of ASCII characters and tokens. Using the three tokens defined, the text 'THIS THEATRE IS THE THIRD OF THREE THEATRES' would be tokenised with the hexadecimal bytes:

FF 49 53 20 FD 20 49 53 20 FE 20 FF 49 52 44 20 4F 46 20 FF 52 45 45 20 FD 53 00

'Tokenised' text has had a fascination for me since the time I used Bentley's Second Phase Code to save money on cables in overseas trading. 'Balance — are working; will telegraph later' is a phrase that sticks in my mind from many years ago. Why not think about the most useful phrases or combinations of letters for your text compression needs and send them in?

DATASHEET

```
;= TOKN - Expand tokenised text to ASCII
;/ CLASS:  2 (Does not save CC & A but position independent & re-entrant
;/ TIME CRITICAL?:  No
;/ DESCRIPTION:  Outputs ASCII text, expanding tokens into full text.
;/ ACTION:  Outputs all ASCII characters.  Recursively expands tokens.
;/ SUBr DEPENDENCE:  Subroutine OUTPUT to output the character
;/                     in the A register.
;/ INTERFACES:  1) Memory area holding text and tokens.  Tokens
;/                  are in the range hex FF thru 80 (-1 to -128).
;/              2) Memory area holding un-numbered token definitions,
;/                  each terminated by a null.  The first definition
;/                  corresponds to token hex FF.  Recursive definitions
```

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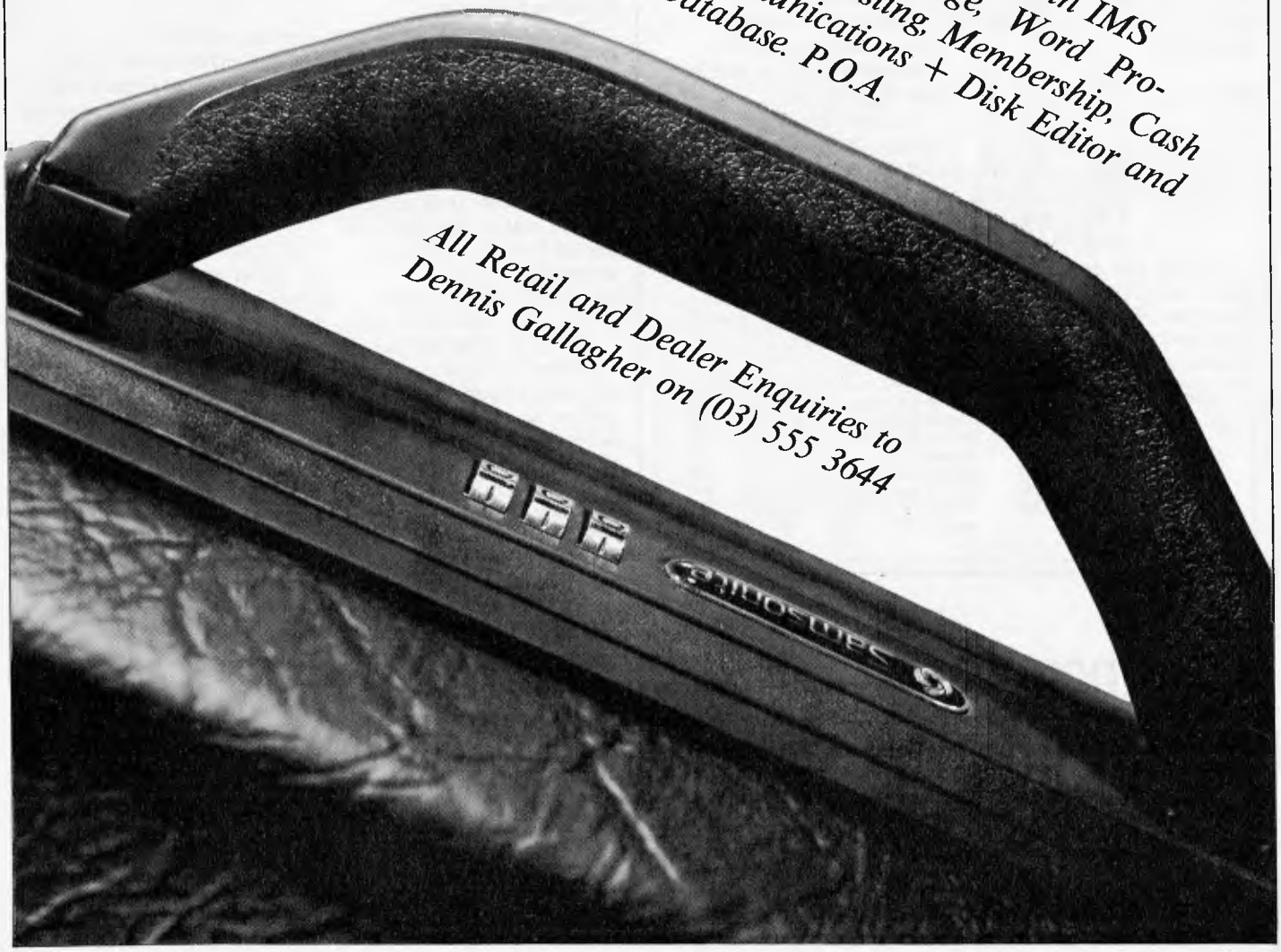


```
;/                    are permitted.
;/ INPUT:  X points to the tokenised text.
;/         Y points to the definitions.
;/ OUTPUT: Expanded text is output via subroutine OUTPUT.
;/ REGs USED:  CC, A, X, Y
;/ STACK USE:  (2+n) bytes, plus (4+n) bytes per level of recursion
;/                when n is the amount used by OUTPUT.
;/ LENGTH:  29
;/ PROCESSOR:  6809

TKN1:  JSR   OUTPUT ;output ASCII byte in A.          BD FA 21
; Entry point is here
TOKN:  LDA   ,X+    ;get source text byte &          A6 80
                    ;point to next.
       BEQ   TKNX   ;exit if null byte.             27 15
       BPL   TKN1   ;token ? - no, output.          2A F7
       PSHS  X      ;save text pointer,             34 10
       TFR   Y,X    ;set text ptr within tokn tabl. 1F 21
TKN2:  INCA         ;count definitions.              4C
       BEQ   TKN4   ;jump when definition found.    27 06
TKN3:  TST   ,X+    ;search for end                  6D 80
       BNE   TKN3   ;of definition.                 26 FC
       BRA   TKN2   ;                               20 F7
TKN4:  BSR   TOKN   ;recurse.                       8D EB
       PULS  X      ;restore text pointer.          35 10
       BRA   TOKN   ;continue.                      20 E7
TKNX:  RTS          ;exit.                          39
```

FOWIAD

Both John Hardman and D Swain have sent the same improvement to the FOWAID routine which appeared in February's Sub Set. This improvement shaves one byte and two T-states off the original, so that it can now be fitted into one of the Z80 restart locations:

```
        EX    (SP),HL
FOWIAD: EX    DE,HL
        EX    (SP),HL
        ADD   HL,DE
        EX    DE,HL
        EX    (SP),HL
        EX    DE,HL
        RET
```

But look closely at the above code. Two different sequences of instructions have been used, both having the effect of an 'EX (SP),DE', using HL as an intermediary. Both sequences are three bytes in length but there is an enormous difference in execution time when EX (SP),HL takes 19 T-states and EX DE,HL only 4 T-states. By using the quicker sequence both times, the execution time of FOWIAD drops from 90 to 75 T-states.

That is just what Peter J H Fox of Luton did in the improved version he sent in (see Fig 1 below).

EX (SP),HL is a 1-byte, 19 T-state, Z80 instruction. EX (SP),IX or IY takes 2 bytes and 23 T-states. 'EX (SP),DE' can be achieved in 3 bytes and 27 T-states. Is there any call for 'EX (SP),BC' or even 'EX (SP),AF'? And how would you do it?

```
FOWIAD: EX    DE,HL   ;disp. to DE, original DE to HL.   EB
        EX    (SP),HL ;original DE to stack, RET to HL.  E3
        EX    DE,HL   ;RET to DE, disp. to HL.           EB
        ADD   HL,DE   ;output in HL.                     19
        EX    DE,HL   ;output to DE,RET to HL.           EB
        EX    (SP),HL ;RET to stack, original DE to HL.  E3
        EX    DE,HL   ;original DE to DE,output to HL.   EB
        RET           ;return                            C9
```

Fig 1

ROOT EXTRACTION

John Kerr has been thinking about, and working on, Steven Weller's fast square root programs (September 82) and the very attractive algorithm they used, with the object of seeing if this might be adapted to other roots. He has discovered that the algorithm can indeed be adapted for any root.

Here is John's account of the square root algorithm, showing how it is adapted for cube roots. You might like to try your hand at producing code from this, before we print John's 16-bit and 32-bit unsigned integer cube root routines for the Z80 next month.

In Mr Weller's algorithm for square root extraction, the input number is shifted left, two bits at a time, into a working accumulator. At some arbitrary stage in the process, the 'virtual input' is that part of the input which has been shifted in and operated upon; call it 'x'. The results of processing, so far, are a partial result 's' for the square root, and a partial remainder 'r' in the working accumulator:
virtual input = x,
partial result = s,
partial remainder = r,
these quantities being related by the equation: $s^2 + r = x$.

After the next round of processing, the virtual input has been augmented by the two-bit number 'y' (the next two bits of the real input). The next, least significant, bit of the result has been found; call it 'd', so the new partial result is 2s+d. The remainder has also changed:
virtual input = 4x + y,
partial result = 2s + d,
partial remainder = q.

So the previous equation now becomes: $(2s+d)^2 + y$. Combine the two equations to eliminate 'x', remembering that as 'd' is a single bit (zero or one), d^2 reduces to d. The result is:
q = 4r+y when d=0, indicating that nothing has been subtracted from the working accumulator; or else,
q = 4r+y - (4s+1) when d=1, ie, the result bit is set.

This shows that the required subtrahend is 4s+1; that is, the *previous* partial result shifted two places left, then incremented.

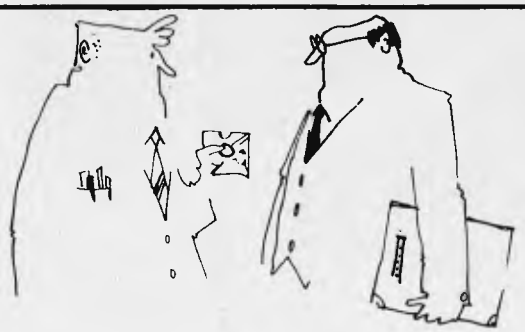
The same analysis can be applied to a hypothetical algorithm for extracting cube roots. It yields the subtrahend value which should be used, if the method is to be sound.

Starting again at some arbitrary point during execution, we have:
virtual input = x,
partial result = c,
partial remainder = r,
this time related by the equation: $c^3 + r = x$.

Now the next *three* bits of the input number are shifted into the working accumulator, giving a new virtual input of 8x+y. After processing, a new result bit 'd' and a new partial remainder have been calculated:
virtual input = 1 + y,
partial result = 2c + d,
partial remainder = q,
and the relevant equation is: $(2c+d)^3 + q = 8x + y$. As before, the two equations are combined to eliminate the unknown 'x', and the result examined assuming d=0, then d+1. The first case (subtraction failed) gives: q = 8r + y. The second gives: q = 8r + y - $(12c^2 + 6c + 1)$.

This does not augur well for the direct method of cubic root extraction; the required subtrahend is an ugly quadratic function of the 'result-so-far', which looks like it will require recalculation, squaring and all, after each round of processing. Luckily, it doesn't; and after a little more algebra, the following algorithm, devoid of full-length multiplication, is obtained.

Clear accumulators for result (Res), subtrahend (Sub) & remainder (Rem). For each group of three input bits:
Shift three bits left into Rem (primary accumulator);
If Rem > Sub,
Then let Rem = Rem - Sub - 1;
  Res = 2*Res + 1;
  Sub=4*Sub + 18*Res.
Else let Res = 2*Res;
  Sub = 4*Sub - 6*Res.
Next group.



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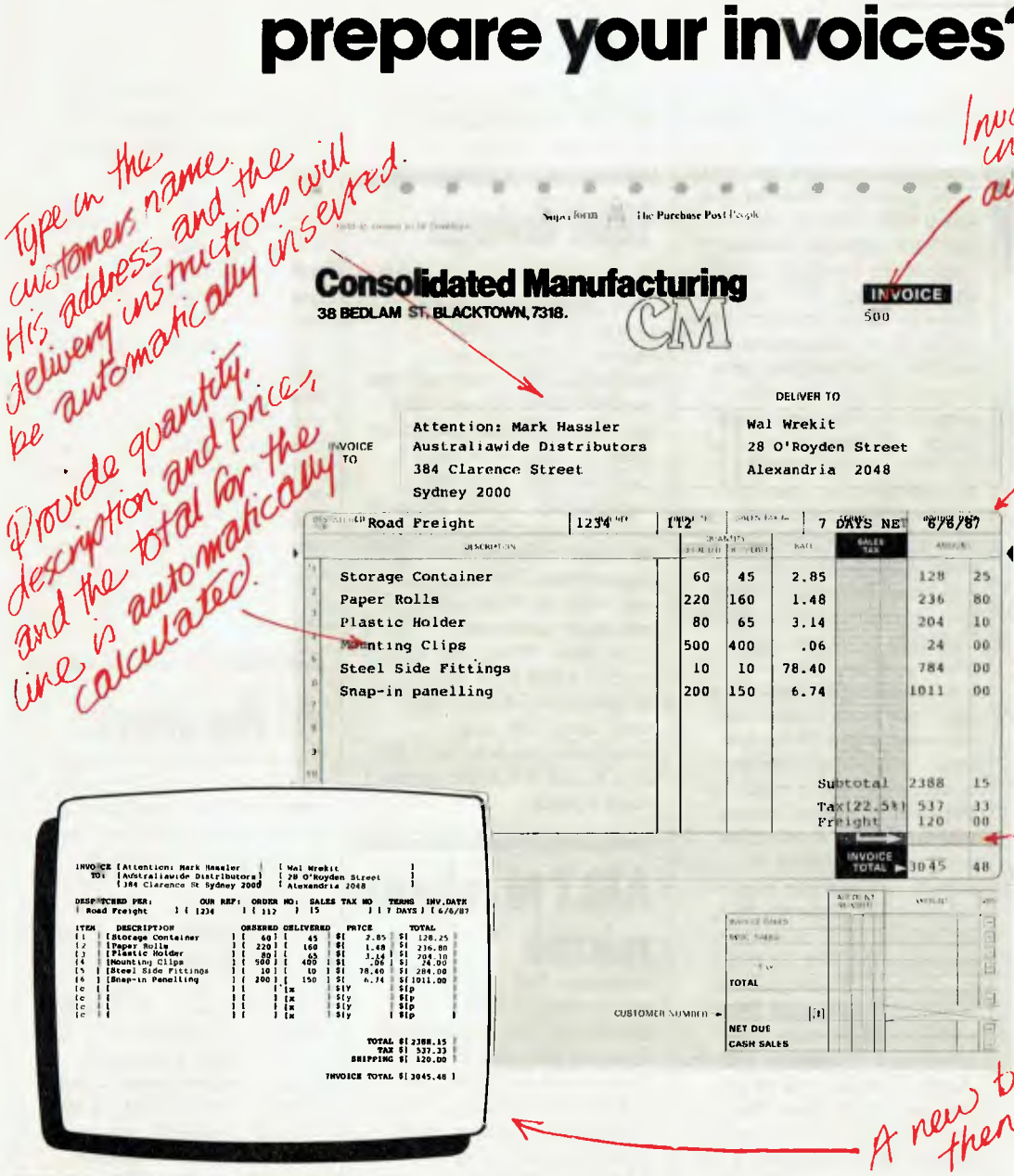

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Sol Libes sends his first dispatch of news and gossip from Stateside.

Random rumours

It seems that Xerox is short of cash and is looking to sell its Shugart Associated disk drive operation . . . Victor Technologies is said to be preparing a portable version of its Victor 9000 . . . Cosmos-Gavilan is apparently about to introduce a portable computer with an 80 x 80 LCD display and a 3.5in disk drive that will fit inside a briefcase. . . Sinclair is thought to be working on a business oriented machine for possible introduction this fall. It is expected to have 128k of RAM, a flat screen, micro disks, to be IBM compatible and sell for about $500. . . There are rumours that IBM plans to alter its version of MS-DOS (they call it PC-DOS) so that it will have unique features and limit compatibility by competitors. . . Digital Research is working on a VMS-like, multi-user, multi-tasking disk operating system for the National 16032 chip. The DOS will not be related to CP/M. A first for DRI. . . There are rumours that now that Microsoft has implemented MS-DOS in the C language it will attempt to bring out versions for the Z80 and 68000. . . Intel is expected to supplement its ROM implementation of CP/M with an implementation of MS-DOS while Digital Equipment Corp is expected to implement its proprietary VMS operating system in ROM. . . Altos Computer Systems is expected to release a new terminal with a built-in Trackball and using the NEC 7220 graphics controller chip. Integrated software, high-intensity software packages to support the terminals will also be produced.

Steve Wozniak, creator of the Apple II, is rumoured to be working independently on a project using a new video graphics display technology which will eliminate most of the video support circuitry. . . It looks like the American National Standards Institute (ANSI) standard for micro-disks is floundering and there will be no standard adopted this year leaving the battle to be fought in the market-place. . . Data General is at last promising to enter the personal computer market later this year with a 32-bit system. . . And Prime Computer is also expected to enter the Personal Computer market with a desktop workstation using either the 8086 or 80186. . . Computer Distributors Inc, Bellevue WA, are rumoured to be ready to introduce the Pick DOS for the IBM PC. The Pick DOS is a business oriented DOS widely used on mini-computers to compete with the Apple Lisa that will be half the price of the Lisa. The units are expected to use the Z8000 16-bit and 6501 8-bit microprocessors. . . The Apple Mackintosh computer is now anticipated for September or October, cost under $2000 and aimed at the school and home markets. Units have reportedly been in the hands of software developers for several months. . . Tandy should shortly introduce the Model IV, replacing the III, with 128k of memory and 24x80 screen. Second will probably be a new colour computer with 64k of RAM and a lower price. And last a portable version of the model III selling for under $1000. . . . Coleco is also expected to introduce a Z80-based micro system this summer.

IBM doings

As of the fourth quarter of last year IBM passed Apple Computer in monthly shipments of personal computers. It is expected that by 1984 IBM PC and IBM-like PCs will have grabbed at least 52 per cent of the $3-5000 personal computer marketplace. . . IBM has also introduced versions of its PC designed to function as replacements for the terminals used with its S/34 and S/38 and large mainframe computers. When used with the S/34 and S/38 the terminal costs $3400 and when used with large mainframes such as the 370s, 30XX and 308X the terminal costs $5800.

AT&T to release micros

American Bell (the independent AT&T subsidiary) has begun quietly to demo their new line of Unix-based micros to other AT&T subsidiaries. They are all high performance, high-priced systems using the MAC-32, 32-bit micro-processor. The systems have networking capability and use the Fortune Systems 16/32 as workstations. DEC and Onyx are also expected to supply system components.

Rent a PC

General Electric ('GE'), one of the largest manufacturers of electronic equipment in the world, has gone into the business of renting personal computers and software to business customers. Initially they will rent IBM PC, Apple and Hewlett Packard equipment and ship through a packaged delivery service. GE believes that this is an excellent way for customers to try various machines and software before buying or needing systems just for special projects.

GE is offering to buy the systems from computer dealers and distributors rather than from the companies themselves. This may cause some problems with violation of dealer contracts. GE indicated that a typical rental for an IBM PC system would be $317 per week or $625 per month with GE maintenance included.

At the shack

Tandy has given up trying to market its Colour Computer outside of its own organisation and admits that it was never able to get this marketing effort off the ground. Last year Tandy had signed up RCA to distribute the system via its distribution network. However, only 60 dealers took the product on — with many later dropping it.

The Colour Computer, which competes against the Commodore VIC-20, TI-99/4A and Atari 400, got caught in the competitive squeeze when Commodore, TI and Atari dropped their prices to under $200. Tandy, which markets the unit via its own distributors as well, refused to drop prices or provide the margins sufficient for these independents to compete (see 'Home Computer Prices Keep Dropping' below).

Tandy is now in a quandary. By limiting its distribution to its own outlets it is losing market share to companies marketing through mass merchandisers such as Sears and K-Mart. The under $200 market place is

YANKEE DOODLES

becoming extremely competitive with very low margins and a great deal of advertising required to yield brand recognition (certainly not the Radio Shack style of doing business). However, by so limiting its distribution it can control selling price and maintain its profit margins. There are rumours that Radio Shack may pull out of the market with the feeling that the competitors are cutting their own throats.

The story on how Tandy came to adopt Microsoft's Xenix as its multi-user disk operating system for the Radio Shack Model 16, 68000/Z80 system is now leaking out. Tandy had introduced the system early last year with its single user TRS-DOS Z80-based DOS and promised to release an unspecified multi-user DOS within three months. The scuttlebut is that Tandy wanted Xenix from Microsoft but Microsoft would not commit to this time schedule. So, Tandy approached some other software houses — including Ryan-McFarland and CRDS — finally entering into an agreement with the latter. Fearful of losing its competitive position in the Unix-based micro DOS market (the way Digital Research lost out to MS-DOS on the IBM PC), Microsoft approached Tandy late last year and offered to deliver Xenix for the Model 16 in three weeks if Tandy would commit to it. Tandy — thinking that Microsoft could never deliver on time — agreed. Microsoft coerced its software engineers into a non-stop three week effort and delivered Xenix on time and ahead of its competitor. Without Tandy adopting Xenix the product would be in second place behind Unisoft's UniPlus in the 68000-based Unix market.

Zilog sues NEC

Zilog has filed suit against NEC Electronics charging that they unlawfully copied the Z80 microprocessor and infringed on patents. They allege that NEC copied the Z80 and related chips and Zilog manuals in manufacturing their PD780 and PD780-1 micro-processors.

Home computer prices keep dropping

There still seems to be a lot of room for price cutting in the home computer market. I recently saw a newspaper ad for the Timex 1000 (Sinclair ZX81) offered by a mass merchandiser for $59.95 with a $15 rebate from Timex, which means that the customer got the unit for $44.95. There is no doubt that the price for this unit will soon go below $40, particularly when offered with software.

And I recently saw a toy store newspaper ad for the Commodore VIC-20 at $84.95. This appears to be a response to the introduction of the Timex 2000 (*née* Sinclair Spectrum) and TI 99/2.

It looks like a repeat of the calculator price wars. Thus we can expect eventually to see the Timex 1000 soon selling for $29.95, and maybe even as low as $9.95 with software. We are already seeing the Timex 1000 being used as a premium give-away to purchasers of cars and major appliances.

IEEE LAN standard close

The proposed IEEE 802.3 standard for Local Area Networking has moved a step nearer adoption with the endorsement by 13 key hardware and software vendors. This proposed standard has moved to the next level of approval by the IEEE microcomputer

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standards committee. From there it goes to the computer standards committee and IEEE standards board for final adoption. If everything goes well we may see it officially adopted by year-end

The standard conforms very closely to the Ethernet LAN as proposed by DEC, Intel and Xerox. This LAN standard is expected to be used by most high performance LAN systems. It should be noted that IBM and AT&T are known to be working on their own LAN systems which do not conform to the proposed standard. Further, the overwhelming majority of LAN systems already installed are of the low and medium performance type where nothing approaching standard exists, and in fact the situation may be termed chaotic.

Unix update

The implementation of Unix on 68000-based micros appears to be split evenly between two different implementations... Xenix from Microsoft, Bellevue WA, and UniPlus+ from Unisoft, Berkeley CA. There are a few vendors who have done their own 68000 ports but it is likely that they will switch to either Xenix or UniPlus+ to achieve some level of compatibility and a wider market base, since there is already some software available for these systems. UniPlus+ was the first port to reach the market and implements the Berkeley version of Unix which accounts for its popularity. Xenix on the other hand is an implementation of the Bell Labs version of Unix and comes from one of the largest micro software houses in operation today (namely Microsoft).

The 8086 and Z8000-based micros appear to be going with Xenix. The only other alternative here is Coherent from Mark Williams Co, Chicago, and they have not been aggressive in getting their product out.

National Semiconductor has already demonstrated their Unix implementation and one done by Human Computing Resources, Toronto, Canada. The initial results do not indicate that this implementation is any faster than the 68000, 8086 and Z8000 implementations despite the claim by National Semiconductor that this micro has been specifically designed to support Unix. The initial demonstrations of the product, however, are still considered prototypes and tuning should improve its performance.

Hot DOS competition

Digital Research and SoftTech Microsystems have both dropped the price of the Disk Operating Systems for the IBM PC. DR's CP/M-86 has been available from IBM for $250 and SM's p-System was $600 while PC-DOS (Microsoft's MS-DOS with minor changes) was offered for only $40. Reportedly, only about three per cent of the PCs have been sold with CP/M-86 and less than one per cent with the p-System. IBM also held up supplying these packages so that PC-DOS had the field to itself for several months giving it another advantage over its competition.

DR therefore decided to take marketing matters into its own hands and market an improved version of CP/M-86 for the PC themselves, and is making it available for only $60. SM and IBM announced that they will make the p-System available for $50 for the run-time system.

Video disk-based games expected

As early as this summer we can expect to see the appearance of the first video disk-based computer games. Using video laser disks these games are expected to appear first in the games arcades with home units to follow within another year or two. One such prototype unit was demonstrated at the Consumer Electronics Show, held last January.

The basic problem of slow access time (it can take as much as ten seconds to move from one frame to another with a typical access time of five seconds) is currently being attacked by developers. One technique proposed is to use two disk players in a game unit. This is feasible since the players are fairly low in cost.

IBM PC News

IBM has released an upgraded version of the PC (called the XT) with a 10Mbyte Seagate hard disk, Zebec controller and larger power supply. IBM took advantage of the chance to also change the printed circuit board to utilise the new 64k RAM chips so that now 64k is the standard minimum RAM size for the PC. Also the number of expansion slots was increased from five to eight and the dual-sided floppy disk capacity was increased from 320k to 360k per drive. IBM also increased the price for the basic unit (less hard disk drive) from $1265 to

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$1355. The unit is $40 less than the Apple IIe and only a few bucks more than the new TI IBM PC compatible system.

IBM also finally started selling the Color CRT display they began showing at Comdex last fall. IBM is also offering its dealers a communications interface which will allow them to interact directly with the factory via phone, by-passing the US mail service. The likelihood is that IBM will soon offer this interface to customers, too.

At the same press conference at which the XT was introduced, IBM also unveiled new models of the 3270 CRT terminals designed for use with the mainframes. One of the models can also function as a stand-alone personal computer.

PCN vs LAN

Manufacturers have been fighting among themselves for several years now to develop a standard for Local Area Networks (LANs) with little progress being made. In the meantime Personal Computer Networks (PCNs) have moved into the market. The PCN interconnects a small number of personal computers allowing them to transfer data and share peripherals such as high-speed printers and large capacity hard disks. When a personal computer is used as part of a PCN it is referred to as a 'workstation'.

Although of lower performance than the LANs, the PCNs are now threatening to overshadow the marketplace. Strategic Inc, San Jose CA, a market research firm, estimates that nearly 12,000 PCNs were installed up through the end of last year — compared to only 800 baseband and broadband LANs. Further, it predicts that by the end of 1987 there will be 110,000 PCNs.

This trend is apparently due to the fact that most installations include only a small number of workstations (typically six or less), use lower data transfer rates and have less traffic, and hence high performance is not required. Also, some PCN makers offer interfaces to allow the PCN to serve as a gateway into an LAN. The problem with PCNs are that there is no established standard and interfacing different peripherals may be a problem.

Low cost PCNs ($300-500/station) typically use either twisted wire pairs or coaxial cable to interconnect devices transmitting data at anywhere from 800k to 2.5 Mbits per second (bps). A single personal computer or special interfaces may be used. In higher performance, higher cost (typically $2000/station) PCNs coaxial cable is used with controller/transceivers at each station.

Hard disk drives shrink

The portable and desktop computer markets are increasing the need for smaller disk drives. Hard disk makers are now striving to reduce the size of the five and ten Megabyte hard disk drives to match the size of the new micro-floppies. The problem is that no standard form factor has yet emerged for these drives. Further, there is no agreement on media size, total drive package size, interface, transfer rate and recording format. The result is that, although the demand is there, the manufacturers are floundering trying to figure out which way to go. It is likely that manufacturers will use the ST506 interface used on 5.25 inch drives as the standard interface with the same transfer rate.

Seagate has already committed to building a 3.25 inch micro-floppy and will probably have the same size in their micro winchester while Tandon and Shugart are committed to the 3.5 inch size. Syquest Technology, the only vendor currently shipping micro winchesters, is using 3.9in media.

Japan in US market

Nippon Electric (NEC), a $6 billion a year company which dominates Japan's personal computer market, entered the US over two years ago with a modes marketing effort. They now claim to hold three per cent of the 16-bit micro market, which is roughly 20 per cent of IBM's share and close to 30 per cent of DECs share. Sony and Epson also entered the US markets last year with 8-bit and portable machines.

Japan has proved that it can build good machines and is committed to long term investments in establishing its position in the marketplace. However, it has met with problems. The rapid pace of change and the innovations introduced by American competitors have proved a formidable challenge to the Japanese whose products are generally unimpressive.

However, it was only two years ago that US IC memory and printer makers were boasting that they would outmanoeuvre and outproduce the Japanese. However, manufacturing and quality control problems in these two markets created opportunities for the Japanese. Using conservative technology and improved manufacturing techniques they now dominate these markets. The Japanese are now attacking the floppy disk and hard disk markets with the same techni-

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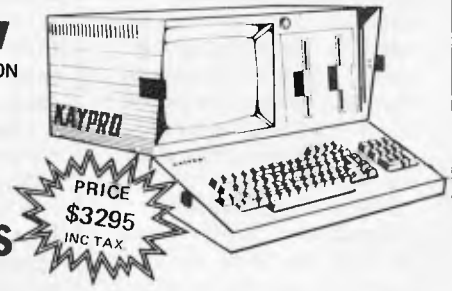

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ques. It is likely that they will attack the segment of the personal computer market that is less innovative and use older technology with success. For example, a portable 8-bit microcomputer, such as the Osborne, is an ideal candidate for Japanese competition.

Super-microprocessors — a status report

National Semiconductor demonstrated its 16032 system recently at a Unix conference running a port of Unix done by Human Computing Resources Corp, Toronto. Further, it has been accepting orders for the chip set promising production quantities this summer. The company has been shipping sample quantities for several months. Thus we can expect to see initial shipments of 16032-based systems before the end of the year.

NS is expected to start shipping their 'Mesa' system this fall. The Mesa, an 8-user system, is expected to contain the 16082 memory management unit with a 32-bit wide virtual memory. NS is promising to start sampling its floating point co-processor chip this month.

The 16032 is reported to be really a 32-bit processor with 16-bit I/O. The 32032, which NS says it will begin sampling in the fourth quarter of this year, is reported to be an upgrade of the 16032 with true 32-bit I/O. Further, NS claims that it will be possible to build a fault-tolerant transaction system by running two 32032s in parallel and comparing results on alternate memory cycles to detect soft errors. NS says the 32032 will be 1.8 times faster than the 16032.

The Motorola 68000 although doing many operations — 32-bits at a time — has an internal 16-bit wide data path and hence the redesign task to move up to a 32-bit version (68020) is a more difficult undertaking for Motorola vis-a-vis National. The 68020 is being promised for April '84 (samples) and August '84 (production). This will be Motorola's true 32-bit micro operating at 16Mhz. It will do 32-bit multiply/divide. The device will use 150,000 transistors, consume 1.5 watts and have approximately 100 pins.

The Motorola 68881 floating point co-processor production schedule has slipped and Motorola is now promising samples in July '84 and production quantities in December '84. It will contain eight 80-bit registers, have all the addressing modes of 68020, be compatible with the IEEE floating point standard plus some additional functions.

The Motorola 68010, its 16-bit micro with virtual memory facilities, is now being sampled and production is expected this summer. The maximum clock speed will be 16Mhz.

A crimp was thrown into Intel's 286 project and 32-bit upgrade when a large group of engineers upped and left their Portland OR operation to form a Unix systems house based on Intel's technology. However, Intel is already shipping limited production quantities of the 80286.

The NS 16032 will compete with the Motorola 68010 while the 32032 will compete with the Motorola 68020. Samples of both the 16032 and 68010 became available at about the same time with NS promising earlier production quantities. It appears that NS may be sampling and producing the 32032 well ahead of Motorola's 68202. Thus although National was very late entering the super-micro marketplace it appears that it now has a good opportunity of garnering enough to be worthwhile.

Further, Digital Equipment Corporation is rumoured to have given its 'VAX-on-a-chip' program top priority and NCR is expected shortly to start sampling its 32-bit chip set to external customers. It is also likely that Western Electric may soon start selling its Bellmac 32 chip set to external customers.

Intel is expected to bring out a new 32-bit micro that is upward code-compatible with its 8086 processor. It is expected in the second half of next year and is tentatively called the 80386.

One last note is that the new 32-bit micros are expected to be implemented in CMOS to reduce the power consumption and heat dissipation of these devices.

Home computer price wars

TI and Commodore are going through a new round of price cuts for the home computer — an action that Tandy has called 'cut-throat'. Both companies slashed $50 from the price of their already 'slashed' prices for the TI 99/4 and Commodore VIC-20 bringing selling prices down to the $130 level.

Atari, in an attempt to be competitive, introduced an 'under $90' keyboard add-on for their 2600 video game system to convert it into a low-cost 'home computer'. This has been seen as a defensive move since the low-cost personal computer appears seriously to have impacted the sales of video game units. Atari also recently introduced a $55 rebate for the Model 400 to effectively lower its price to just under $200. TI and Commodore broke the $200 barrier five months previously.

TI recently introduced its 99/2 computer with a dealer cost of $75. Tandy is expected to introduce a new lower cost colour computer to replace their current unit which has a $299 price tag. There are rumours that the unit, made in Korea and costing $150, should appear soon.

Atari, in an attempt to reduce manufacturing costs, laid off 1700 workers and shifted a large part of its video games and personal computer manufacturing to the Far East.

Offshore manufacturing

American microcomputer and component manufacturers are moving their manufacturing facilities outside the US to maintain their competitive positions in a marketplace that is becoming increasingly more price competitive. They are setting up plants in Taiwan, Singapore, India, Mexico, Puerto Rico, Brazil and France.

The auto computer

At a recent automobile show in New York City, Ford showed a prototype car called the Concept 100 that is slated for introduction next year. Among other features it sported a touch-sensitive 5 inch CRT built in to the dash and a Z80 CPU. General Motors showed a prototype of its 1995 Buick Queston with a flat screen built into its dashboard.

Where is the iAPX432?

It is over two years now since Intel introduced its iAPX432 32-bit microprocessor chip set and as yet no commercial product has been introduced using it.

Many of the pioneering users who started product development projects using the 432 have since cancelled the projects or put them on hold due to performance limitations which have shown up with the

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YANKEE DOODLES

432. First of all Intel was a year late in delivering samples and then some users claimed that the samples delivered operated at only 20 per cent of their rated speed.

Further, the unique architecture of the 432 meant that companies were starting from ground zero in software development, and software development tools and support chips have been slow in becoming available. The complex architecture also means that the software development task is more complex and more expensive and few companies have been willing to make the investment.

Intel is currently starting production on the third revision of the 432 chip set which it hopes will finally meet Intel's original performance claims. Also, the bus interface and memory control ICs are expected finally to become available and we will soon see 432-based systems being introduced.

Intel text co-processor chip

Intel has announced an IC (82730), to operate in conjunction with its 8086 16-bit micro, that provides word-processing display functions such as proportional character spacing, smooth scroll, display of superscripts and subscripts, variable fonts, allows users to define their own character sets and provides complete correspondence between display and printed copy. The unit can also be used in conjunction with Intel's new 82720 graphics co-processor allowing mixing of text and graphics on the screen. IC samples are now being supplied to OEMs and production is expected this fall.

No business like show business!

The Comdex Fall Computer Show now claims to be the fastest growing show (of any kind) in the country. Its last show exhibit space almost doubled and attendance increased by a whopping 125 per cent. The only larger computer show is NCC (National Computer Conference). NCC and Comdex Fall are so large that there are few convention facilities that can handle them. The Las Vegas Convention Center, believed to be the largest single-floor hall in the country, is already too small for the next Comdex show and it is spilling over into two other hotels.

Who sells micros?

Future Computing Inc, a Texas marketing research firm, claims that this year computer stores will sell $3.5 billion worth of micro-computers, while $900 million will be sold by systems houses, $600 million by mail order, $500 million by office-products suppliers and lastly $500 million by industrial distributors.

Quotation of the Month

'I am not an Atari Democrat.' Alan Cranston, announced candidate for President. END

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Hardware

The Z80 Card

The Z80 card comprises of a Z80 processor, 64K RAM (giving a total of 96K), and 16K ROM containing the TORCH CPN operating system. All peripherals are handled by the 6502 operating simultaneously in parallel with Z80 giving faster more efficient computing power.

Dual discs

The dual discs are easily connected to the BBC micro via the "TUBE" and disc interface sockets. The disc pack contains two 400K disc drives each capable of holding up to 250 files. Disc performance is greatly enhanced by the 6502 peripheral processor which catches complete disc tracks and information, speeding up file access considerably.

Graphics Facilities

All screen graphics and character displays are accessbile by sending characters to the screen. Characters are easily re-defined. Graphics and text may be mixed freely anywhere on the screen. Colours can be changed after each operation and separate bit planes may be defined for use in high speed animation.

Utilities

A number of utilities are provided with the disc pack including a number of demonstration programs.

Software

The TORCH discpack operating system is called CPN (Control Program Nucleus) and appears *identical to CP/M* when running application programs. Because both the operating system and the 20K of screen RAM reside in the 6502's memory area nearly 63K of user RAM is available; a considerable improvement on conventional CP/M systems.

CPN also gives access to the advanced sound, speech and peripheral capabilities of the BBC machine, and has modes to allow the tracing of inter processor commands.

The operating system resides in 16K of ROM and loads directly into memory, so no disc tracks are required. This allows the system to be re-booted in less than a second.

CPN configured software has already been locally produced for the following — Mars Sapphire (with full graphics facilities), Compas Pascal and Micropro packages:

- Wordstar • Mail Merge
- Spellstar • Calcstar • Datastar
- Supersort I • Supersort II
- Infostar

TORCH Z80 Disk pack includes installation in your Model "B" BBC, test, programmer manual, user guide, utilities disk and twin disk drives (800K).

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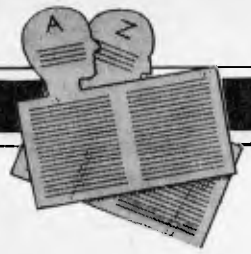

USER GROUPS INDEX

DIRECT ACCESS

Below is a complete list of user groups known to us in Australia and New Zealand. Users Groups' Secretaries are asked to provide us with alterations, additions and corrections as promptly as possible to avoid a longer than necessary delay before publication. During the next four months, these changes will be published and the next complete listing will appear in the December '83 issue of APC.

VICTORIA

MICOM
The MicroComputer Club of Melbourne is a club catering for a wide range of computers and interests. MICOM can be contacted by writing to P.O. Box 60, Canterbury 3126. The Club meets on the third Saturday of each month at the Burwood State College on Burwood Highway from 2 to 5pm.

CPMUG
The CP/M User Group of Melbourne is a special interest group of MICOM for CP/M users. CPMUG meets at 8pm on the fourth Tuesday of each month at Hawthorn Community House, 39 William Street, Hawthorn. Further enquiries may be directed to MICOM.

PEACH USER GROUP OF MELBOURNE
A special interest group of MICOM for Hitachi Peach users. The group meets at 8pm on the first Friday of each month at the Templestowe Technical College, Cypress Avenue, Templestowe and also at MICOM meetings. Enquiries, MICOM or Greg Hudson on (03) 429 3216 (decent hours only).

GEELONG COMPUTER CLUB
Write to Geelong Computer Club, P.O. Box 6, Geelong 3220.

KAOS
Contact Ian Eyles, 10 Forbes Street, Essendon 3040. Tel: (03) 375 3478 (AH).

SHARP COMPUTER USERS ASSOCIATION
Meetings are at the Burwood Heights High School, Mahoneys Road, East Burwood, Victoria on the second Friday of each month of the school year. The Association is a non-profit organisation with its main interest, at the moment, the PC1500/Tandy PC2 but the owner of any Sharp Computer is welcome to attend meetings.

BENDIGO VIC-20 COMPUTER USERS GROUP
The first meeting of the group was held on the 25th of March in the library of the Bendigo Technical College, Macrae Street, Bendigo. The meeting resolved to meet every fourth Friday of the month in the library at 8.00pm. Office bearers were to be elected at the April meeting. For further details contact the Acting Secretary, Mr Bob Lukeis, 5 Board Court, Kangaroo Flat, Vic 3555 or telephone (054) 477 593.

FORTH INTEREST GROUP — AUSTRALIA
This club is the Australian chapter of the international FORTH Interest Group. Meetings are held on the first Friday of each month at 8pm. Contact the secretary on (03) 29 2600 or write to P.O. Box 103, Camberwell 3124 for more information and a catalogue of FORTH books and software. To obtain a monthly newsletter from the Australian FORTH Interest Group (a separate organisation) send $10 to Ricchie Laird at 25 Gibsons Road, Sale, Vic 3850.

EASTERN SUBURBS 80 USERS GROUP
The group meets on the fourth Wednesday of each month (except August) at Kingswood College, 355 Station Street, Box Hill 3128. Starting time is 7pm. For more information telephone Cameron McKern on (03) 288 1713 (AH) or via MCCKCH ESSURR on The Australian Beginning.

PENINSULA GROUP
This group meets at State College, Frankston on the second Thursday of each month except during January. Those interested should contact M.G. Thompson on (03) 772 2674.

MICROBEE USERS GROUP
Meets on the second Wednesday of each month at the Burwood Teachers College, Building E. Further information, contact Grant Forest on (03) 879 2257 or write to 10 Sunbeam Avenue, Ringwood East 3135.

COMPUCOLOR USER GROUP
Meetings are held on the 2nd Wednesday of every month at Panatronics, 691 Whitehorse Road, Mont Albert. For further information contact Neil Brandy on (03) 890 0579.

AUSOM
Apple Users' Society of Melbourne can be contacted by writing to AUSOM, P.O. Box 43, Forest Hill 3131.

Z.S.E.
ZX81 users can now contact the ZX81 Software Exchange by sending a S.A.E. to Z.S.E., C/- Chris Tueno, 5 Muir Street, Mt Waverley 3149.

S.M.U.G.
To find out more about this group of SORD M100 users contact Mr Robin Miller, 60 Winmalee Drive, Glen Waverley, 3150.

CCC
The Color Computer Club meets every Friday fortnight in Geelong. It has a program library and produces a monthly newsletter and more details can be obtained from A. Gay, 3 Quamby Avenue, North Geelong 3215. Telephone: (052) 78 3424.

S.C.U.A,
Sorcerer Computer Users (Australia). Further details can be obtained from the Secretary, S.C.U.A., P.O. Box 144, Doncaster 3108.

VIC 20 MELBOURNE USER GROUP
Meetings are held on the 3rd Wednesday of every month at Panatronics, 691 Whitehorse Road, Mont Albert. For fuirther information contact Neil Brandy on (03) 890 0579. Please 'Bring a Chair'.

THE NORTHERN AND WESTERN SUBURBS COMPUTER USERS GROUP
Meetings are held at CP/M Data Systems, 284 Union Road, Moonee Ponds, every second Thursday at 7pm. Anyone interested can contact David Coupe on (03) 370 9590 or Clive Budd on (03) 370 2917.

NSZXUG
The group caters for ZX80 (8k and 4k ROM), ZX81 and the Spectrum machines. Also produced is a small range of quality software and hardware for these micros. A catalogue of these items and membership details are included with the free introductory issue. Interested parties can obtain the newsletter by sending a 27 cent stamp to P.O. Box 148, Glen Waverley, Vic 3150.

BALLARAT COMPUTER USERS GROUP
Membership is $5.00 per annum to cover postage of newsletter. Meetings on the first Thursday of each month at the Hopetoun Street Community Education Centre in Ballarat. Interested persons can contact the Publicity Officer, John Preston on (053) 31 4363.

M.A.C.E.
Melbourne Atari Computer Enthusiasts (M.A.C.E.) has over one hundred members spread over Australia and publishes a monthly newsletter called the Australian Atari Gazette. Meetings are held on the first Sunday of each month at midday at 3M Australia, cnr of Blackburn and Ferntree Gully Roads, Melbourne. Contact MACE, P.O. Box 246, Northcote, Vic or phone (03) 481 2215.

A note from Kelvin Eldridge: "If you own an Atari 400 or 800 computer then contact me for information on the two Atari user groups that exist in Melbourne. Kelvin Eldridge, P.O. Box 173, Reservoir 3073. Telephone: (03) 470 5027 (AH)." *Why didn't he just tell us who they are?*

NEW SOUTH WALES

COMMODORE USER GROUP
For more details contact Mr John Guidice, C/- The Commodore Users Group, G.P.O. Box 4721, Sydney 2001.

USER GROUPS INDEX

AUSTRALASIA ZX80 USERS GROUP
Anyone interested in the ZX80 may contact Tony Mowbray, 87 Murphys Avenue, Kieraville, 2500. Phone: (042) 28 5296.

MICROBEE USER GROUP
The Albury/Wodonga District Microbee User Group can be contacted at 202 Koobe Street, Albury 2640. Phone: (060) 25 1601 and ask for Eric Eulenstein.

NEWCASTLE 80 MICRO USERS GROUP (NMUG)
Meetings are on the last Wednesday of each month at the hall on the corner of Fowler and Ogden Streets, Hamilton South, NSW. Contact, Dennis Jackson on (049) 68 1910.

AUSBORNE USER GROUP
The Sydney based Osborne user group publishes a monthly news-letter and has an 80 diskette library available to members containing utilities, games, application programs, system patches, etc. For further information contact Ian MacCulloch on AH (02) 81 1908 or write to P.O. Box C530, Clarence Street, Sydney 2000.

HUGAM
The Hunter Users Group — All Microcomputers — meets at the University of Newcastle, Room W308 of the Education building on the second Wednesday night of each month at 7.30pm. The group produces a newsletter and further information can be obtained from The Secretary HUGAM, P.O. Box 39, Broadmeadow 2292.

80AT
Mail enquiries to 80AT, C/-Planet 3 Systems, 47 Birch Street, Bankstown 2200.

SYDNEY PEACH USER GROUP
The contact address is 261 Northumberland Street, Liverpool 2170 or, for more information telephone Ben Sharifon (02) 707 2466 (BH), (02) 36 4825 (AH) or Esther on (02) 601 8493 (BH).

PEACH USER CLUB
The New South Wales Peach User Club holds weekly meetings on Saturday at 2pm at Cybernetics Research, 120-122 Lawson Street, Redfern. The Club offers memberships at $10 for a six month period which entitles members to newsletters, access to the Club software and technical library, and technical advice.

MEGS
The Microcomputer Enthusiasts Group meets on the third Monday of each month at the Wireless Institute Australia Hall, 14 Atchison Street, St Leonards at 7pm.

FORTH GROUP
On the 25th of March the Sydney Forth Group was established. The Group will meet on the second Friday of the month at 7pm in Room LG16, Morven Brown Building, University of New South Wales. For further information contact Peter Tregeagle, 10 Binda Road, Yowie Bay 2228. Telephone: (02) 524 7490.

WOLLONGONG COMPUTER CLUB
For more information call Paul Janson, 14 Hoyward Street, Kanahooka 2530 on 61 5451.

TI-99/4 HOME COMPUTER USER GROUP
Contact Brian Lewis, P.O. Box 149, Pennant Hills, NSW 2120. Telephone: John (Secretary) (02) 848 0956.

MACARTHUR COMPUTER USERS ASSOCIATION
This group has been formed for members of the Campbelltown and surrounding communities who are interested in computing whether on micros, minis or mainframes. They meet on the first Monday of each month. The President is Mr C Wylie, 85 O'Sullivan Road, Leumeah 2560. Telephone: (46) 26 1625.

THE BLUE MOUNTAIN COMPUTER CLUB
Meetings are held at the Springwood Civic Centre on the last Friday of each month at 7.30pm. For further details contact Eric Lindsay, 6 Hill Crest Avenue, Gaulconbridge. Telephone: (047) 511 044 (BH) or Greg Baulman on (02) 648 5342.

ILLAWARRA SUPER 80 USERS GROUP
The group was formed in January of last year and meets on the first Monday of each month commencing at 5.30pm at the Australian Offices, 86 Market Street, Wollongong. The postal address of the group is P.O. Box 1775, Wollongong 2500.

APPLE USERS GROUP
The A.U.G. meets at the Sydney Grammar School Science Auditorium on the second Monday of every month at 6.30pm. The group maintains an expanding software library on disk and publishes a monthly newsletter called 'Apple-cations'. Further enquiries to A.U.G. (Sydney) P.O. Box 505, Bankstown, NSW 2200 or to the Secretary, Colin Rutherford on (02) 520 0926.

NORTHSIDE MICROBEE USERS GROUP
Meetings are held on the third Saturday of each month at the McMahons Point Community Centre in Blues Point Road, North Sydney from 1 to 5pm. The President is Colin Tringham of 6 Tunks Street, Waverton 2060, telephone 92 6408 and the Secretary is Tony Williams, 3/125 Kurraba Road, Neutral Bay 2089, telephone 909 3951.

QUEENSLAND

QUEENSLAND SORCERER USER GROUP (QSUG)
Meetings are held on the last Sunday of each month at the Queensland University. Annual membership fee if $10. For more information contact G. Snell on (04) 205 1017.

ASUG
Stephen Page has founded a national Sirius (Victor 9000) user group with free membership. Write to the Australian Sirius Users' Group, P.O. Box 204, Chermside 4032 or ring (07) 350 2611 for a membership application form.

TI-99/4 USER GROUP
Contact P.O. Box 396, Nundah 4012. Telephone: 263 4989 or 263 6161.

BRISBANE YOUTH COMPUTER GROUP
Mr A Harrison, P.O. Box 396, Sunnybank 4109 should be contacted for more information.

IREE MICROCOMPUTER INTEREST GROUP
Details on club membership etc may be obtained from the Secretary N. Wilson, P.O. Box 81, Albion 4010. Telephone: 356 6176.

APPLE-Q
User Group days are held every third Sunday of the month (December excluded) at the Hooper Education Centre, Kuran Street, Wavell Heights. The Centre is open from 8.30am until 4.30pm and members are encouraged to bring their Apple along. Bar-B-Que facilities are also available for members staying all day.

Those interested in becoming members of Apple-Q should forward $18.00 subscription fee to the Secretary, Apple-Q The Brisbane User Group, P.O. Box 721, South Brisbane, Qld 4101.

Apple-Q is affiliated with Apple Core.

COMPUTER OWNERS GROUP (COG)
Formed for people on the northern side of Brisbane, CIG has an emphasis on computer use and programming, rather than on electronics. The group produces a small monthly news-letter called "Cog 'n' Speil" and meets on the second Wednesday of each month. For more information telephone Betty Adcock on (07) 263 4268.

OHIO SUPERBOARD USER GROUP
For membership and newsletter information, please send a large S.A.E. to Ed Richardson, 146 York Street, Nunday 4012.

COMMODORE COMPUTER USERS GROUP OF QUEENSLAND
Meets on the first Tuesday of each month at Construction House, 130 Petrie Terrace, Brisbane at 7.30pm. For further information call Bill Brown on (07) 349 6612 or write to P.O. Box 274, Springwood 4127.

HITACHI MB6890 ("Peach") and MB16000 ("Success") USERS GROUP
Anyone interested please contact Mark or Jeanene Howard at 56 Peter Street, Strathpine, Queensland 4500. Telephone: (07) 205 4729.

SOUTH AUSTRALIA

TRS-80 USERS GROUP
To obtain details contact Mr G. Stevenson of 36 Sturt Street, Adelaide 5000.

BEEBNET
An Australian BBC and Econet Users Group has been formed which is looking for new members and software producers or distributors who would be interested in serving

USER GROUPS INDEX

their market. All correspondence should be sent to Beebnet, P.O. Box 262, Kingswood 5062.

S.A.A.U.C.
Contact the Secretary, S.A.A.U.C., C/- The Bookshelf, 169 Pirie Street, Adelaide 5000.

COMMODORE COMPUTER USERS ASSOCIATION OF S.A.
This group meets at 7.30pm on the first Tuesday of each month at the Adelaide University Union Building. Further information is available from Earle Rowan, Commodore Computer Users' Association of S.A., P.O. Box 60, Clarence Gardens 5039.

COMMODORE VIC COMPUTER USERS ASSOCIATION
The club meets monthly and can be contacted at 13 Miranda Road, Paralowie 5108 Attention: Eddie Hann, Secretary.

SORCERER USER GROUP OF SA (SUGSA)
Contact Brian Richards, Secretary, SUGSA, P.O. Box 647, Salisbury 5108. Meetings are held on the second Wednesday of every month on the first floor of the Commodities Exchange Building, 123 Pirie Street, Adelaide.

S.A.M.G.
The South Australian Microprocessor Group meets at the Thebarton High School in Ashley Street. Contact can be made through P.O. Box 113, Plymouth, S.A. 5038 or by phoning (08) 278 7288.

TI-99/4 USER GROUP
Contact Ray Mountford, 7 Baker Street, Enfield, S.A. 5085. Telephone: (08) 260 6587.

TASMANIA

DEVONPORT COMPUTER INTEREST GROUP
For information contact John Stevenson, RSD 422, Sheffield 7306 or telephone (004) 92 3237.

TASMANIA APPLE USERS CLUB.
Meetings are held on the 3rd Tuesday of each month at various locations. New members are most welcome and enquiries may be made to Ray Williams, President/Secretary, P.O. Box 188, North Hobart, 7002. Tel: (002) 34 1271.

TEMOS
All enquiries are welcome and may be directed to John Stephenson, President, 4 Melinga Place, Taroona 7000. Telephone: 27 8770.

TI-99/4 USER GROUP
Contact Andrew Zagni, 161 Carella Street, Howrah, Tas 7018. Telephone: (002) 47 8738.

WESTERN AUSTRALIA

OSWEST
The Osborne Users Group of Western Australia. Get details from Richard Eddy, 28 Lawlor Road, Attadale 6156. Telephone: 330 3439.

A.C.T.

MICSIG
Contact the Registrar, MICSIG, C/- P.O. Box 446, Canberra City 2601.

CANBERRA MICRO-80 USERS GROUP
For all owners and users of Z80-based computers. Exchange of programs and ideas; advice for beginners and enthusiasts. Meetings each month on the third Thursday. Contact Bill Cushing, Urambi Village, Crozier Circuit Kambah 2902. Telephone: (062) 31 6399.

BBC USERS GROUP OF CANBERRA (BUCG)
Meets on the last Wednesday of each month and welcomes all interested in the BBC Computer. Membership is free and details may be obtained from Steve MacLeod (062) 58 7719 or John Toms (062) 58 4052.

ACTAPPLE
This Apple user group meets on the second Thursday of each month. For more information contact Jeff Brock, Secretary/Editor, P.O. Box 1231, Canberra City 2601.

AUSTRALIAN ZX80 USERS ASSOCIATION
Contact can be made with the editor of the Club magazine, David Brudenall, 19 Godfrey Street, Campbell, ACT 2601.

SORCERER COMPUTER USERS OF AUSTRALIA (ACT BRANCH)
Interested persons may contact Mr G. T. Dick, 31 Creswell Street, Campbell, ACT 2601. Tel: (062) 48 7793 for details of membership and information on forthcoming activities.

NORTHERN TERRITORY

DBUG
The Darwin MicroBee Users Group can be contacted by telephoning Felion Molina on 82 5613 (BH) or 88 1455 (AH). The club's address is Box 3111, GPO Darwin 5794.

NEW ZEALAND

COMBINED MICRO-COMPUTER USERS GROUP (CMUG)
This is an association of microcomputer clubs, groups, etc, formed to co-ordinate activities and to give a combined voice on topics concerning all micro users. Representation from all clubs and groups is welcomed to CMUG, C/- P.O. Box 6210, Auckland.

AUCKLAND COMPUTER EDUCATION SOCIETY (ACES)
Ray Clarke, 1 Dundas Place, Henderson, Auckland. (09) 836 9734 (H).

HP41C USERS GROUP (AUCKLAND)
C/- Calculator Centre, P.O. Box 6044, Auckland, Grant Buchanan, (09) 790 328 (W). Meets 3rd Wednesday, 7pm at Centre Computers, 1 Great South Road, Epsom.

NZ TRS-80 MICRO-COMPUTER CLUB
Olaf Skarsholt, 203a Godley Road, Titirangi, (09) 817 8689 (H). Meets 1st Tuesday, VHF Clubrooms, Hazel Avenue, Mt Roskill, Auckland.

OSI USERS GROUP(AK)
Vince Martin-Smith. 44 Murdoch Road, Grey Lynn, Auckland. Meets 3rd Tuesday, VHF Clubrooms, Hazel Avenue, Mt Roskill.

SYMPOOL (NZ SYM USER GROUP)
Mark Bennett, P.O. Box 651, Manurewa, (09) 266 6994 (H).

ATARI 400/800 USER CLUB
Dave Brown, P.O. Box 6053, Hamilton, (071) 54 692 (H).

GISBORNE MICRO-COMPUTER GROUP
Ron Taylor, 17 Byron Street, Gisborne, (079) 81 450 (H).

MOTOROLA USER GROUP
Harry Wiggans, (ZL2BFR), P.O. Box 1718, Palmerston North, (063) 82 527 (H).

TARANAKI MICRO-COMPUTER SOCIETY
P.O. Box 7003, Bell Block, New Plymouth: Francis Slater, (067) 84 514.

OSBORNE USER GROUP
Dr Jim Baltaxe, 18 Matipo Street, Palmerston North, (063) 64 411.

HAWKES BAY MICRO-COMPUTER USERS GROUP
Bob Brady, Piramai Pharmacy, Piramia Plaza, Napier, (070) 439 016.

CHRISTCHURCH MICRO-PROCESSOR USERS GROUP
J.D. Mann, 330 Centaurus Road, Cashmere, Christchurch, (03) 325 652.

CHRISTCHURCH '80 USERS GROUP
David V Smith, P.O. Box 4118, Christchurch, (03) 63 111 (H).

CHRISTCHURCH PEGASUS USERS GROUP
Don Smith, 53 Farquhars Road, Redwood, Christchurch, (03) 526 994 (H), 64 544 (W) ZL3AFP.

NELSON VIC USERS GROUP
The group writes: "We wish to contact other VIC or Commodore Users Groups to exchange VIC public domain software, newsletters, etc. Contact us (airmail please) at: P.O. Box 860, Nelson, New Zealand. Phone: (054) 79 361.

DIARY DATA

DIRECT ACCESS

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc. Organisers are requested to notify APC of forthcoming events well in advance to allow time for inclusion in 'Diary Data'.

Melbourne	Business Efficiency Fair '83 Contact: Exhibitions and Trade Fairs, 44 Cardigan Place, Albert Park 3206. Tel: (03) 699 9100	August 9-12, 1983
Melbourne	10th Australian Computer Exhibition, Contact: Riddell Exhibition Promotions. Tel: (03) 699 1066	September 27-30, 1983
Boston, USA	CP/M '83 for the CP/M operating system.	September 29- October 1, 1983
Brisbane	Computer Expo '83 Contact: Robert Woodland Exhibitions Tel: (07) 372 3380	November 4-6, 1983

NETWORK NEWS

Here is a list of all Australian personal computer networks. As more networks appear — and as more facilities are added to existing ones — we'll report them in this section, which appears monthly.

CYBERNET. Operator: Control Data Australia Pty Limited, 493 St Kilda Road, Melbourne 3004. Telephone: (03) 268 9500. Sales offices in every capital city. Facilities: Access to hundreds of applications from statistical analysis, financial modelling, linear programming, structural analysis, mineral evaluation to data base management. Hours: 0600 to 2400, Monday to Friday.

MICOM CBBS. Operator: The Microcomputer Club of Melbourne, P.O. Box 60, Canterbury 3126. Facilities: Computer bulletin board system, allows users to exchange messages on subjects of mutual interest. Free of charge. Hours: 24 hours/day, 7 days/week (single 'phone line only). Access number: 762 5088. Protocol: full duplex ASCII, 8 data bits, 1 stop.bit, no parity.

The Australian Beginning. Operator: The Australian Beginning Pty Ltd. 364 LaTrobe Street, Melbourne. Tel: (03) 329 7998. Facilities: Information service, electronic mail, software storage and software downloading. Hours: 24 hours/day, 7 days/week.

INFONET. Operator: Network Services Division of Computer Sciences of Australia Pty Ltd, 460 Pacific Highway, St Leonards, NSW. Tel: (02) 439 0033. Facilities: Access to databases produced by the Australian Bureau of Statistics and the Institute of Economic and Social Research. Hours (E.S.T.): Monday to Friday (7am to 9pm), Saturday (8am to 5pm) and Sunday (8am to 11.30am).

AUSINET. Operator: ACI Computer Services, P.O. Box 42, Clayton, Victoria. Tel: (03) 544 8433. Facilities: Medium to database whose subject coverage includes agriculture, education, energy, industry, public affairs, science and technology and an online Australian database directory. Hours: 8.30am to 9.00pm E.S.T. Monday to Friday.

IP Sharp Associates Network. Operator: IP Sharp Associates Pty Ltd, 13th Floor, 175 Pitt Street, Sydney. Tel: (02) 232 6366. Facilities: The network is an international time sharing data processing network, the host computers being located in Toronto, Canada. Hours: 24 hours/day, 7 days/week.

LAZING AROUND

by J J Clessa

Quickie

A rope ladder hangs down the side of a ship. The rungs on the ladder are one foot apart. At low tide the water just covers the bottom rung. At high tide the water level goes up by 3 feet. How many rungs will be covered then? The answer is *not 4.*

Prize Puzzle

In my house there are many cats. Seven of my cats won't eat fish, six of them won't eat liver, and five won't eat chicken. Four of them eat neither fish nor liver. Three of them eat neither fish nor chicken and two of them will eat neither liver nor chicken. One of them will eat neither fish, liver nor chicken, and none of them will eat all three foods.

How many cats have I got?

March Prize Puzzle

Not a very big response for this puzzle. About 30 replies in all, of which 16 were able to give an *exact* answer to the problem.

Incidentally, about 6 of the replies did not qualify for the prize since they were not on postcards. Please remember postcards (or backs of envelopes) only for your entries.

Several of the correct entries came from overseas but the winner, selected at random was Mr David Brighton of Huonville, Tasmania. Congratulations Mr Brighton, your prize is on its way.

Mr Brighton's solution was:

X = 5 476 209 930

Y = 20 000

which gives the required value exactly.

DIRECT ACCESS

MICRO EXCHANGE

All Micro Exchange ads must be submitted by readers on the appropriate form (or a photocopy). Maximum of 30 words. Print one word per box, very clearly. Contact name and telephone number/s must be included in the 30 words. All ads must be accompanied by a fee of $5.00 for Australian Personal Computer or $7.50 for inclusion in both Australian Personal Computer and Australian Business Computer. Make cheques or Postal Orders payable to Micro Exchange. Ads cannot be repeated (unless sent on another form) and we cannot guarantee to print an ad in any specific issue. Please help the typesetter by printing very clearly. Send your form to: Micro Exchange, P.O. Box 62, Middle Brighton. Vic 3186.

VICTORIA

ACCESSORIES BMC,VDUS $180 EA. COLOUR $250 EA. VERBATIM DISKETTES, SINGLE SIDE, 5" DOUBLE DENSITY $2.93 EA. + SALES TAX, APPLE SOFTWARE HALF PRICE, ATARI GAMES ZX81 PRINTER $125. MX80 MX100 RIBBONS CHEAP PHONE DGA B.H. (03) 690 8955 OR (03) 690 8362

ADLER TA20 COMPACT DESIGNER DESK INCLUDED 8K CPU MANUALS SOFTWARE AVAILABLE AS NEW COST $8,000 OCTOBER 1980. MUST SELL $750 O.N.O. PHONE ROSS OR CHRIS (03) 616 4606

APPLE II EUROPLUS WITH MICROSOFT SOFTCARD, APPLE LANGUAGE CARD, CP/M, PASCAL, MBASIC, GREEN PHOSPHOR MONITOR, DISK DRIVE, CASSETTE BACKUP, 30 DISKETTES OF SOFTWARE. $2500. PHONE MR WEST A.H. (03) 20 2150

ATTENTION: APPLE 2, OHIO, TRS-80 MODEL ONE USERS. COMPLETE HARDWARE SUPPORT NOW AVAILABLE AT REASONABLE RATES, PREVENTATIVE AND EMERGENCY MAINTENANCE A SPECIALITY. MINIMA COMPUTER SERVICES PTY LTD PHONE: (03) 88 3286

B.B.C. MODEL-A COMPUTER, 16K RAM, 32K ROM, FULL QWERTY KEYBOARD, V.HIGH RESOLUTION COLOUR GRAPHICS, 3 OCTAVE SOUND, POWERFUL SCREEN EDITOR UNWANTED XMAS GIFT, STILL BOXED. COST OVER $1,400, SELL FOR $1,100 O.N.O. (03) 789 3226

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CENTRONICS 779 PRINTERS. FIT LOWER CASE FOR UNDER $18 THIS MODIFICATION COSTS $95 IN U.S.A. SEND 50c STAMPED S.A.E. FOR FURTHER INFORMATION TO DON MCKENZIE 29 ELLESMERE CRES, TULLAMARINE 3043

CIRCUIT CELLAR MPX 16 WAVE SOLDERED PCB TOMS MANUAL SEE BYTE NOV'82 TO JAN'83 $950 (03) 710 1431

COMMODORE PERIPHERALS (1) 3023 MATRIX PRINTER WITH CABLES AND MANUAL $475 (2) 4040 DUAL IEEE DISK DRIVE INCLUDING CABLE AND SOFTWARE $1400 PHONE NIGEL BALL (03) 617 5454 (B.H.)

COMMODORE SYSTEM 8032 COMPUTER WITH RS232 PORT PLUS 8050 1.2 Mb DUAL DISK PLUS DATA BASE SOFTWARE ALL CABLES AND FULL DOC SUPPLIED $4,500 PHONE NIGEL BALL B.H. (03) 617 5454

CROMENCO C3.DUAL 8 INCH DRIVES, 4MHZ Z80A, 64K RAM, CDOS CP/M, HUGE SOFTWARE LIBRARY, CITOH PRINTER, TELERAY TERMINAL SOLID RELIABLE GEAR. SUIT EXPERIMENTER/HOBBYIST. OFFERS OVER $3750 CONSIDERED. (03) 241 5193

DONMON IS MY UNIQUE ROM BASED MONITOR PROGRAM AT 3000H., FOR SYS-80 AND TRS-80 COMPUTERS. SEND 50c STAMPED S.A.E. FOR FURTHER INFORMATION TO DON MCKENZIE, 29 ELLESMERE CRES. TULLAMARINE 3043.

ENHANCED VERSION TC8 HIGH SPEED CASSETTE FIRMWARE IN EPROM ASSEMBLED AT 3000H OR F800H FOR SYS-80 AND TRS-80 WITH FITTING INSTRUCTIONS $12.90 DON MCKENZIE 29 ELLESMERE CRES, TULLAMARINE 3043 (03) 338 6286

FIT 48K MEMORY IN SYS-80 AND TRS-80 COMPUTERS FOR UNDER $70 USING NEW TECHNOLOGY 64K CHIPS. SEND $5 FOR FITTING INSTRUCTIONS TO DON MCKENZIE 29 ELLESMERE CRES, TULLAMARINE 3043 (03) 338 6286

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I HAVE PEOPLE IN MELBOURNE, SYDNEY, ADELAIDE, BRISBANE AND PERTH. FITTING 48K IN SYS-80 COMPUTERS FOR $105. SEND $5 FOR FITTING INSTRUCTIONS TO DON MCKENZIE 29 ELLESMERE CRES., TULLAMARINE 3043.

LOWER CASE CHARACTER GENERATOR FOR TANDY LINE PRINTER ONE AND CENTRONICS 779 PRINTERS $12.90 INCLUDES FITTING INSTRUCTIONS REQUIRES SMALL AMOUNT OF HARDWARE KNOWLEDGE. DON MCKENZIE, 29 ELLESMERE CRES, TULLAMARINE 3043

NEW STILL IN BOXES HITACHI PEACH & 16K MEMORY & DUAL 5.24" DS/DD(1 MEG) & CONTROLLER & SUPER HI-RES COLOUR MONITOR & LIGHTPEN TOTAL HARDWARE $4,000 (WILL SEPERATE) HIFINANCE DRS+CRS & INVOICING & INVENTORY & HIWRITER $1,000 LEASING AVAILABLE FULL WARRANTY PHONE: (054) 43 2589

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SYS-80 AND TRS-80 MODEL ONE USERS. SEND FOOLSCAP SIZE 50c STAMPED S.A.E. FOR CATALOGUE ON MY AVAILABLE HARDWARE MODIFICATIONS TO DON MCKENZIE 29 ELLESMERE CRES., TULLAMARINE 3042 (03) 338 6286

SYS-80 AND TRS-80 MODEL ONE. FIT THREE LINE DESCENDER LOWER CASE CHARACTERS FOR UNDER $18 SEND 50c STAMPED S.A.E. FOR FURTHER INFORMATION TO DON MCKENZIE 29 ELLESMERE CRES, TULLAMARINE 3043

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WANTED!

Computer Programs and Programmers

If you have written a program or are about to write one, for the VIC 20, Commodore 64, Atari, Microbee or Apple II computer, and you feel it is worthy of distribution, please submit it to us for further review. We distribute Australian written software in Australia and the U.S.A. and are constantly looking for new products. Generous royalties are paid for all programs accepted by us.

Please contact us for details.

OZI SOFT

123 Clarence Street, Sydney 2000 Phone: 29 6330

MICROBEE

THE FOLLOWING PROGRAMMES ARE NOW AVAILABLE FROM MYTEK COMPUTING

MACHINE CODE TUTORIAL consists of eight interactive exercises designed for teaching machine code programming and related topics as they apply to the MicroBee computer. Only a general knowledge of the BASIC language is assumed. MACHINE CODE TUTORIAL is designed to bridge the gap between BASIC programming and being able to understand and use typical Z80 manuals.

MACHINE CODE TUTORIAL uses a unique double screen technique to display both the normal computer output and the tutorial on the screen at one time. This allows the student to use the MicroBee in the normal way, while the tutorial instructions appear in the lower half of the screen.

A Monitor is built into MACHINE CODE TUTORIAL

Topics covered include the following:

- Using the in-built Monitor: DUMP, ENTER, GO MOVE
- Writing and Running Z80 Machine Code Programs
- Nearly all Z80 Mnemonics
- Flags
- Hexidecimal-Decimal-Binary Conversion
- Assembly Language and Hand Coding
- Using the BASIC USR(x) Statement
- Instream and Outstream Vectors
- Screen RAM
- Cursor Control
- PCG and Programming Graphics Shapes
- Memory Map Explained
- ROM Read Latch
- BASIC Scratch Area
- 6545 Video Driver Chip Explained
- RESET Options
- Special GO addresses in the BASIC Language
- Z80 Speeds and Timing
- Undocumented Secret Z80 Codes
- Keyboard Scanning. Checking for More Than One Key Depressed
- Parallel and Serial Interfacing
- Cassette Interface and Associated Subjects
- Sound Effects Generation
- Format of BASIC Programs in Memory
- Speech Digitizing

BASIC TUTORIAL is a super teaching aid for any classroom. BASIC TUTORIAL is a set of nine interactive exercises designed for teaching Basic to the computer novice. No previous knowledge is assumed.

BASIC TUTORIAL uses a unique double screen technique to display both the normal computer output and the tutorial exercises at the one time. This allows the student to use the MicroBee in the normal way, while the tutorial instructions appear in the lower half of the screen.

To learn to drive a car, a student must get in and drive. Reading theory books help, but the real learning comes by driving. The same applies to computing. Books are no substitute for experience. These computer run tutorial exercises teach computing better than any other form of instruction.

DIGITALKER is a Computer Voice Storage & Retrieval System. Give your MicroBee a Voice! DIGITALKER allows the MicroBee user to store his voice in the computer as digital data which may be played back at some later time.

Simply load the DIGITALKER software, plug the DIGITALKER hardware into the I/O PORT and connect the DIGITALKER lead to the EAR plug of your tape recorder.

Once the voice has been recorded, it may be played back immediately or stored on cassette. The digitized voice may easily be incorporated into the users own programs without detailed knowledge of machine code. The DIGITALKER hardware is not required in order to play back the voice. Thus any MicroBee user may play back a voice previously recorded with DIGITALKER!

★ A Monitor program is included with DIGITALKER ★

ASTEROIDS PLUS is the finest high resolution graphic arcade game available for the MicroBee computer. It features spinning 3-D point by point resolution graphics, shields, intelligent beings, guided missiles, black holes, high-score board and breath-taking sound effects. ASTEROIDS PLUS took more than 1,000 man hours to write and cost in excess of $20,000 to develop. You owe it to yourself to experience the best in arcade games on your MicroBee.

TOUCH-TYPE TUTOR employs one of the worlds most advanced methods of learning to touch-type. Most computer users are one-finger typists. As well as typing slowly, they contract eye strain by having to keep glancing between the keyboard and screen. TOUCH-TYPE-TUTOR quickly teaches the student to type without looking at the keyboard with a unique method of combining sight and sound. TOUCH-TYPE-TUTOR gives graded exercises and displays a keyboard on the screen. It also lights up the next key, flashes and beeps if any error is made and gives an accuracy rating. As well as all this, the words-per-minute rate is displayed and if the student does well, the MicroBee will actually compliment him in a human voice!

BEEZ80 is far from your average run-of-the-mill disassembler! Other than being a mere 4K long, able to disassemble at the speed of light and packed with options, BEEZ80 will display before your very eyes all those unknown instructions ZILOG never talk about! The author has been doing extensive research into the actions of the Z80 processor when confronted with the 700 or so undocumented (and so called "illegal") code sequences. Over 100 of these are VERY useful! Did you know you have extra 8 bit registers and a complete set of instructions to manipulate them? Did you know about extra rotate instructions?

MYTEK MONITOR provides the user with a System Level Interface which is a must for any application outside BASIC programming. A Monitor allows the user to display and change memory contents, move memory contents, save the load specified areas of memory to and from cassette, as well as fill, search and compare memory. MYTEK MONITOR loads into normally unused memory locations F400 through F7FF. Thus no valuable program space is used.

The following Monitor commands are available. Parameters enclosed in [square brackets] are optional.

DU xxxx [yyyy]	Dump memory onto the screen from xxxx to yyyy. Parameter yyyy is optional	LO [xxxx]	Load file from tape. If xxxx is specified, the file will be loaded from this address rather than the header address
DA xxxx [yyyy]	Dump memory onto the screen and also print the ASCII characters	FI xxxx yyyy [zz]	Fill memory from location xxxx to yyyy with the byte zz (default 00)
EN xxxx	Enter or change memory locations starting at xxxx. Type HEX bytes separated by a SPACE or RETURN. Terminate with back slash /	MO xxxx yyyy zzzz	Move memory from location xxxx-yyyy to the block starting at location zzzz
AS xxxx	Enter ASCII text. Type RETURN at the end of the line to continue. Terminate with a backslash /	CO xxxx yyyy zzzz	Compare block starting at xxxx with block starting at yyyy for zzzz bytes. Any differing bytes are displayed
GO xxxx	Execute the Z80 program starting at xxxx. The monitor WARM start is pushed onto the stack	SA [F] namexx T xxxx yyyy [zzzz]	Save block xxxx-yyyy on cassette with optional auto EXEC address zzzz. Optional F specifies 1200 baud default 300. The NAME may be 6 characters long and the file type T may be any ASCII character
BA	Jump to BASIC. To re-enter the monitor give the BASIC command EXEC or hit RESET	SE xxxx yyyy aa [bb cc dd ...]	Search from xxxx to yyyy for occurance of bytes aa bb cc etc

WORDPROCESSOR. This full and comprehensive professional Wordprocessor comes in a quality ring binder and features most of the commands of the highly acclaimed SPELLBINDER. We expect to release this package by late June 1983, at a retail price of $40 to $50. Ring or write for details.

All **MYTEK** programs come on cassette, are written in machine code and run on both 16K and 32K MicroBees. We are able to take phone orders. Programs to be released in the near future are: WORDPROCESSOR, DEFENDER Game, Cassette Based Z80 EDITOR/ASSEMBLER Package, Microsoft Compatable 8K BASIC INTERPRETER, Microsoft Compatable Cassette Based COMPILER, and TAPE DOCTOR.

MACHINE CODE TUTORIAL	$25.00
ASTEROIDS PLUS	$22.50
BASIC TUTORIAL	$20.00
TOUCH TYPE TUTOR	$20.00
DIGITALKER	$55.00
BEEZ80 Disassembler	$20.00
MYTEK MONITOR	$15.00

WANTED: We wish to contact programmers who are capable of producing high quality software in any area of programming on the MicroBee. MYTEK is the largest independent producers of software for the MicroBee and if you wish to join our team of skilled programmers, please phone or write to us.

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Construction Worker

by Marc and Chris Wilkins

The program is written for a 16k System 80 or TRS-80. Instructions are included in the listing and although there is a machine language subroutine included, memory is reversed in the program.

```
100 POKE16561,255:POKE16562,124:CLEAR300:DEFINTA-Z:DEFSNGS:FORA=32000TO32039:REA
DB:POKEA,B:NEXTA:POKE16526,0:POKE16527,125:RANDOM
110 CLS:FORZ=1TO13:PRINT@270,"CONSTRUCTION WORKER!":FORQ=1TO10:NEXTQ:U=USR(0):NE
XT:FORZ=1TO12:FORQ=1TO10:NEXTQ:U=USR(0):NEXT
120 PRINT@270,"CONSTRUCTION WORKER!":PRINT@64,STRING$(20,"-"):PRINT"   IN THIS GA
ME YOU ARE A CONSTRUCTION WORKER AND YOU ARE AVOID-ING FALLING OBJECTS (HAMMERS,
 BRICKS, SHOVELS, LUNCHBOXES ETC.) WHILST TRYING TO RUN FROM BUILDING TO BUILDIN
G.
130 PRINT"   BUT .... THE OPPOSITE DOOR ONLY OPENS PERIODICALLY, AND YOU  MUST S
TAY INTACT (WITHOUT BEING HIT BY THE OBJECTS) UNTIL THE   DOOR OPENS AND YOU CAN
 GO INTO THE BUILDING!":PRINT"   YOU GET 5 POINTS FOR REACHING THE OTHER SIDE, A
ND !";
140 PRINT" POINT FOREVERY TEN OBJECTS DODGED. YOU HAVE THREE MEN. YOU WILL BE PU
SHEDOUT FROM YOUR SHELTER IF YOU STAY TOO LONG.":PRINT"   USE '<' KEY TO MOVE LE
FT, AND '>' KEY TO MOVE RIGHT."
150 PRINT"   IF YOU MAKE 250 POINTS YOU WILL GET ALL YOUR MEN BACK, OR IF YOU HA
VE LOST NO MEN YOU WILL SCORE DOUBLE POINTS":PRINT"   IT WILL ALSO BECOME MORE D
IFFICULT."
160 PRINT@896,"PRESS ANY KEY TO PLAY!";
170 IFINKEY$=""THEN 170
180 C=0:S=0:D=-1:F=1:X=1
190 'DRAW UP SCREEN'
200 CLS:PRINT@576,STRING$(6,176):PRINT@640,CHR$(130);CHR$(131);CHR$(164);:PRINT@
706,CHR$(176);CHR$(156);CHR$(134);CHR$(191);STRING$(4,131);:PRINT@770,CHR$(149);
:PRINT@773,CHR$(176);
210 PRINT@965,CHR$(176);STRING$(4,179);:PRINT@637,CHR$(176);:PRINT@896,CHR$(149)
;:PRINT@634,CHR$(149);CHR$(132);:PRINT@900,CHR$(160);CHR$(186);:PRINT@960,STRING
$(4,176);:PRINT@962,CHR$(189);CHR$(163);CHR$(191);
220 FORA=900TO960STEP5:PRINT@A,CHR$(186);STRING$(4,131);:NEXT:PRINT@1005,CHR$(1
86);
230 FORA=1TO1022:PRINT@A,CHR$(176);:NEXT:POKE16363,176
240 PRINT@634,STRING$(6,176);:PRINT@696,CHR$(152);CHR$(134);CHR$(129);:PRINT@760
,CHR$(151);STRING$(2,131);CHR$(191);:PRINT@824,CHR$(149);CHR$(144);" ";CHR$(176)
;
250 PRINT@666,CHR$(149);"  ";CHR$(176);:PRINT@952,CHR$(181);STRING$(2,176);CHR$(
186);
260 PRINT@0,"YOUR SCORE
";S;:PRINT@192,"DEATHS:";:PRINT@56,"RECORDS:";:PRINT@128,"1ST";S1;:PRINT@184,"2ND";S2;:
PRINT@246,"3RD";S3;
270 'DEFINE STRINGS'
280 M$=CHR$(136)+CHR$(176)+CHR$(140)+CHR$(26)+CHR$(154)+CHR$(191)+CHR$(139)+CHR$
(144)+CHR$(28)+CHR$(152)+CHR$(131)+CHR$(130)+CHR$(144)
290 C$="    "+CHR$(26)+STRING$(4,6)+"    "+CHR$(26)+STRING$(4,6)+"    ":E.M$=CHR$
(179)+CHR$(167)+CHR$(26)+STRING$(3,6)+CHR$(140)+CHR$(167)+CHR$(167)+CHR$(26)+STR
ING$(3,6)+CHR$(160)+CHR$(142)+CHR$(190)+CHR$(26)+STRING$(3,24)+CHR$(177)
300 D$=CHR$(131)+CHR$(191)+CHR$(26)+STRING$(3,6)+"  "+CHR$(176)+CHR$(26)+STRING$
(3,6)+"  "+CHR$(176)+CHR$(26)+STRING$(3,6)+CHR$(176)+CHR$(176)+CHR$(186):DM$=CHR
```


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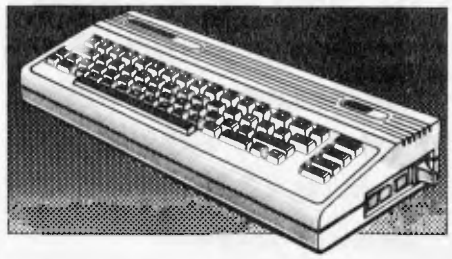

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PROGRAMS

```
$(137)+CHR$(150)+CHR$(129)+CHR$(26)+STRING$(3,6)+CHR$(130)+CHR$(130)
310 E$=CHR$(131)+CHR$(140)+CHR$(176)+CHR$(26)+CHR$(8)+CHR$(170)+CHR$(26)+STRING$
(2,8)+CHR$(136)+CHR$(170)+CHR$(26)+STRING$(3,6)+CHR$(176)+" "+CHR$(170)+CHR$(26)
+STRING$(3,6)+CHR$(176)+CHR$(167)+CHR$(190)
320 F$="   "+CHR$(26)+CHR$(6)+" "+CHR$(26)+STRING$(2,6)+"  "+CHR$(26)+STRING$(3,
6)+"   "+CHR$(26)+STRING$(3,6)+STRING$(3,176)
330 O$(1)=CHR$(163)+CHR$(163)+CHR$(163)+CHR$(149):O$(2)=CHR$(174)+CHR$(150)+CHR$
(140)+CHR$(140):O$(3)=CHR$(139)+CHR$(160)+CHR$(164)+CHR$(135):O$(4)=CHR$(131)+CH
R$(130)+CHR$(164)+CHR$(176):O$(5)=CHR$(150)+CHR$(140)+CHR$(191)+CHR$(191)
340 O$(6)=" "+CHR$(170)+CHR$(129):O$(7)=CHR$(140)+CHR$(140)+CHR$(190)+CHR$(156):
O$(8)=CHR$(164)+CHR$(153)+CHR$(140)+CHR$(140):O$(9)=CHR$(172)+CHR$(190)+CHR$(188
)+CHR$(132)
350 G$=CHR$(160)+CHR$(184)+CHR$(160)+CHR$(144)+CHR$(26)+STRING$(4,6)+" "+CHR$(17
0)+CHR$(149)+CHR$(26)+STRING$(3,6)+CHR$(190)+STRING$(2,191)+CHR$(163):S$="

360 'MAIN PROGRAM'
370 M=7774:O=M:T=0:I$=INKEY$:D=NOTD
380 D=NOTD:IFDTHENPRINT@764,E$;:RESET(114,36)ELSEPRINT@764,F$;:SET(114,36)
390 S=S+.1*F:PRINT@64,INT(S);:T=T+X:IFT=50ANDM=7774THENM=779:PRINT@0,C$;:O=M
400 IFS>25ORANDX=1THENX=2:FORZ=1TO20:PRINT@64,INT(S);:FORQ=1TO30:NEXTQ:PRINT@65,"
  ";:FORQ=1TO30:NEXTQ:NEXTZ:IFV=1THENF=2:PRINT@376,"DOUBLE";:PRINT@448,"POINTS!
";:ELSEV=0:PRINT@320,S$;:PRINT@256,"FREE MEN!";:FORQ=1TO600:NEXTQ:PRINT@256,S$
410 FORZ=1TO7:I$=INKEY$:IFI$=""THENNEXT:GOTO450
420 IFI$="-"ANDM>779THENM=M-5
430 IFI$="+"THENIFM<819THENM=M+5ELSEIFDTHEN490
440 IFPEEK(M+15362)=32ORO=MTHENPRINT@0,C$;:PRINT@M,M$;:O=M:NEXTZELSEPRINT@0,C$;:
GOTO460
450 O=USR(O):IFPEEK(15362+M)<>32ANDM>774THEN460
460 PRINT@M,M$;:FORZ=1TOX:R=RND(9):PRINT@64+R*5,O$(R);:NEXTZ:IFRND(20)=1THEN380EL
SE390
470 PRINT@819,C$;:PRINT@762,EM$;:FORZ=1TO20:NEXTZ:PRINT@762,D$;:S=S+5*F:GOTO390
480 PRINT@M,G$;:PRINT@256+U*3,DM$;:U=U+1:FORZ=1TO500:NEXT:PRINT@M,C$;:IFU<3THEN3
70
490 S=INT(S):IFS>5ITHENS3=S2:S2=S1:S1=S:ELSEIFS>S2THENS3=S2:S2=S:ELSEIFS>S3THENS
3=S
500 PRINT@M,G$;:PRINT@535,"* GAME OVER *";:GOTO160
510 DATA 183,62,12,33,247,62,19,55,63,1,45,0,237,184,1,19,0,237,66,235,237,66,23
5,61,32,239,33,10,80,17,11,60,1,45,0,54,32,237,176,201
```

PET Zombies

by P Barker

'Zombies' is a PET version of the arcade game. A number of zombies converge steadily towards you, their one goal in life (?) to zombify you. Your only defence is to lure the zombies into the open graves dotted around the screen and thus postpone your eventual zombification for as long as possible. You can have anything between 20 and 50 zombies, and you control your movements via the number keys as explained in the program. If you avoid your horrendous fate for longer than five minutes, I reckon that's pretty good going.

```
5 POKE59468,12
10 POKE59451,0:POKE59467,12:POKE59466,15:REM SOUND BOX ON
20 FORI=1TO9:READD$(I):D1%(I):NEXT
100 PRINT"□                ZOMBIES"
110 PRINT"
120 PRINT"■          YOU  ARE  IN  A  GRAVEYARD  THE";
130 PRINT"CHURCH CLOCK HAS JUST  STRUCK  ■MIDNIGHT■ !";
140 PRINT"YOU MUST EVADE THE ZOMBIES FOR  AS  LONG";
150 PRINTAS  POSIBLE  BY  LURING  THEM INTO  OPEN";
160 PRINT"GRAVES (■   ■). BUT IF YOU ARE CAUGHT THEN";
170 PRINT"YOU ARE ■ZOMBIEFYED■.KEYBOARD COMMANDS :-"
180 PRINT"■                  7   8   9
190 PRINT"■                   \  |  /
200 PRINT"■                4 - 5 - 6
210 PRINT"■                   /  |  \
220 PRINT"■                1   2   3
230 PRINT"■PRESS  SPACE  TO  PLAY  ■ZOMBIES■"
240 GETA$:IFA$<>" "THEN240
1000 PRINT"■■■
```

PROGRAMS

```
1520 IFZ>49THENPRINT"■■TOO MANY      ":GOTO1500
1530 IFZ<20THENPRINT"■■TOO FEW       ":GOTO1500
1540 ZZ=Z
1550 RETURN
1999 '          :REM BOARD
2000 PRINT"■┌──────────────────────────────────────────┐"
2010 A$="│                                          │"
2020 B$="│  ■  ■  ■  ■  ■  ■  ■  ■  ■  ■  ■  ■  ■  ■  │"
2030 PRINTA$:FORI=1TO7:PRINTA$:PRINTB$:PRINTA$:NEXT:PRINTA$
2040 PRINT"└──────────────────────────────────────────┘■"
2045 O0=20:O1=13:O=SS+O0+SW*O1:D=0:J=1:Z=ZZ:N%=1:NT=1
2050 POKE0,81:FORI=1TO2
2060 P1=INT((SW-3)*RND(0))+1:P2=INT((SL-2)*RND(0))+1:P=P1+P2*40+SS
2070 IFPEEK(P)<>32THEN2060
2080 Z%(I,0)=P1:Z%(I,1)=P2:POKEP,42
2090 NEXT
2110 RETURN
2999 '          :REM GAME
3000 TI$="000000"
3010 GETA$
3020 V=VAL(A$)
3030 IFV=0THEN3070
3040 D0=D0%(V):D1=D1%(V):D=D0+D1*SW
3070 IFPEEK(O+D)=32THENPOKEO,32:O=O+D:POKEO,81:O0=O0+D0:O1=O1+D1
3080 IFPEEK(O+D)=42THENPOKEO,32:O=O+D:GOTO3700
3085 FORI=1TONT
3090 J=INT(RND(0)*Z)+1
3095 P=SS+Z%(J,0)+(Z%(J,1)*SW):POKEP,32
3100 Z%(J,0)=Z%(J,0)-SGN(Z%(J,0)-O0)
3110 Z%(J,1)=Z%(J,1)-SGN(Z%(J,1)-O1)
3120 P=SS+Z%(J,0)+(Z%(J,1)*SW)
3130 IFPEEK(P)=81THEN3700
3140 IFPEEK(P)=160THEN3500
3150 POKEP,42
3160 NEXT:GOTO3010
3500 FORI=200TO0STEP-10:POKE59464,I:NEXT
3510 IFPEEK(P)=160THENP=P-1:GOTO3510
3520 POKEP+1,230:POKEP+2,230:POKEP+3,220
3530 Z%(J,0)=Z%(Z,0)
3540 Z%(J,1)=Z%(Z,1)
3550 Z=Z-1
3560 IFZ<1THENGOSUB2000:NS=NS+1:NT=NS:Z=Z+INT(RND(0)*5):IFZ>49THENZ=49
3565 IFZ<NTTHENNT=Z
3570 GOTO3010
3700 POKE54964,255
3710 FORI=0TO30:POKE59464,255:POKE0,42:POKE59464,200:POKE0,81:NEXT
3720 POKE59464,0
3730 GETA$:IFA$<>""THEN3730
4000 T=INT(TI/60):PRINT"■■■YOU HAVE SURVIVED FOR"T"SECONDS"
4010 IFT<HSTHEN4040
4020 PRINT"■YOU HAVE SURVIVED LONGEST":IFHS=0THENHS=T:GOTO4050
4030 PRINT"■THE PREVIOUS BEST TIME WAS"HS"SECONDS":HS=T:GOTO4050
4040 PRINT"■THE BEST TIME IS STILL"HS"SECONDS"
4050 RETURN
5000 DATA-1,1,0,1,1,1
5010 DATA-1,0,0,0,1,0
5020 DATA-1,-1,0,-1,1,-1
```

Chicken Little

This is a real time game for the MicroBee with the object of shooting down stars as they fall before they reach the ground; hence the name "Chicken Little". The program uses less than 8k and it is suggested that you remove the REM statements to liven the whole thing up.

For the benefit of other brands of micros, the following is a brief description of the code:

1. All PEEKs and POKEs are directed towards screen memory.
2. Line 440 — SET turns on a chunky graphic dot on the screen. So a series of SETs creates the "ray" effect from the gun.
3. Line 470 — RESET turns off the graphic dots.
4. Line 530 — PLAY emits a two second tone to confirm that you have been obliterated and may be deleted if your micro doesn't have this facility, or perhaps change it to play the Death March.

```
00010 REM
00020 REM ************************************************
00030 REM *          (C)Copyright...LED/020582           *
00040 REM ************************************************
00050 REM ************************************************
00060 REM *       CHICKEN LITTLE'S GAME TO SAVE THE WORLD *
00070 REM ************************************************
00080 REM
00090 REM
```


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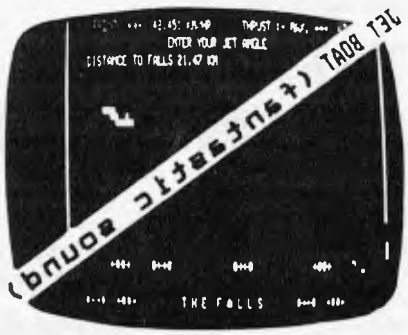

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CLEAR...C	CLOAD...^C	CLS.....^L	CONT....^F	CSAVE...^K
CSNG....^K	DATA....D	DEFDBL...^U	DEFINT..)I	DEFSNG..^G
DEFSTR..^P	DELETE..)D	EDIT....^E	ERROR....^B	FOR.....F
GOSUB...^H	GOTO....G	INKEY$..^K	INPUT....I	LEFT$...L
LIST....^L	MID$....^M	MOD.....^N	NEXT....^N	PEEK....P
POINT...)Z	POKE....O	RANDOM..^R	READ....R	RESET...^Y
RESTORE..^Q	RESUME..^M	RETURN...J	RIGHT$..^X	RND.....Y
RUN.....^R	SET.....E	STEP....^B	STOP....^G	STRING$.S
STR$....Z	SYSTEM..^S	TAB(....T	TROFF...)T	TRON....^T
		USING...U	VARPTR..V	

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PROGRAMS

```
00100 SPEED 50:DIM S(100):N=0:E=15
00110 CLS:D=64:X=62430:Y=0:P=61:REM X=ADDRESS TO LAST LINE OF SCREEN
00120 GOSUB 690
00130 LORES
00140 FOR Q=2 TO 62:POKE 61440+Q,42:REM LINE OF STARS ACROSS TOP
00150 NEXT Q
00160 POKE X-1,160:POKE X,181:POKE X+1,181:REM DRAW THE GUN
00170 GOSUB 540
00180 FOR B=1 TO N
00190 POKE S(B),42:REM 42=ASCII VAL OF "x". S=NEW POS ON SCREEN
00200 NEXT B
00210 FOR M=1 TO E
00220 LET A0$=KEY$
00230 IF A0$="Z" THEN LET Y=Y-1:GOTO 370
00240 IF A0$="/" THEN LET Y=Y+1:GOTO 370
00250 IF A0$="X" THEN LET G=P-1:GOTO 400
00260 IF A0$="." THEN LET G=P+1:GOTO 400
00270 IF X<62400 THEN LET X=62463:LET P=127
00280 IF X>62463 THEN LET X=62400:LET P=1
00290 POKE X-1,160:POKE X,181:POKE X+1,181:REM DRAW GUN AT NEW
      POSITION
00300 NEXT M
00310 FOR C=1 TO N
00320 POKE S(C),32
00330 LET S(C)=S(C)+D
00340 IF S(C)>62400 THEN GOTO 500
00350 NEXT C
00360 GOTO 180
00370 POKE X-1,32:POKE X,32:POKE X+1,32:REM CLEAR IMAGE OF GUN
      BEFORE YOU MOVE IT
00380 LET X=X+Y:LET P=P+(Y*2):LET Y=0
00390 GOTO 300
00400 FOR L=3 TO 44
00410 LET C=(47-L)/3
00420 REM CHECK IF YOUR GUN HAS HIT A STAR
00430 IF PEEK(61440+(G/2)+(C*64))=42 THEN GOSUB 590:LET D=64:
      NEXT* L 460
00440 SET G,L
00450 NEXT L
00460 FOR L=3 TO 44
00470 RESET G,L
00480 NEXT L
00490 GOTO 300
00500 CLS:CURS 338:PRINT "GOODBYE SWEET WORLD"
00510 CURS 463:PRINT "........ALL DEAD........."
00520 PRINT "YOUR SCORE WAS ",N-1
00530 PLAY 1,15:END
00540 E=E+1
00550 FOR A=1 TO N
00560  LET S(A)=61440+INT(RND*63):REM PICK A RANDOM STAR TO MOVE
      DOWN SCREEN
00570 NEXT A
00580 RETURN
00590 F=61440+(G/2)+(C*64)
00600 FOR A=1 TO N
00610  IF S(A)=F THEN LET S(A)=61440+INT(RND*63):REM REPLACE STAR
      THAT WAS SHOT DOWN WITH A NEW ONE
00620 NEXT A
00630 CURS 1:PRINT N
00640 LET N=N+1
00650 IF E>40 THEN LET E=38:GOTO 670
00660 LET E=E+4
00670 LET S(N)=61440+INT(RND*63):REM PICK ANOTHER STAR TO ADD TO
      THOSE ALREADY COMING DOWN
00680 RETURN
00690 CURS 75:PRINT "CHICKEN LITTLE'S FEARS HAVE BEEN REALISED"
00700 CURS 150:UNDERLINE
00710 PRINT "THE SKY IS FALLING ":NORMAL:PRINT
00720 PRINT:PRINT "BUT ALL IS NOT LOST."
00730 PRINT "HE HAS FOUND A GUN BIG ENOUGH TO SAVE THE WORLD."
00740 PRINT:PRINT "DO YOU WANT TO KNOW HOW TO DRIVE THIS GUN?"
00750 INPUT "ANSWER 'Y' OR 'N' ",A0$
00760 IF A0$="y" OR A0$="n" THEN PRINT "PLEASE PUSH LOCK FOR ALL
      CAPITALS":GOTO 750
00770 IF A0$="N" THEN CLS:RETURN
00780 CLS:LORES:POKE X-1,160:POKE X,181:POKE X+1,181:REM DRAW GUN
00790 PRINT "BELOW YOU CAN SEE THE GUN":PRINT
00800 PRINT "IT CAN MOVE LEFT BY PUSHING THE 'Z' KEY.":PRINT
00810 PRINT "TO MOVE IT RIGHT YOU PUSH THE  '/' KEY ":PRINT
00820 PRINT "TO FIRE THE LEFT GUN PUSH 'X' AND TO FIRE THE RIGHT PUSH
      '.';\;"(THATS A FULL STOP)"
00830 PRINT "YOU MAY TRY THEM NOW BUT THEY WILL DO NOTHING"
00840 PRINT "HIT THE 'Y' WHEN YOU ARE READY TO START"
00850 PRINT
00860 PRINT "BY THE WAY YOU MUST SHOOT THE STARS BEFORE THEY REACH"
00870 PRINT "GROUND ZERO OR ALL THE WORLD WILL BE DESTROYED."
00880 LET B0$=KEY$
00890 IF B0$="z" THEN PRINT "PLEASE PUSH LOCK TO PUT IN CAPITALS"
00900 IF B0$="Y" THEN CLS:GOTO 730
00910 GOTO 880
```

Commodore 64 Sprite editor

by A R Bennet

A Sprite, for the unenlightened, is a programmable graphics object 24 pixels by 21 pixels — a sort of high resolution user-definable character. Working out the codes for these little creatures (or planes/missiles/space invaders/etc) is normally a boring and time-consuming task. This editor, however, allows you to 'draw' your sprites on the screen using a joystick, so you can design hundreds of weird and wonderful creations quickly and painlessly. You simply draw your design, enlarge it along either axis as you wish and then let the editor produce the appropriate code which it will helpfully place into DATA statements for you.

To quote Simon Rockman, who checked the program for *APC*, the editor is '... very nice to use, does the job perfectly and is better than the one I bought. I will be using this version in future.'

The joystick, by the way, must be connected to port 2.

```
10 REM **********************
20 REM **  COMMODORE 64  **
30 REM **  SPRITE EDITOR **
40 REM ** BY A.R.BENNETT **
50 REM **  (C) 18/1/83   **
55 REM **********************
60 POKE53280,6:POKE53281,6:PRINT"■■■■■■■■■■■■■■■■DO YOU WANT INSTRUCTIONS (Y/N)
62 GETA1$:IFA1$=""THEN62
63 IFA1$="Y"THEN30000
64 REM ** SET-UP **
65 DIMMN(65)
66 PEN=1:SP=1024+80+1:L=SP:XX=0:YY=0:X=0:Y=0:E$="DRAW":J$(0)="DRAW":W=0:H=160
67 J$(1)="ERASE"
75 XP=1024+27:FORI=0TO8:AK(I)=80*I:NEXT
80 RESTORE
85 PEN=0:REM * PEN COLOUR = BLACK *
90 V=53248:POKEV+21,4:POKEV+16,4:POKEV+23,0:POKEV+29,0:POKEV+4,4:POKEV+5,200
92 FORI=0T062:POKE704+I,0:NEXT
95 POKEV+27,0:POKE2042,11:POKEV+41,0
99 REM ** PRINT SCREEN **
100 PRINT"■■■■";TAB(13);"■SPRITE EDITOR■"
110 PRINT"**************************"
120 FORI=1T021:PRINT"■■                          ■":NEXTI
130 PRINT"**************************"
131 POKEL,160:POKE(L-1024+55296),0
132 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(15)"■";J$(W);"■ MODE  ■"
140 PRINT"■■"
160 PRINTTAB(29);"■- CREATE":PRINTTAB(29);"  SPRITE"
170 PRINTTAB(29);"- ENLARGE":PRINTTAB(29);"  IN X"
180 PRINTTAB(29);"- ENLARGE":PRINTTAB(29);"  IN Y"
190 PRINTTAB(29);"- CREATE":PRINTTAB(29);"  DATA"
200 PRINTTAB(29);"- ERASE/":PRINTTAB(29);" DRAW MODE"
210 PRINTTAB(29);"- MOVE  ":PRINTTAB(29);"  PEN   "
220 PRINTTAB(29);"- DROP  ":PRINTTAB(29);"  PEN   "
230 PRINTTAB(29);"- ESCAPE":PRINTTAB(29);"  SELECT"
240 PRINTTAB(29);"- NEW   ":PRINTTAB(29);"  SPRITE"
249 REM ** JOYSTICK IN PORT 2 **
250 FQ=0:JOY=PEEK(56320):POKEL-1024+55296,5:FORWW=1TO8:NEXTWW
251 POKEL-1024+55296,PEN:IF(JOY=127)THEN250
252 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(15)"■";J$(W);"■ MODE  ■"
260 ONFGGOTO3000,2000,2500,1500,2600,10000,5000,250,600
295 IF(JOY<112)THEN7000
310 IF(JOY>112)AND(JOY<127)THEN5000
370 GOTO250
599 REM ** RESTART **
600 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(10)"ARE YOU SURE (Y/N)?■"
610 GETA1$:IFA1$=""THEN610
620 IFA1$="Y"THENRUN
630 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(5)"                              ■"
640 GOTO250
1499 REM ** CREATE/PRINT DATA **
1500 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(5)"WILL ERASE PROGRAM (Y/N)?■"
1510 K=0:A1$="":GETA1$:IFA1$=""THEN1510
1515 IFA1$="Y"THEN1530
1520 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■                              ■":GOTO250
1530 PRINT"■■■■";
1535 PRINT"■ ■":PRINTG;"DATP   ■■■■";
1550 IFK>62THEN1570
1555 PRINTMN(K);"■,";
1560 K=K+1:IFK/11=INT(K/11)THENG=G+1:GOTO1535
1565 GOTO1550
```


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PROGRAMS

```
1570 PRINT"■ ■"
1590 POKEV+21,0:NEW
1999 REM ** CHANGE SPRITE SIZE IN X **
2000 P=PEEK(V+29):POKEV+29,4-P:GOTO250
2499 REM ** CHANGE SPRITE SIZE IN Y **
2500 P=PEEK(V+23):POKEV+23,4-P:GOTO250
2599 REM ** ERASE MODE **
2600 E$=J$(W):W=1-W
2605 PRINT"■■■
```

```
30200 GOSUB40000
30210 PRINT"■■ ■ERASE/DRAW MODE■ - SWITCHES BETWEEN"
30220 PRINT"■■■■■■■■■■■■■■■■■■■■■■ERASE AND DRAW MODES."
30230 PRINT"■ ■MOVE PEN■ -          ALLOWS YOU TO MOVE"
30240 PRINT"■■■■■■■■■■■■■■■■■■■■■THE PEN WITHOUT"
30250 PRINT"■■■■■■■■■■■■■■■■■■■■■DRAWING."
30260 PRINT"■ ■DROP PEN■ -          ALLOWS YOU TO START"
30270 PRINT"■■■■■■■■■■■■■■■■■■■■■DRAWING AGAIN."
30280 PRINT"■ ■ESCAPE SELECT■ -     ALLOWS YOU ESCAPE"
30290 PRINT"■■■■■■■■■■■■■■■■■■■■■FROM SELECT MODE"
30295 PRINT"■■■■■■■■■■■■■■■■■■■■■IF YOU PRESS THE"
30300 PRINT"■■■■■■■■■■■■■■■■■■■■■JOYSTICK BUTTON BY"
30305 PRINT"■■■■■■■■■■■■■■■■■■■■■MISTAKE."
30306 PRINT"■ ■NEW SPRITE■ -        CLEARS THE SPRITE"
30307 PRINT"■■■■■■■■■■■■■■■■■■■■■AND ALLOWS YOU"
30308 PRINT"■■■■■■■■■■■■■■■■■■■■■TO REREAD THE"
30309 PRINT"■■■■■■■■■■■■■■■■■■■■■INSTRUCTIONS."
30310 GOSUB40000
30320 PRINT"■■ ■SELECT MODE■ -      ON THE RIGHT HAND SIDE"
30330 PRINT"■■■■■■■■■■■■■■■■■■■■■OF THE SCREEN ARE THE"
30340 PRINT"■■■■■■■■■■■■■■■■■■■■■COMMANDS THAT ARE"
30350 PRINT"■■■■■■■■■■■■■■■■■■■■■AVAILABLE TO YOU."
30360 PRINT"■■■■■■■■■■■■■■■■■■■■■TO ENTER SELECT"
30370 PRINT"■■■■■■■■■■■■■■■■■■■■■MODE SIMPLY PRESS THE"
30380 PRINT"■■■■■■■■■■■■■■■■■■■■■JOYSTICK BUTTON AND"
30390 PRINT"■■■■■■■■■■■■■■■■■■■■■MOVE THE ARROW TO"
30400 PRINT"■■■■■■■■■■■■■■■■■■■■■THE COMMAND THAT YOU"
30410 PRINT"■■■■■■■■■■■■■■■■■■■■■WISH TO USE THEN"
30420 PRINT"■■■■■■■■■■■■■■■■■■■■■RELEASE THE BUTTON."
30430 PRINT"■■ ■NOTE■ - THE JOYSTICK MUST BE IN PORT 2"
30500 GOSUB40000
30510 GOTO65
39999 REM ■■ HIT ANY KEY ■■
40000 PRINT"■                ■HIT ANY KEY"
40005 GETA1$:IFA1$=""THEN40005
40010 RETURN
```

Spectrum Blaster

by Alan Green

Well, yes, it is another space-invader type game (and Spectrum's not here yet though our tip is that it will be by the time this issue appears), but it has some redeeming features. Like the fact that it demonstrates many of the special features of the Spectrum, including colour (BRIGHT, FLASH, INVERSE, etc) sound (ok, bleep) and user-defined graphics. And anyway *I* happen to *like* zapping bug-eyed monsters.

The program runs on both 16 and 48k machines and contains full instructions: the usual 'blast the aliens before they kill your grandmother and eat your pet dog' (or visa versa, of course). Please note that the 'A', 'B' & 'C' in lines 40, 50 & 60 respectively should be entered as graphics A, B & C. The same applies to 'B' and 'C' in line 487. Thanks to Neil Marshall for the modification in lines 212 and 214.

```
  5 GO SUB 520
 10 REM ...Alien Blaster...
 20 REM ...c Alan Green ...
 30 REM ...    1982     ...
 40 FOR n=0 TO 7: READ j: POKE
USR "A"+n,j:NEXT n
 50 FOR n=0 TO 7: READ k: POKE
USR "B"+n,k:NEXT n
 60 for n=0 TO 7: READ l: POKE
USR "C"+n,l:NEXT n
 70 LET a=10: LET s=0: LET q=1
 80 LET z=31: LET y=120
 90 PRINT AT 12,4;"Do you want
instructions"
 95 BEEP .1,20: LET a$=INKEY$:
IF a$="y" THEN GO TO 380
 96 IF a$="n" THEN GO TO 100
 97 IF a$="" THEN GO TO 95
100 BORDER 1: PAPER 1: INK 6: C
LS
110 PRINT AT 1,0; BRIGHT 1; INK
 3;"
   ";AT 19,0; INK 6;"
   "
120 PRINT AT 0,2; BRIGHT 1; INK
 5;"Score 0";AT 0,16; BRIGHT 1;
INK 5;"High ";ss
150 LET c=INT (RND*30)+1: LET b
=3
152 IF c<=5 THEN LET w=2000
153 IF c>5 AND c<26 THEN LET w=
3000
154 IF c>=26 THEN LET w=1000
155 LET ch=INT (RND*2)+1
160 PRINT AT 18,a; INK 6;" A ";
AT b-1,c-1;"   ";AT b,c; INK 4;C
HR$ (ch+144)
170 LET x=(a+8)+12
180 LET a=a+(INKEY$="2" AND a<=
28)-(INKEY$="1" AND a>=1)
190 PLOT x,z: PLOT OVER 1;x,z
200 IF INKEY$="0" THEN DRAW INK
 5;0,y: BEEP .025,20: PLOT x,z:
DRAW OVER 1;0,y: GO TO 260
205 GO SUB w
210 LET b=b+1: BEEP .01,19-b: I
F b=19 THEN GO TO 230
212 PRINT AT 18,a; INK 6;" A "
214 LET a=a+(INKEY$="2" AND a<=
28)-(INKEY$="1" AND a>=1)
220 GO TO 160
230 BEEP .5,-20
240 PRINT AT 18,c-1;"   ": PRIN
T AT 21,q*2; INK 7;CHR$ (ch+144)
: IF q=5 THEN GO TO 300
250 LET q=q+1: GO TO 150
260 IF x=(c*8)+4 THEN GO TO 280
270 GO TO 205
280 FOR n=-3 TO -1: PRINT AT b,
c; INK 1; INVERSE 1;CHR$ (ch+144
): BEEP .04,5-n: PRINT AT b,c; I
NK 2;CHR$ (ch+144): BEEP .04,n:
NEXT n
```


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PROGRAMS

```
 290 LET s=s+(b*(ch*2)): PRINT A
T 0,8; BRIGHT 1; INK 5;s: PRINT
AT b,c;" ": GO TO 150
 300 PRINT AT 10,12; INK 7;"Game
 Over": IF s>=ss THEN LET ss=s:
PRINT AT 0,21; BRIGHT 1; INK 5;s
s
 305 GO SUB 600
 310 PRINT AT 12,6; INK 6;"Press
 Y to play again"
 320 IF INKEY$="y" THEN CLS : BE
EP .3,30: GO TO 70
 330 IF INKEY$="n" THEN CLS : ST
OP
 340 GO TO 320
 350 DATA BIN 00000000,BIN 00011
000,BIN 00011800,BIN 10011001,BI
N 10011001,BIN 11111111,BIN 1000
0001,BIN 10000001
 360 DATA BIN 00111100,BIN 01111
110,BIN 11011011,BIN 01111110,BI
N 01011010,BIN 10000001,BIN 0100
0010,BIN 00100100
 370 DATA BIN 00111100,BIN 00100
100,BIN 00111100,BIN 01111110,BI
N 11111111,BIN 00100100,BIN 0100
0010,BIN 10000001
 380 BORDER 2: PAPER 2: INK 7: C
LS
 390 PRINT "ALIEN BLASTER": PRIN
T AT 0,0; OVER 1;"------------"
 400 PRINT AT 2,0;"The Aliens ar
e invading your ";AT 4,1;"system
,your only hope is to";AT 6,1;"b
last them before they land";AT 8
,1;"and colonise the earth !"
 410 PRINT AT 10,1; INVERSE 1; I
NK 7; FLASH 1;"WARNING..."
 420 PRINT AT 12,1;"ONLY FIVE AL
IENS HAVE TO LAND";AT 14,1;"TO T
AKE OVER !!!"
 430 PRINT AT 21,1;"Press any ke
y for next page"
 440 BEEP .1,16: BEEP .1,21 : IF
 INKEY$="" THEN GO TO 440
 450 CLS
 455 PRINT "ALIEN BLASTER": PRIN
T AT 0,0; OVER 1;"------------"
 460 PRINT AT 2,0;"To move base
right press ";INVERSE 1;"'2'"
 470 PRINT AT 4,0;"To move base
left press  ";INVERSE 1;"'1'"
 480 PRINT AT 6,0;"Press "; INVE
RSE 1;"'0'"; INVERSE 0;" to fire
": PRINT AT 9,0;"There are two d
ifferent aliens, one scores more
 than the other."
 485 PRINT AT 12,0;"The aliens a
re worth more the  nearer they
are to the planet."
 487 PRINT AT 15,5; INK 5;"B...R
aider": PRINT AT 17,5; INK 4;"C.
..Broid"
 490 PRINT AT 21,1;"Press any ke
y to start"
 500 BEEP .2,5: IF INKEY$<>"" TH
EN GO TO 100
 510 GO TO 500
 520 BORDER 2: PAPER 2: INK 7: C
LS
 530 PRINT AT 10,9;"Alien Blaste
r"
 540 FOR n=-10 TO 40
 550 BEEP .1,40-n
 560 NEXT n: PAUSE 2: BEEP .5,20
: BEEP 1,15: RETURN
 600 FOR n=0 TO 2: BEEP .1,10: B
EEP .1,15: NEXT n
 610 FOR n=20 TO 0 STEP -2
 620 BEEP .1,n: NEXT n
 630 PAUSE 3: BEEP .25,15: BEEP
.25,15
 640 RETURN
1000 LET c=c-1: RETURN
2000 LET c=c+1: RETURN
3000 RETURN
```

CHIP CHAT

BenRosen, once a mere "something in the City" in Wall Street, and now a venture capitalist, has his own explanation of what Apple's *Lisa* stands for. Fans of the high-paying Cuperation firm will know that the lovely *Lisa,* now the company's most expensive computer, was once the name of a girlfriend of Apple inventor Steve Jobs. And since such things are not seemly in corporate chairmen, history was purged, and it became "Local Integrated Software Archirecture".

"Humph", said the sceptical Rosen over the top of his *Wall Street Journal.* "I reckon that I know what *Lisa* stands for. I reckon it stands for "Let's Invent Some Acronym"...

... Hippie types, gurus and trendies who read the Whole Earth Catalog will be edified to know that there is also a Whole Earth Software Catalog. This is published by Point Foundation and licensed by Doubleday & Co of New York. Knowing the content of the Whole Earth Catalog makes the mind boggle with respect to its silicon stablemate — could make interesting reading...

... Heard recently at a micro gathering: "IBM has truly embroiled the 16-bit concept. This bit's the keyboard, this bit's the screen, this bit's ..."

...American microcomputer magazines sell by weight. The content hardly matters.

Latest to fall into this trap is the new *PC World* monthly for PC users: as fat as *Byte,* it looks a tremendous success. But where *Byte* rates nearly 600 pages on quite ordinary paper, *PC World* turns out to have "better quality" stock, and only 360 pages.

It must be deliberate. Reading the copy in another of our favourite US papers, we found the following piece, which could provide a useful competition: guess which subject is under discussion?

"I want to provide two things," he explains. "One a positive experience. If you have a bad experience, you become more and more fearful. The second thing is to have the patient respond to suggestions."

Today, the term hypnosis is associated with images of nightmarish nightclub performers who mercilessly put innocents under hypnotic suggestion, only to make them cackle and crow and look like fools on stage. Beiburger says that the misunderstood term is actually a serious application commonly used in psychiatry and by medical doctors as suggestive therapy for behaviour modification.

This came from a computer magazine. It is an article on the use of micros in dentistry. Apparently there is one guy who makes his patients stare at the screen until they go boss-eyed, and then they can't feel any pain. And apparently, the readers of this magazine could not be expected to know what hypnotism is.

In the journalism business, we call this "padding" to fill space.

In the case of *Byte,* it will one day lead to catastrophe, as an aeroplane fails to get enough lift at the end of the runway to get the magazines off the ground...

... Graffiti on a factory wall: "The people have no steak ... Let them eat microchips."

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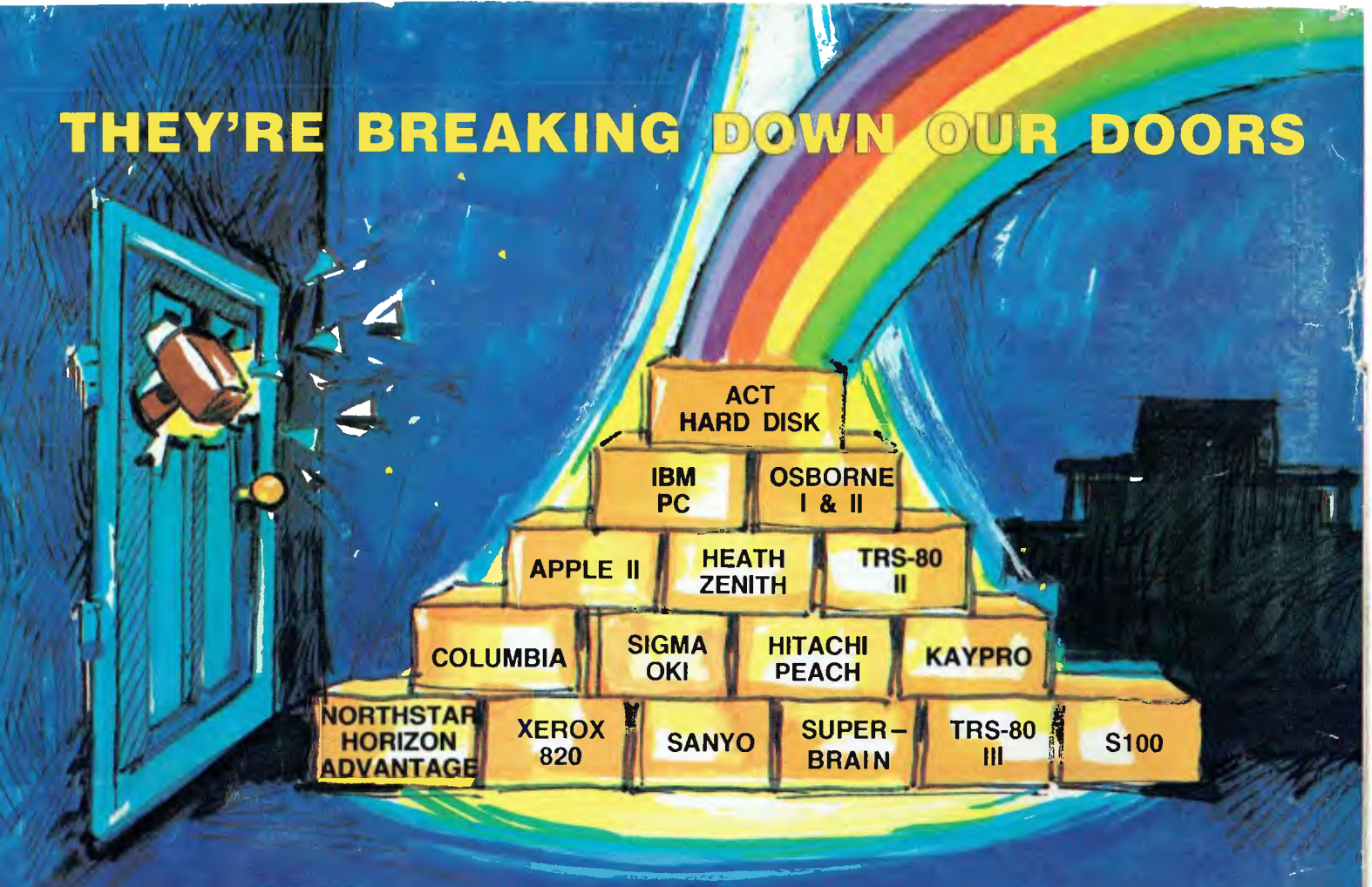

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