

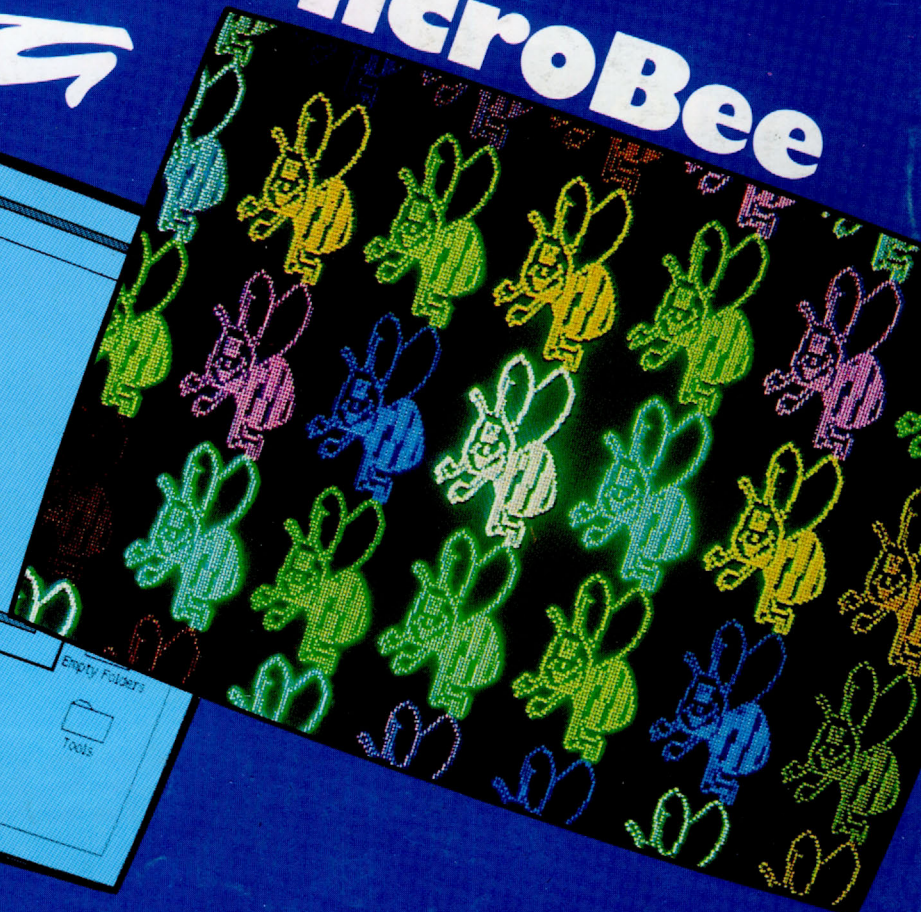
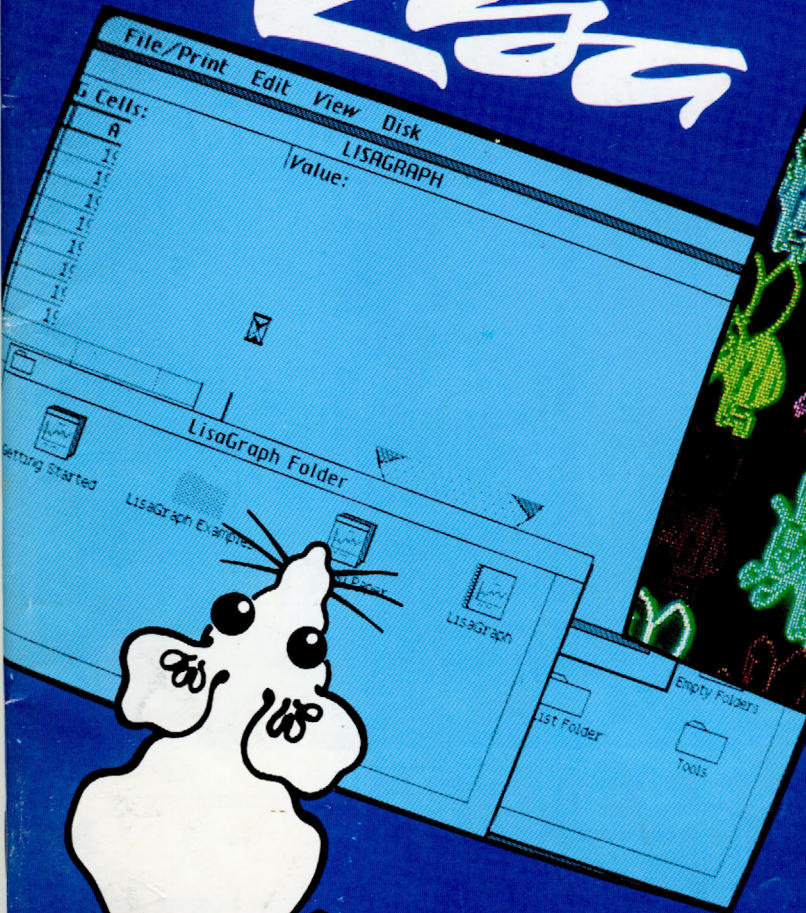
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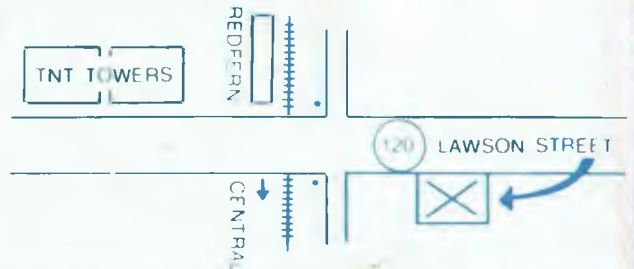
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# inside your computer

Vol 2, No 8. March, 1983.

## special

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#### Another Star Is Born

Apple's amazing Lisa is meant to be *the* machine for the busy executive: he can learn how to use it in half an hour without having to touch the keyboard to get his work done. While this rather powerful machine may be out of reach for many, it tells us a lot about the future of microcomputers.

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#### Your Computer News

Our roundup of the latest in software and hardware, new and upcoming releases and happenings in the world of microcomputers.

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#### CP/M Plus, Plus

Bill Bolton reports on the latest US developments for CP/M after his *Your Computer* tour to CP/M '83.

## features

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#### Lisa With An S

Frank Linton-Simpkins takes his own, less conventional look at Apple's Lisa. He likes her smile...

### 39

#### Here Comes SuperBee

Applied Technology celebrates the MicroBee's first birthday with the launch of a range of new options - including a high-resolution colour version of the machine. We haven't had a chance to review it fully yet, but we're impressed with what we've seen so far.

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#### C No Evil

Jack Dikian continues his occasional series on the lesser-known computer tongues with a look at C - a versatile language which is fast taking a dominant position in the software development world.

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#### Micro Testing

We discover a novel application for word processing packages - using the mail merge facility to set individual assignments for students!

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#### Understanding Assembler

Here's part four of our experiment in writing a monitor for your system.

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#### BASIC For Birdwatchers

Les says he's almost finished his tutorial; but just in case you get it wrong, this month he takes a look at Microsoft BASIC's error-handling options.

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#### The Columbia Challenge

Now that IBM has launched its personal computer locally, a lot of attention will focus on the 'IBM-compatible' market. The Columbia MPC is one of the better efforts...

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#### muSimple muMaths

An owner report on Microsoft's answer for the mathematically-inclined computerist.

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#### Sinclair Goodies

John Crabb tries some interesting packages for the Sinclair ZX80/81, including business and utility applications.

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#### Text File

If you have something worthwhile to say, why not share it around through the pages of *Your Computer*...

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#### Popular Systems

Individual columns devoted to the popular systems, including new columns devoted to the VIC-20 and the Kaypro II, and an expanded MicroBee column to make up for the one we left out...

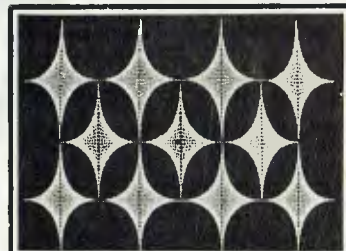
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#### Readers' Services

Want to contribute a story, write a program, ask a question, subscribe, sue us or...? Read this first.



Apple shows the way of the future with the stunning (but expensive) Lisa. Les Bell's report on this imaginative and powerful trend-setter starts on page 20.



The MicroBee comes of age - with colour, modems, low-cost disk drives, and more. We report on the latest releases for the Bee, plus some of the future plans for its development, starting on page 39.



Our Basic For Birdwatchers tutorial is coming to an end (no applause, please). We start wrapping it up this month with a look at error-trapping and handling. See page 64.

# editorial



*WE RECENTLY received an interesting letter (it may even appear in Text File this issue) from Colin Legg, of the Sydney software company Computer Cognition. He raised a point education authorities must soon be obliged to consider – software piracy in schools.*

*Colin said he was despairing after being so often told the worst offenders in the software piracy 'game' may be teachers in schools: "It appears that quite a few teachers offer a software distribution service to students, who only need to*

*bring a blank disk to school to receive free 'boot-leg' copies of almost any software," he wrote.*

*"The scarcity of well written educational software on the marketplace is surely a result of the actions of the teachers who have given their profession this reputation. It is hard to imagine how these teachers can hope to facilitate the moral development of their charges, or even encourage a normal respect for justice and law, when they set this sort of example.*

*"While it may be some time before we see individuals being prosecuted under copyright laws, I suggest that teachers, schools or Education Departments will become prime targets for such actions." he stated.*

*We must agree. We, too, regularly hear of software 'hand-outs' in schools, and have seen high-school students who don't even own a computer with enough diskettes to fill a good library. And it's not just one program to each of these many diskettes, either – one Apple diskette will be crammed with 10 'broken' copy-protected commercial programs.*

*Breach of copyright is a fact of life in the computer business, and we're aware of many diverse philosophies that can justify or condemn copying in different circumstances. We could fill the magazine if we tried to delve into them here. One thing is certain, though: the rampant and indiscriminate piracy – theft, if you prefer a less romanticised description – that seems to be the order of the day throughout the school system cannot be good for anyone.*

*A more responsible attitude is needed at the school end, while software manufacturers might also consider a more realistic approach to licensing programs to schools. Whichever way it happens, it needs to happen...* □

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# MICRO DECISION



The Micro Decision is a professional, CP/M® based computer system that comes with the hardware and software needed for the large or small business. This system is ideal for the professional or small business owner who wants to enter the computer age at an amazingly low price. It offers all the word processing, financial planning and programming tools needed to increase productivity.

The big office with a backlog of work on its minis and mainframes can use the Micro Decision to generate budget projections, sales reports, resource utilization studies, off-book receivables . . . all those special projects that need to be done now, but don't justify tying up a big machine.

The Micro Decision is a single board, Z80®-based computer that comes with 64K of RAM, an on-board disk controller and one or two 5 1/4 inch floppy disk drives. An expansion port allows the Micro Decision to handle up to four 5 1/4 inch drives, while two RS-232 serial ports connect the Micro Decision to a terminal, and a printer or modem.

Standard software includes Wordstar®, the popular word processing program, and Correct-It®, a powerful spelling checker. Financial forecasting is easy with Logi-Calc®, the electronic "spreadsheet" that adds computer power to business projections. Programmers will appreciate the choice of three programming languages: Microsoft® Basic-80, BaZic®, and Morrow Designs' Pilot. The software package is completed by the CP/M 2.2 Operating System, the industry standard O/S that allows access to more than 2,000 business programs.

Morrow Designs' optional terminal offers a full 12 inch diagonal, high resolution screen with 80 characters by 24 lines. The detachable keyboard allows positioning for maximum user comfort. An extra RS-232 serial port provides opportunities for additional I/O communication. And the terminals' intelligent features significantly improve system performance.

Add a printer and you have all the tools necessary to produce and store letters, documents and financial reports.

The Micro Decision is more than just the sum total of its hardware and software specifications. Morrow Designs has added features to the Micro Decision that make it convenient for the beginner as well as the experienced CP/M user. These features include: multiple diskette formats, enhanced error handling, Virtual Drive, simple terminal configuration, extensive diagnostics, a menu-driven front end, and perhaps most important, a clearly written user manual.

The Micro Decision's straightforward component design insures continued reliability. Each system is given extensive quality control and testing before shipment.

Morrow Designs has been dedicated to high-performance, low-cost computing since 1976. First in solid state memory, then disk memory, today in both single and multi-user computer systems.

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# your computer news

## Computer Congress

THE FIRST ANNUAL Australian Personal Computer Congress, to be held at Sydney's Sheraton-Wentworth from March 9-11, will be opened by the Minister for Science and Technology, Mr D S Thompson.

An 'elite group of speakers of international reputation' and senior executive from the major hardware and software companies will present papers.

They include Phillip D. Estridge (vice president and general manager of the personal computer division of IBM), Ed Faber (president of Computerland), Jerry Whitmore (vice-president of information for the Digital Equipment Corporation), Chuck Peddle (president of Victor Technologies, designer and manufacturer of Sirius), Robert Fisher (general manager of Peachtree Australia), Takayoshi Shiina (president of SORD Computer Systems), Barry Jones (Shadow Minister for Science and Technology), Dr William Caelli (president of ERA Computer Corporation), Professor Arthur Sale (of the Department of Information Science at the University of Tasmania), Professor Phillip Grouse (Information Systems, University of New South Wales), Robert Jane (managing director of Bob Jane T. Mart), Dr John Cribb (manager of computer services for the CSR) and Peter Johnson (executive director of Myer).

Further information is available from the Australian Computer Society at 32 Clarence Street, Sydney, NSW 2000, or phone (02) 290 3887. □

## "Hello" Seminar

A MELBOURNE-based independent computer consulting firm - Fletcher DP Services - is holding two one-day seminars in Melbourne (March 12 and

March 16) to introduce microcomputers to the businessman and review the various tasks one could use a system for.

Included in the seminar cost of \$75 is a one-hour personal consultation, reviewing specific needs and the various hardware and software options available, as well as lunch and morning and afternoon teas.

Further information can be obtained by phoning Mark Fletcher on (03) 527 3443. □

## Gestetner's Micro

GESTETNER has released two new products, the EW-100 word processor and the T-200 microcomputer.

The 100-year-old office-equipment company says it is confident the products will be well accepted in the small to medium-sized business market. □

## Apple's Takeover

FROM MAY 1, Apple Computer Australia will take over responsibility for the distribution of all Apple products in Australia from current distributor Electronic Concepts.

David Strong, general manager of Apple Computer Australia, says the move is in line with the plans announced in July 1982, when Apple established a local subsidiary to gradually assume local importation, distribution and dealer support.

"This is the logical extension of Apple's activities here", says Mr Strong. "Apple recognised the need to have a direct presence and responsibility here, to meet the increasing sophistication of the personal computer market and personal office system products.

Electronic Concepts will continue to market Apple products in Australia, as well as providing ongoing support to dealers. □

## Arfon Winners



Winners in the *Your Computer Arfon* competition collect their booty: above, winner Bill Newton of Sydney (left) receives his prize from Computer Cellar's Ross Dibley while second placegetter Jim Prior collects his prize in Perth, from Miss I Vermuelen of Victoria Park's VIC-20 Centre.



### Ship Shape

A PILOT computer graphics scheme enabling ships to be designed in three dimensions, almost like an actual model, has been installed at Appledore Shipyard in England as part of a \$48 million investment plan by the British Shipbuilders Group.

The group's aim is to produce cheaper ships, using the world's most advanced design techniques, and reducing construction man-hours by a quarter. The system consists of six monochrome and two multi-colour graphics terminals, linked to a computer with associated peripherals, such as an electrostatic printer, a multi-colour pen plotter and a high-speed line printer.

The three-dimensional facility enables technical personnel to create accurate picture descriptions of shop

design in all detail necessary for the building work to be done – whether for the steelwork of the curvaceous hull, the complexity of the engine room, or outfitting crew accommodation. □

### Education Pack

**COMPUTER Cognition**, which recently released an educational range of Apple software, including Maths Invaders, is making an offer to all Australian schools in which the schools can purchase the three programs, normally \$50 each, for \$120.

Schools are being asked to send no money, but simply order the three programs for seven days' inspection.

For more information, contact Computer Cognition, PO Box 2164, North Parramatta, NSW 2151, or phone (02) 724 4847. □

### Micros at Cetia '83

MELBOURNE is to host a personal computer seminar as part of the 11th Cetia Computer Communications Exhibition and Convention, from May 31 to June 3 at the Royal Exhibition Buildings.

"Personal Computing: Why, When, Where and How" will be the theme of the national seminar, conducted by Technisearch in association with the Royal Melbourne Institute of Technology.

Cetia '83 seminar programmes will include: Office Automation – A Real Benefit to Management; Computers in Education and Training; Executive Involvement in Data Research Priority, Selection and Security; Productivity through an Intelligent Computer Networking System; Breaking the Programming Log Jam – Are the

Fourth Generation Languages the Answer?; Auditing in an EDP Environment; Comparison and Selection of Word Processors; Decision Support Systems for Executives and EDP Project Management.

Organisations requiring participation details on the 11th Cetia exhibition should write to: Executive Director, Cetia-Datcom '83 Exhibition, PO Box 259, Roseville, NSW 2069, or phone (02) 467 2166. □

### Computer Pop Charts

BRITAIN'S weekly top of the pops list of best-selling records is now being assessed by computer, under a system devised by Gallup Poll of London.

Retailers at selected shops punch record and tape catalogue numbers on to a

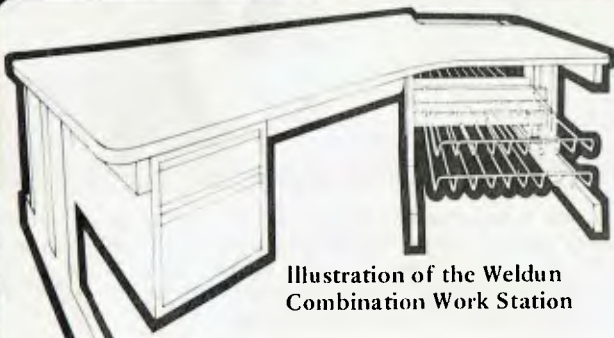


Illustration of the Weldun Combination Work Station

With the advent of more and more offices using computers it has become very necessary to have the correct kind of furniture for the operatives.

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keyboard terminal which stores them until they are transferred to a central computer.

Interrogation by the central computer takes place twice weekly at night. After the data is processed, the charts are transferred on to Prestel, the nationwide visual display information system. Charts for six types of music are collated.

Gallup, which began its survey nearly 50 years ago, now has companies in 39 countries. □

### Sirius User Group

A NATIONAL group is being formed to look after the needs of Sirius One and Victor 9000 computer users.

The group, founded by Brisbane microcomputer enthusiast Stephen Page,

says it will issue a newsletter containing programming tips and information about new products, and will develop a software library. Close contact will be maintained with the Australian Sirius distributor, and minor updates for Sirius software will be released to the users' group.

Warren Burrows, managing director of Computers and Peripherals, the Queensland company which is backing the users' group, is enthusiastic: "The formation of a united national body of Sirius owners and users indicates that the Sirius has taken a firm footing in the Australian computing marketplace," he says.

Membership in the group will be free. For a membership form, write to the Au-

stralian Sirius Users' Group, PO Box 204, Chermside, 4032, or phone (07) 350 2611. □

### Gamesmanship

STRATEGIC Simulations, of California, has released two new microcomputer Rapid-fire games, Galactic Adventures (for the Apple) and Epidemic! (for the Apple and the IBM-PC).

Galactic Adventures is a science-fiction game with tactical combat. Players start on a strange planet and are sent out into the streets to gain combat experience, acquire skills such as Star Piloting, Noetic Logic and lockpicking, earn money and recruit fellow adventurers for their team.

The game comes complete with diskette and

rulebook for \$US39.95.

Epidemic! assigns players the task of stopping the spread of the largest, most virulent epidemic known to man. Alien microbes have struck Earth and, as director of the Centre for Disease Control, the player must contain the disease to a limited area, minimising fatalities and finally rid the Earth of the disease.

Epidemic! comes with a diskette, rulebook and player aid cards for \$US39.95. The Apple version is designed for the 48K Apple II Plus or Apple III. The IBM version is designed for the 64K IBM-PC with colour.

For further information, write to Strategic Simulations, 465 Fairchild Drive, Suite 108, Mountain View, CA 94043, United States. □

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can be configured for a price range of about \$9000 to \$14,000, depending on the application.

For further information contact Robocom Australasia Ltd, on (03) 645 3067, or write to PO Box 354, Hawthorn, Vic 3122. □

**SME Systems' Lark**  
SME SYSTEMS, of Mitcham, Victoria, has released a low-cost 50 Mbyte storage unit suitable for organisations with large database requirements.

The Lark hard-disk system provides 25 Megabytes of storage on a removable cartridge, and 25 Megabytes of storage on a fixed disk.

The unit with controller will sell for \$8200, and a

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second unit for \$6500 – two of the units can be used together in either star or daisy-chain configuration, under the controller in the first unit.

For further information, contact SME Systems, 22 Queen Street, Mitcham, 3132, or phone (03) 874 3666. □

**Computer Holiday**

CLUB Mediterranee, the world's largest resort organisation, has added Atari computer workshops to its Malaysian and New Caledonian holiday villages.

The object of the workshops is to introduce club members to the uses and enjoyment of personal computers. The workshops offer a variety of Atari programs, including entertainment, games, languages, music,



graphic design, home finance management and word-processing, plus special educational programs for children.

The computer workshops are each equipped with four Atari 400s and eight Atari 800s and a full complement of peripherals. Software pro-

grams include Pac-Man, Space Invaders, Centipede, Conversational French, Music Composer, Invitation to Programming, Personal Financial Management System and many more.

For further information, contact Kate Buckley on (03) 579 2011. □

**AED's New System**

A NEW S100 microcomputer system which boasts 8 and 16-bit operation in the one computer has been released by AED Microcomputer Products.

Called the Universe Supercomputer II and based on Supercomputer, the new system complies almost totally to the S100 IEEE 696 specification. According to AED, there are a few other S100 machines on the market that can support this claim.

AED has housed the new computer in a more versatile roll-around module which contains the computer card frame, the floppy drives, the hard disk equipment, all power supplies, and any optional equipment.

AED claims the new system is one of the fastest in the world due to the 6MHz

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8-bit processor and the 8MHz 16-bit processor with no memory wait states, combined with ultra-fast Direct Memory Access (DMA) channel-type CP/M floppy and hard disk equipment.

The new computer runs the 8-bit CP/M-80, 16-bit CP/M-86, and the 8-bit multi-user CP/M and CDOS compatible MULTI/OS operating system.

For further information, contact Acoustic Electronic Developments, 130 Military Road, Guildford, 2161, or phone (02) 681 4966.

**Promrammer**

THE SYDNEY-based New Generation Computer Store has been appointed the exclusive Australian and Asian distributor for Promrammer, a new all-Australian card for the Apple II.

Promrammer is a multi-

function EPROM programmer, memory and I/O device which combines features previously requiring up to four separate cards.

Its applications include the storage of frequently used programs and special hardware driver routines in the 24K of onboard Eprom. This eliminates disk waits and memory use clashes.

For further information, contact the New Generation Computer Store, 93 Longueville Road, Lane Cove, 2066, or phone (02) 427 4780.

**CASE Contract**

CASE COMMUNICATION Systems has been awarded a \$60,000 contract for the supply of DCX multiplexing equipment to CAGA Ltd, one of Australia's major finance companies.

The CASE equipment re-

places CAGA's existing multiplexing units.

A 52-channel CASE DCX 840 will be installed in Sydney for the control, via DDS links, of smaller CASE units in Brisbane, Hobart, Perth and Adelaide. A second DCX 840 node will be installed in Melbourne and will have the capability of concentrating up to 12 Victorian branch multiplexers over one or more high speed DDS trunks to Sydney.

**H-Z Catalogue**

A NEW CATALOGUE from Heathkit/Zenith covers its problem-solving courses, trainers and accessories.

This free catalogue outlines a departure in the well-known series of courses, which are available in two formats: the textbook series (for classroom and group instruc-



tion) and the self-study series.

For a copy of the catalogue, write to Warburton Franki Ltd, 372 Eastern Valley Way, Chatswood, NSW 2067.

# The CP/M Operating System

ANNOUNCING TWO AUTHORITATIVE COURSES ON CP/M

## 1. An Introduction to CP/M

With Les Bell

What better way to learn about CP/M than from some of Australia's top authorities in the field!

**For new users**, Les Bell, Editor of *Your Computer* will be giving a one-day introductory course on the practical use of CP/M80 and CP/M86 commands and functions. Great for those who are unfamiliar with CP/M or simply want to use it without getting into the technical details.

**For experienced users** or those responsible for supporting CP/M systems, Bill Bolton, CP/M columnist from *YC*, and Rod Whitworth, the "father" of CP/M in Australia, have put together a comprehensive two-day workshop on the structure, maintenance and alteration of CP/M systems. A "must" for those commercially involved with

## 2. Installing and Maintaining CP/M

With Bill Bolton and Rod Whitworth

CP/M systems or those planning to use it in a professional DP environment.

The attendance fees are: \$195 for the introductory course, \$345 for the advanced workshop, or \$465 for the two combined. Fees include documentation, notes, lunches and a superb selection of CP/M utility programmes.

These courses form part of a comprehensive programme of microcomputer educational courses presented by Management Technology Education, Australia's leader in Technology Awareness Training.

For full details of the CP/M courses or other courses in MTE's programme, complete the following and return to the address below.

Please send more details on the courses marked

- AN INTRODUCTION TO CP/M
- INSTALLING & MAINTAINING CP/M
- MICROCOMPUTER HARDWARE
- PCS AS AN AID TO MANAGERS
- VISICALC & OTHER SPREADSHEETS
- SELECTING A MICROCOMPUTER
- MICROCOMPUTER SOFTWARE
- MICROS IN PROFESSIONAL DP

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# Compiling 6000 lines a minute?? On a Microcomputer??

COMPAS compiles a large subset of Standard Pascal directly into native Z-80 machine code. Compilation is done in just one pass, at a speed of up to 6000 lines per minute on a 4MHz system. Thus, a 500 line program is compiled into fast and efficient object code in as little as 5 seconds!

The computer supports two models of operation. In the interactive mode, the object code is stored directly into memory. Once compiled the program can be executed immediately. In the diskfile mode, the object code is linked to the run time package and stored in a machine code file (a COM file), which may be executed from CP/M simply by typing its name. The run time routines occupy only 5K bytes of memory.

COMPAS supports full random access file handling. The SEEK procedure gives you the ability to move randomly within a file, and through the LENGTH and POSITION functions you can examine the length of a file and the position of a file pointer. Records in a random access file are kept in their internal binary format to speed up processing and minimise storage consumption. Legible I/O is performed through text files. Apart from disk files, text file variables can be assigned to logical I/O devices (CON:, LST:, PUN:, RDR:, or USR:).

COMPAS includes a native machine code compiler, an advanced screen editor, and a run time package, and is fully contained in a single 16K byte program, leaving approximately 40K bytes of free memory in a 64K byte CP/M system.

COMPAS implements a large subset of Standard Pascal, and in many ways improves upon the language, for instance to pro-CASE statements allow for an optional OTHERS specification, and CODE statements may be used to insert machine code instructions in a program. Assignments is allowed between structured variables (eg array to array copying).

COMPAS is a complete programming package based on the high level programming language Pascal, designed to run on any Z-80 based microcomputer with CP/M operating system, and min. one disc drive.

## Compare COMPAS with other compilers:

(Table 1 from A.P.C. 10/82 page 100).

*Language	Compile time	8k primes	16k primes
Basic	33.6 secs	15.7 secs	—
Fortran	27.7 secs	14.1 secs	28.6 secs
Pascal	28.1 secs	13.0 secs	26.6 secs
USCD Pascal	30.6 secs	11.0 secs	20.4 secs
COMPAS Pascal	< 1.0 sec	3.4 secs	6.9 secs

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COMPAS is totally different from other compiler based Pascal systems, as it allows you to create, edit, run, and debug Pascal programs in a highly interactive manner.

COMPAS implements a powerful set of string manipulation facilities. String variables are fully dynamic, with lengths of up to 255 characters. Variables, constants, standard functions, and user defined functions can be combined into string expressions using the concatenation operator (+), and sub-strings can be extracted from string variables and constants through indexing. Integer/string and string/integer conversion is provided through the CHR and ORD functions, and the length of a string can be found using the LEN function.

The COMPAS screen editor is a powerful tool. The cursor is movable in all four directions, and changes made to the text appear right away on the screen. Advanced features include TAB characters, search and the replace, and an edit buffer, by which you can move blocks of text and duplicate insertions.

---

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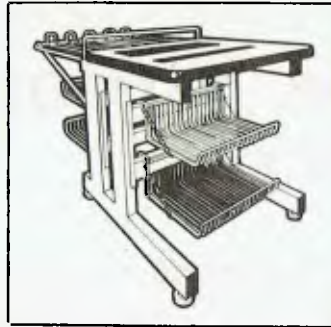
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## NEC 3550

The NEC 3550 has been designed & built to be fully compatible with the IBM Personal Computer. It has a wide variety of forms handling options & more than a dozen word processing functions.

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### Building Software

BURROUGHS has developed a new software package, Micro-Conacs, after research among small and large building contractors. It will launch the new software at seminars in Brisbane, Sydney and Melbourne during March.

Micro-Conacs has been designed for small businesses or large companies which wanted to decentralise. The modules for the system are: Costing; accounts payable and receivable; sub-contractors; general ledger; plant hire; purchasing control, estimating and word processing.

Micro-Conacs will cost from \$25,000.

Seminars will be held in Brisbane on March 10, Sydney on March 17 and March 22, and at Melbourne on March 24.

For further information, contact Barry McCrea on (02) 922 6466.

### Able Expansion

ABLE COMPUTERS, designer and manufacturer of Unibus-compatible products for users of Digital Equipment computers, has expanded its coverage in Australia through the appointment of three new distributors.

These are: Kairinsky and Associates, 14 Crichton Road, Garden City, 3207, Phone (03) 64 3699, and 23 Bronte Road, Bondi Junction, 2122, Phone (02) 387 2017; Disk Computer Systems, 97-99 King William Road, Unley, 5061; and Computer Communications, 50 Wimbledon Street, Cannington, 6107, phone (09) 458 9752.



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SBC-100S (Slave)	—\$795.00
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ExpandoRAM II	—\$450.00
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**HP Bar-Code Readers**

HEWLETT-PACKARD'S new bar-code readers offer users of HP terminals an alternative to keyboard data entry. Expected to be especially useful in such industrial applications as stock control, shopping control, item tracking and material movement, the HP 92911A simply plugs in, in series with the keyboard cables.

The new bar-code reader is designed to function with the HP 2622A, HP 2623A, HP 2624B and HP 2626A terminals and with the HP 125 personal office computer. It receives its power supply from the terminal to which it is connected, and is entirely

transparent to the applications software, which need not be modified to accommodate use of the reader.

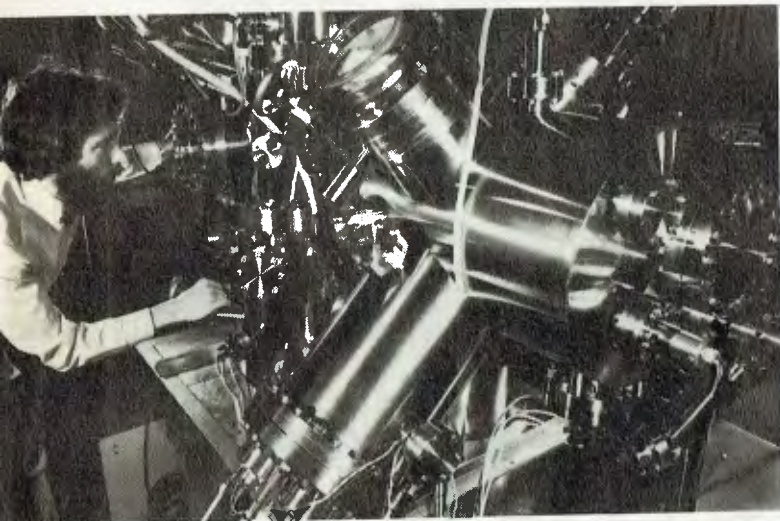
**Shelly's Beach**

AN 18-YEAR-OLD Adelaide lifesaver, Shelly Harris, has been named winner of the Ampec Trans-Tasman Surf Life-Saving Test competition, which ran in the December issue of *Your Computer*.

Shelly's prize was a Jefferson Wave Ski and air travel and accommodation in Sydney to watch the Ampec-sponsored Trans-Tasman Surf Life-Saving Test at Manly Beach.

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**Super-Chip Research**  
DESIGNED AND built by a British research team, this equipment is being used to help electronics manufacturers produce a super chip for the computer of tomorrow. It

combines two systems — Molecular Beam Epitaxy (MBE) and Secondary Ion Mass Spectrometry (SIMS) — to form one of the world's most effective tools for constructing ultra-efficient

semiconductors.

Researchers at the London Polytechnic are paving the way for the production of a super chip made from materials such as indium arsenide and gallium antimonide — potentially 20 times faster in operation than the more commonly used silicon.

The MBE technique uses a beam of molecules in an ultra high vacuum environment to form one-tenth-of-a-micron thick layers or 'sandwiches' of semiconductor material on a crystalline base. The composition and arrangement of these layers ultimately determine the speed of the chip.

The London Polytechnic researchers are using the equipment to 'grow' a composite semiconductor structure called a superlattice which, says team leader Dr Ivan Parker, "could be de-

veloped to form the basis of very fast chip technology". A critical factor in chip design is precise control over the distribution of impurities. This is achieved in conjunction with the SIMS analytical system that scans material atom layer by atom layer, giving the most sensitive reading possible of impurity concentrations.

The most promising 'sandwiches' produced will be evaluated in industrial laboratories with the view to them being used for integrated circuits on established production lines.

Improvements in chip performance are needed for voice entry computers and hyperfast centralised computers required for instant response to streams of wide-ranging inquiries from home or office-based links. □

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250 ns 4 64 dynamic RAM chips in two 64K banks, supporting full DMA controller access.

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Using Z80 DART with CTC baud rate generation for Video terminal and serial printer or communications port. Speeds of 110 to 38400 BPS with DTR handshake.

### PARALLEL PORTS (2)

ZILOG PIO providing two parallel ports implemented in the CP/M BIOS as a fully optioned CENTRONICS printer port.

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Implemented from one channel of the CTC and readable from BASIC and other languages.

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Two 8" double sided, double density drives giving 2.4 MB on line. The BIOS auto-senses the type and density of disk in use. The controller will support two additional 8" drives AND four 5" drives.

### HARD DISK INTERFACE

Provided for future expansion.

### CP/M 2.2

Fully implemented BIOS provides features and facilities simply not found in any other system. Written and supported in Australia.

### CACHE DISK BUFFER

All disk reads cause the whole track to be buffered in the second memory bank. This dramatically speeds up disk access.

### WARMBOOT FROM MEMORY

The CP/M CCP and BDOS are written to the second memory bank during cold boot. This means that the disk in drive A: does not need CP/M on it after initial cold boot and that warm boots are VERY fast.

### TYPE AHEAD BUFFER

Keyboard input generates a Z80 mode 2 interrupt to place the character in a 64 byte FIFO (first in, first out) buffer.

### BUILT IN "M" DRIVE

The unused 48K of the second bank implements a VERY FAST pseudo-disk drive for heavily disk bound tasks such as submit files.

### ENHANCED CCP

A user selectable option provides our own CCP which is upward compatible from the Digital Research version and increases overall system usability for old and new CP/M'ers by adding several new commands and improving existing ones.

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# Another Star Is Born



*On the eve of the IBM PC launch in Australia, Apple announced its new flagship – the Lisa. As Les Bell reports, the Lisa breaks new ground in personal computing...*

AS MANY OF our readers will have discovered, there are major obstacles to be overcome before the personal computer becomes the ubiquitous business tool it promises. One of the major drawbacks is its poor performance at handling graphical material. Another is the complexity of operating systems and different applications software packages which all behave in different ways.

Apple's latest offering, Lisa, solves many of these problems. Specifically intended as a personal computer for upper-level executives and professionals, this new machine represents a giant leap forward in the design of (it's cliché time) the man-machine interface.

Lisa is not a prepossessing machine to look at; the enclosure styling is conservative, consisting of a screen/disk drive and main processor cabinet with detachable keyboard. Beside the keyboard, you will usually find a small

box with a button on top, called the mouse.

The design is somewhat understated, yet ergonomically sound. Finished in Apple's house colour, it will fit inconspicuously on an executive desk. The only other boxes are the printer (a small dot matrix type) and Profile 5 Mbyte hard disk drive.

The 12 inch screen is a monochrome type which can display bit-mapped graphics with a resolution of 720 by 364, or up to 40 lines of 132 characters. This will vary according to the type style being displayed, as Lisa has a number of different typefaces and sizes available, which can all be displayed and printed.

The keyboard is similar to a conventional typewriter, with the addition of a numeric pad and cursor arrow keys. There are no 'control' or function keys - the concept is absolute anathema to the Lisa team.

The Lisa screen is analogous to your desk top. Around the edge are displayed labelled icons, or small images, of familiar office objects - file folders, sheets of paper, a calculator, clock and even a wastebasket. Across the top of the screen is a menu bar, which displays

the options available to the user at any time.

Suppose that at the right of the screen is a small file marked 'Sales Report'. By moving the mouse around the desk top, the user causes a small arrow to follow its movements around the screen, and by using this to point to the sales report file and then pressing the button, the user can tell the system he wants to work with that file. The file will turn black to indicate that it has been selected.

Now by moving the mouse to the menu bar, the user can choose what he wants to do. Pointing to the 'edit' selection and pressing the button causes the file to be opened and the contents displayed ready for editing.

Editing is extremely simple with the system. Text insertion is simply a matter of moving the mouse to the insertion point, clicking the button and typing. To select text for deletion, copying, typeface changes, and so on is done by an operation called 'draw-through' - the mouse is moved to the beginning of the block and the button depressed, then the mouse is moved to the end of the block and the button released. The block of text will appear in inverse.

Clicking the button twice with the cur-

sor in the same spot – a 'double-click' - will select the word in which the cursor is positioned.

Once editing is completed, a document can be moved back into its file, again using the mouse. Deletion of a file is achieved by moving it into the wastebasket – with the additional feature that should you want to recover it, it can be retrieved from the wastebasket and re-opened. Presumably the wastebasket is emptied daily!

The task underway is displayed in a window on the screen, and as the user works other windows can be opened, moved about and closed as required. For example, selecting the 'file/print' option from the menu bar will open a window containing a sub-menu of options which are handled in exactly the same way with the mouse.

Multiple windows can appear on the screen and windows can overlap and obscure each other as required.

The user can move between windows, and implicitly between tasks, with absolutely no concern for exiting programs, closing files and other impedimenta foisted on the user by conventional operating systems.

Information displayed in one window can be extracted using the 'cut' operation of the editor and moved into another document using the 'paste' operation – regardless of the program that lies 'behind' that window.

For example, one window can display a financial table prepared using a spreadsheet calculator program, while the other might be an annual report being edited. The cut and paste commands work exactly the same way.

### For the User

The result of this is that Lisa is very much simpler to use than any other personal computer. All the application packages produce displays which are manipulated in exactly the same way, be they textual, tabular or graphical.

Apple claims Lisa can be mastered in thirty minutes, as opposed to thirty hours for a conventional personal computer. And there is no doubt that for the executive who is not a fast typist, the mouse is a very much faster and easier way of controlling the machine.

Lisa is supplied with six applications software packages as standard, covering such areas as word processing, spreadsheet calculations, graphing and plotting, database management, project management and drawing.

LisaWrite is a word processing package with some important differences from its precursors. It operates inside a variable-sized window, so that the document can be shrunk or stretched, and the window can be scrolled around the document. Furthermore, LisaWrite im-

plements the 'what-you-see-is-what-you-get' philosophy of other word processors – but quite literally.

Five typefaces are available (Gothic, Courier, Elite, Modern and Classic) both on the printer and on the screen, in a range of sizes as well as bold and italic styles with optional underlining, super and sub-scripts. Proportional spacing is supported, and all page numbers, headers, footers and other layout options appear on the screen exactly as they do on paper.

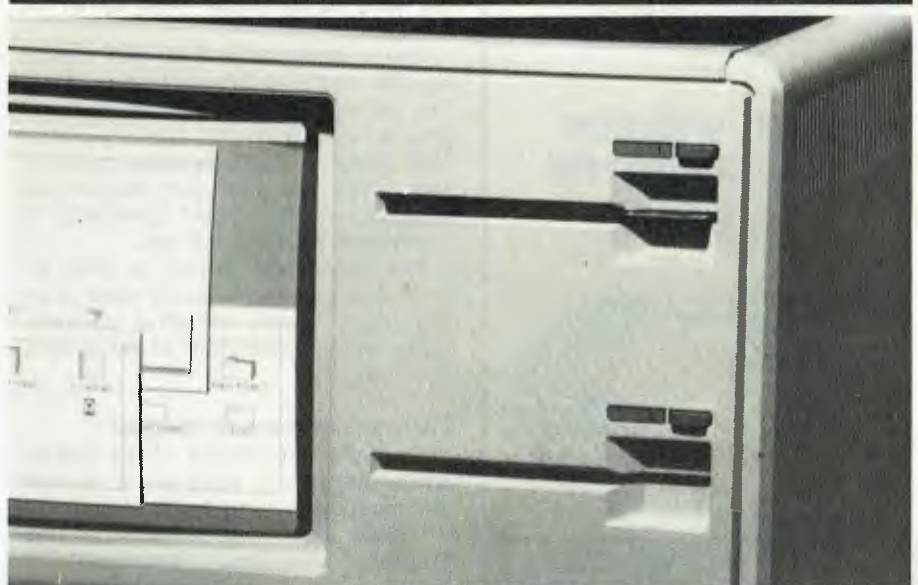
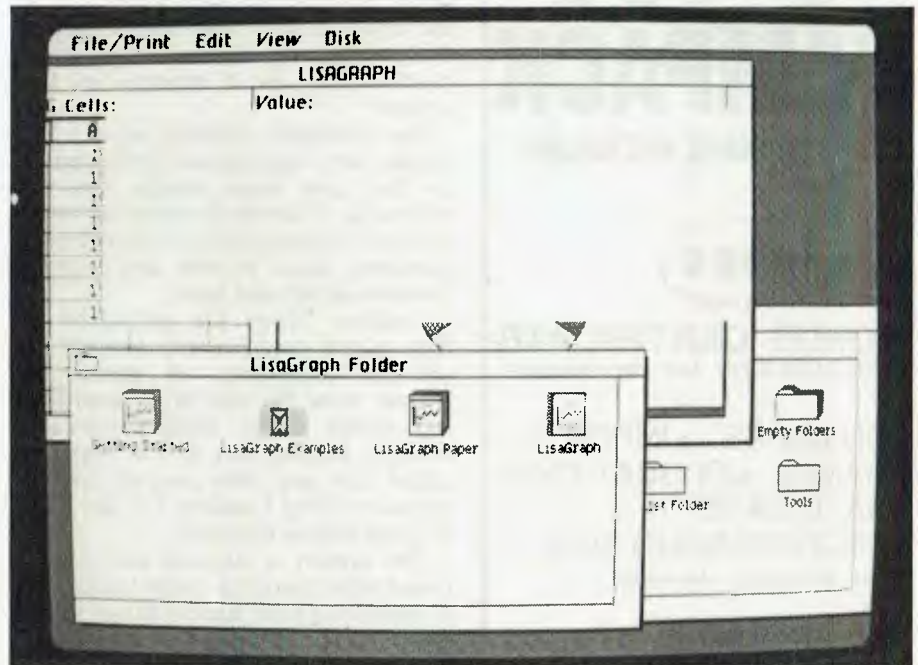
LisaCalc is a spreadsheet calculator roughly similar in capabilities to Visicalc. However, the display is very different, utilising the graphics capabilities of Lisa. Rows and columns are ruled to look like an analysis sheet, and the sheet can be edited in exactly the same way as text. LisaWrite can even be used to edit a LisaCalc model.

The program incorporates a calendar to assist with time and money problems.

The sheet can be split horizontally, vertically or both, and data can be quickly and easily transferred into LisaGraph for plotting and display on the same screen as the spreadsheet. A variety of timesteps are available and a rich set of formatting commands allow reports to be neatly laid out.

Data can be cut and pasted from LisaCalc into LisaGraph for plotting as bar, line, mixed bar/line, pie or scatter charts. Using the mouse, free-floating titles can be positioned anywhere on a graph, and the same choice of typefaces applies, giving presentation quality.

LisaList is a database manager oriented towards the professional user. It supports up to 100 fields per record, and a number of data types: text,



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As with other Lisa applications, the user can select typefaces, use the mouse for editing and print reports exactly as they appear on the screen. Lists can be sorted on complex keys, such as time and date, and multiple sort fields can be specified by filling in a simple table.

Lisa's graphical abilities are particularly useful in LisaProject, a critical path project management program. The display shows a CPM chart, and the user can use the mouse to draw in new task boxes and lines linking them – the program automatically recomputes the project schedule and the critical path.

Projects can be almost arbitrarily complex, with the ability to zoom in on one section for modification and then shrink the chart to show an overview of the entire project. The printer can of course print any section or the whole chart exactly as it appears on the screen.

The maximum drawing size is 32 square feet – approximately 60 pages – so that quite large projects may be worked on. A variety of reports are available from the program to show resource utilisation, tasks in order and interdependencies between tasks.

LisaDraw allows the generation of high quality graphics with virtually no previous experience. A palette of shapes allow the user to produce perfect circles, boxes, straight lines and shading. Virtually any kind of graph or output from any other program can be enhanced using LisaDraw – it can even be used to draw free-hand.

The system is supplied with a self-paced tutorial program called LisaGuide. In addition, a short tutorial at the beginning of each manual is claimed to have the user doing useful work within 30 minutes.

Lisa is designed to work with matching dot matrix and daisywheel printers. The dot matrix printer is designed to reproduce everything that appears on the Lisa screen in high-resolution mode of 160 x 144 dots/inch, with proportional spacing and 22 different typestyles. In draft mode, it runs at 120 cps.

The daisywheel printer is also intended to reproduce exactly what is on the user's screen, including graphics. Using a 130-spoke print wheel, it runs at 45 cps.

#### For the Software Developer

From the descriptions of the mouse and editing above, some of our readers will undoubtedly have deduced that Lisa is based upon the concepts of the Smalltalk language developed at Xerox's Palo Alto Research Center. In-

deed, Lisa's main language is said to be Smalltalk-like.

For the uninitiated, Smalltalk is rather different from conventional languages such as BASIC and Pascal, which make a fundamental distinction between procedures which operate on data and the data items themselves. In Smalltalk, procedures and their associated data are tightly bound into modules called objects.

Thus the object fred, an example of the class box, would contain not only the data describing the box fred but also the procedures to make fred grow, rotate, and so on

Because of the work done at XPARC which has to some degree focussed on the educational applications of Smalltalk, there has been a tendency to dismiss it as a 'kid's programming language'. This is a grave error, as Smalltalk encompasses very sophisticated concepts of operating system design, user interface design and structured programming which are equally applicable to business.

A Lisa Applications Development Toolkit, which will allow developers to create integrated applications in Lisa's version of Smalltalk, will be available later this year. In the meantime, Lisa also supports a version of DEC BASIC-PLUS, Pascal and COBOL, so that more conventional software can be ported onto the machine.

The machine's native operating system is 'Unix-like', indicating that it is not integrated into the Smalltalk system as the Xerox researchers originally envisaged. The machine will also support other operating systems, including the CP/M family (though it is not clear whether this refers to CP/M 68K or to a Softcard Z-80 option) and Xenix.

The LisaTerminal program allows Lisa to emulate a glass teletype, DEC VT52 or VT100 terminals, or an IBM 3270 terminal – an important facility for corporate purchasers. Lisa is also designed to become part of AppleNet, a low-cost local area network developed by Apple. In addition, Apple plans to offer other LAN interfaces, including Ethernet.

At the bottom level of the machine's architecture, the hardware is based on the Motorola 68000 16-bit processor with a megabyte (1,000,000 bytes) of main memory. In case you're wondering why so much memory, a typical Smalltalk virtual system requires about 300 Kbytes before you even start talking about applications software.

The two floppy disks are Apple's new 871 mechanism, which uses diagonally-opposed heads and a special 13 cm disk to give 871 Kbytes capacity per drive. However, the Profile hard disk is still required to give the speed performance demanded by the virtual memory

multi-tasking operating system.

The hardware is modular, utilising zero insertion-force card sockets for high reliability, and a diagnostic program permits swift determination of module failures.

### For the Industry

For the personal computer industry, Lisa spells the dawning of a new age. At last, there is no need for the user to master programming languages, operating systems and all the jargon of computing. In fact, from one rather obtuse

viewpoint, Lisa takes all the fun out of it!

But there is no doubt that the extreme simplicity of use makes Lisa a great leap forward from other leading-edge computer designs such as the DEC and IBM PC's. It takes the concepts developed at Xerox and puts them to work for the first time with a range of application software and demonstrates the payoff in terms of learning time and personal productivity.

For those who like to think in terms of a gigantic battle between IBM and Apple for the personal computer mar-

ketplace, this new machine gives Apple more than just a breathing space – it has maintained Apple's lead in terms of meeting the needs of personal computer users.

While Lisa has been announced in Australia, it will not be available until the second quarter of the year. The system includes the computer with one megabyte of memory and two built-in floppies, a five megabyte Profile drive and the six integrated application programs – at a suggested retail price of \$11,950. At first glance, that's a lot of money, but for a system with that much memory and a hard disk, that lovely Smalltalk system is virtually free.

Now that this kind of technology is becoming commercially available at a reasonable price, the nature of the whole game is going to change. □



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# Lisa With An S

By Frank Linton-Simpkins

A LITTLE OVER three centuries ago, a man called Giocondo married a lady called Lisa and sometime after that marriage Leonardo da Vinci, during one of his periods of relative poverty, painted Mona Lisa Gioconda and thereby raised all sorts of questions.

Mona Lisa Gioconda has become the symbol of the eternally enigmatic woman, a cardinal warning to brush your teeth after meals, the very archetype of the smugly pregnant woman, the first women's libber in history to get painted, and so on...

My bet is that the enigmatic smile on the face of Mona Lisa Gioconda was caused either by the fact that she knew it was going to cost Mister Giocondo a bomb and it served him right, or just because Leonardo wasn't too good at painting teeth. I mean, anyone who can have 12, pardon 13 (one mustn't forget the composition of a coven) people at a dinner party, all sitting on the same side of the table, has to have allowances made for him.

But now, centuries after Mrs Giocondo refused to bare all in the teeth department, another Lisa that is even heavier on the symbolism has been thrust into the savage world of small business computers. Lisa is a product of that least enigmatic of computer companies, Apple, and Lisa made the screens of several of the local television stations in Sydney and, for all I know, was on the national networks as well.

Lisa, it seems, has passed through the barrier of literacy and to communicate with its users employs certain readily identifiable symbols. This is rather like having those international street signs with easily understood pictures rather than having to re-track your way through your high school Welsh as you cross from England into Rugby and Mead country. It is also similar to the use of symbols on voting papers in places like rural India.

As in the case of Mrs Giocondo's portrait, the idea behind the new Lisa was inevitably going to have its day. The new Lisa follows after the 'User Friendly' concept, that computers could be used by the data-processing illiterate if the system software could be made to help in a hand-holding mode. Now it is seemingly hoped that the generally illiterate can be lead into the operation and programming of computers, with the aid of Lisa's soft guiding hands.

Lisa should be welcomed the way that Mona Lisa Gioconda would have been by

the businessmen of the 1500s, with avidly opened arms.

If Lisa can deliver what she seems to promise, then the Apple Computer Company can look forward to a future of vast prosperity and much luxury. For years and years, your average businessmen hated his computer people with an unrequited detestation that he could neither admit to or slake with their blood. He had to have computers and, therefore, he had to have computer professionals. Those professionals he rightly suspected of being radicals who might just be smarter than he was.

Perhaps our average businessman would have suspected that his computer people were better educated and more intelligent than he, but he was 'Smarter'. One recalls the words of the great Professor Parkinson reporting on the attitudes of certain senior managements, "He's brilliant to be sure, but is he sound?" and "We rather distrust brilliance here". Was Parkinson an Australian, I wonder?

For all these reasons, and others like jealousy and the hatred of the young by the aging, computer people within most organisations were feared, reviled and hated, and by no one more thoroughly than the management. This was exacerbated by management refusal to train computer people themselves so that they had to headhunt one another's experienced computer staff, which in turn forced up the wages that had to be paid and this, in its turn, increased the resentment of computer people by managements.

Lisa seems to offer the glimmering of a return to management's golden age, the immediately pre-computer era. Best of all, there are hopes that the jobs being 'saved' by the computer's introduction may in good time include those of computer people as well.

Lisa certainly makes the operation of the computer well within the range of abilities of even the Sydney Hill habitues, who regularly hurl full beer cans at the police, their wives, the English cricketers and other authority figures.

The heavy intellectual loads involved in such mind-cracking tasks as moving the cursor around the screen have largely been removed on Lisa. No longer does the hapless operator have to work out what the arrows mean on cursor control keys. He, she or whatever (there is an anti-discrimination law in New South Wales and I'd hate to leave anything out

and risk a charge of judeo-christian bias) has a sort of sliding block that is moved about a flat surface and on the screen the cursor mimics the movement of the nimble-fingered operative.

But before any celebrations are planned to light up the minds and hearts of the Institute of Directors and the Federation of Australian Industry, be warned that Lisa is another first, a machine that will bring the most benefit to the small business sector of Australian life. With all its excellence, Lisa might still have certain problems of breathlessness if asked to prepare networking programs to handle something like the Westpac Bank's operations in New South Wales, let alone on a national basis.

Lisa will bring most to a relationship with a small or smallish business. She is probably that ideal personage, a one-business woman. This lady might be induced, like the lady Catella in the sixth novel of the third day of *The Decameron*, to share some of her bounty, but not without such soul searching and some deception that might require the services of one of those snide computer professionals.

It's rather interesting that only about 30 years after they first appeared on the scene, the best-fed industrial group in the history of the world is fast fading from our awareness. The dinosaurs reigned for about 100 million years, man himself has run for about three million years (or 7000 plus, if Darwin was wrong) and now homo-computeris-Babbageia has run for the time 1946 to 1983. The Lords of Creation seem to be having a shorter run in each successive generation.

How long will the computers and their associated machinery last as man's replacement in the Lord of Creation business? Will the computers finally decide that they also need a god and build one in their own image and likeness? Will their garden of Eden be the laboratories of Presper and John? Will their Eve be Ada Countess Lovelace? Their serpent, the Univac salesman who sold the first commercial computer to that American insurance company in 1950? Their Cain the first man to fit a computer on to a guided missile or bomb?

It seems somehow appropriate that the first computer system that really looks as if it will do in the computer professional carries a woman's name. One recalls Eve, Delilah, Pandora, Kali, *et al.* Now it may be that we will also have to add Lisa with an S. □

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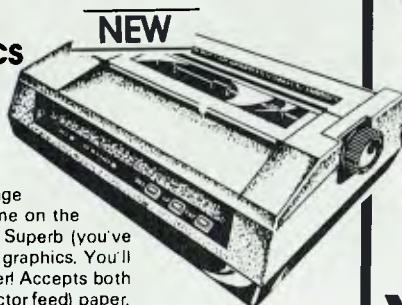
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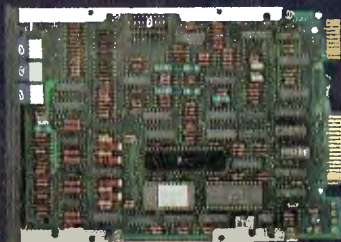
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Cash	500.00	500.00	525.00	525.00	6483.39
Unsold Goods	250.00	262.50	65.63	578.13	3769.28
<b>Total Assets</b>	<b>750.00</b>	<b>1812.50</b>	<b>1693.13</b>	<b>4255.63</b>	<b>26289.88</b>
<b>LIABILITIES</b>					
Acct.s Payable	20.00	18.33	16.81	55.14	155.52
Storage Costs	50.00	50.00	50.00	150.00	600.00
Labor	100.00	105.00	110.25	20000.00	21276.46
Materials	1000.00	100.00	105.00	1205.00	2004.43
<b>Total Liabilities</b>	<b>1170.00</b>	<b>273.33</b>	<b>282.06</b>	<b>1725.39</b>	<b>4351.66</b>
<b>NET</b>	<b>420.00</b>	<b>1539.17</b>	<b>1411.07</b>	<b>2530.24</b>	<b>21938.14</b>
Dep. Allowance	100.00	100.00	100.00	300.00	1200.00

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 Width: 9 Memory: 66 Last Col/Row:U254 ? for HELP  
 Function keys: F1 = HELP ; F2 = ERASE LINE/RETURN TO WORKSHEET

Now that IBM has released its new personal computer, many observers feel there will be a spate of new machines which are compatible with it. Les Bell examines one of the first to arrive...

THE IBM Personal Computer has been available for over 18 months in the US, and in that time a number of new machines have appeared which are claimed to be IBM compatible to at least some degree. Indeed, some industry observers feel that through its use of Microsoft's MS-DOS operating system, freely available to other manufacturers, IBM has opened the doors of the personal computer industry to the Japanese. Certainly Microsoft has always been a major supplier of software to Japanese companies.

But it seems likely that the closest competitor so far to the IBM PC, in terms of

both hardware and software compatibility, is an American product: Columbia Data Products' Multi-Personal Computer (MPC).

The MPC is slightly larger than the IBM PC, and the enclosure is rather simpler in design, foregoing IBM's 'slanted' front

panel look. The most common configuration has two double-sided floppy disk drives (320 Kbytes/drive), although one of these can be replaced by a 5 or 10 Mbyte hard disk unit.

In front of the system box is a keyboard which is identical in layout to the IBM's, although it doesn't have the unusual 'clicky' feel of that machine. The keyboard also doesn't tilt up, although it's perfectly comfortable in its low-profile position.

At the rear of the machine is the power switch, keyboard connector and access to the connectors of plug-in boards. There are also two serial port connectors, a parallel port, a hardware reset button and - praise be - a fuse holder!

Inside, the layout is also similar to the PC. However, the main board is rather larger, with eight expansion slots as opposed to five, a difference which Columbia feels will be critical to the machine's success. The expansion slots are compatible with IBM's and other peripheral/memory boards and accessories.

your computer



Many of the functions which are handled by optional boards on the IBM machine are standard on the Columbia. For example, the disk controller is on the main board, and does not take up a slot. Incidentally, there's no cassette interface on the MPC – but it appears that less than one percent of IBMs are used with cassette only.

Similarly, two RS-232C ports are built in, as well as a Centronics parallel printer port – both optional extras on the IBM.

### Colour Graphics

The Columbia is supplied with a colour graphics card as standard – in fact, on early models it is the IBM colour graphics card, which shows Columbia is taking the question of compatibility very seriously. The card provides outputs for both NTSC television (not very useful in Australia) or an RGB direct-drive monitor, which provides very high quality.

The main board also carries 128 Kbytes of RAM with parity, enough for serious work. The only ROM on the MPC contains the disk bootstrap and a small monitor program. Unlike the IBM PC, which has Cassette BASIC in ROM, the MPC loads in BASIC completely from disk. Regular readers (particularly Tandy owners!) will know that I much favour this approach as it doesn't leave 32 K of wasted space while running Pascal or other languages.

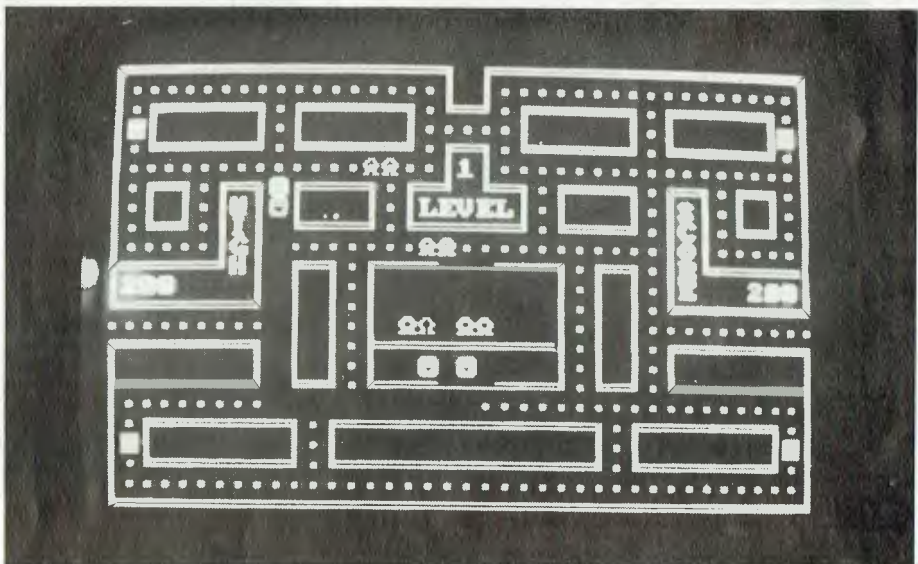
In addition, and as its name suggests, the Columbia MPC is designed to support multiple users simultaneously – something that is not realistically possible with BASIC in ROM wasting space. In any case, the MPC will support up to 1 Mbyte of memory, and as a hard disk is required to support multi-user operation, the hard disk controller is also present on the main board.

As well as the 13 cm floppy and hard disks, the MPC will also support 20 cm floppy and hard disks for greater capacity, although the bulk of users will probably stick with the smaller drives.

One feature of the PC that the Columbia currently lacks is a real-time clock. MS-DOS asks for the time and date on power up, but the real-time clock runs slower than real time by a factor of three. Presumably this is just a software bug in MS-DOS, and can be fixed by a patch. On the other hand, Columbia has a time/calendar board which probably offers a much higher level of functionality as well as working right.

### Software

As mentioned above, the operating system used by the MPC is MS-DOS, the generic version of IBM PC-DOS. It comes complete with the usual utilities, as well as a few extras. An installation utility allows the serial ports to be initialised on cold



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6. Customization facilities. Applications notes and assembler files supplied with package.		6. "WordStar Customization Notes" available. <b>Cost \$500 plus tax.</b>

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boots and enables tab character expansion in printer drivers, as well as allowing systems to be built for other disk systems.

Two BASICs are supplied. Microsoft BASIC version 5.22 is the standard BASIC which knows nothing about hardware features such as graphics or programmable function keys — in fact it doesn't even have the CLS statement. However GW (Gee Whizz?) BASIC has the same specs as IBM BASICA, which includes high resolution graphics extensions, communications and interrupt handling functions.

On test, the Columbia seems reasonably quick. On the Interface Age prime number benchmark the machine turned in a performance of 14 minutes 13.72 seconds, while it completed our disk write test in 27.35 seconds. Both these results are similar to the IBM PC.

The Columbia is also supplied with CP/M-86 as standard, together with a number of configuration utilities. Gentle aside to Columbia: who wrote these utilities? They don't respond to control-C or ESC or anything as a way of breaking out of the program without altering anything, leaving the user with no option but to re-boot the system. Silly!

Other standard software includes the Perfect Writer word processor program which seems to do everything you might expect a word processor to do, and Perfect Calc, a spreadsheet calculator program.

Other operating systems are available: MP/M-86 is now being delivered for multi-user operation (up to 8 users), and OASIS-16 (a popular commercial multi-user system) will soon be available. Xenix (Microsoft's version of Bell Labs' UNIX) is also planned.

For those who can't leave behind existing 8-bit software, a Z-80 plug-in board allows CP/M 2.2 to run in the system.

A few small considerations show the thought that has gone into the Columbia product. For example, the user can bypass the power-up self test, saving considerable time if a lot of memory is installed. Under MS-DOS, the system prompt is 'A:' — and a useful reminder to the user that he is using MS-DOS rather than CP/M-86.

### Problems Cured

As regards software compatibility with the IBM PC, early difficulties seem to have been fixed and the unit appears to be free of problems. Columbia has prepared a list of software which has been tested on the MPC; this includes all the most popular packages such as the Visi's, database management systems, communications utilities, the Context MBA, a stack of Digital Research and Microsoft languages and even Concurrent CP/M-86.

I have tried Visicalc and Visiplot/Trend

and both worked fine; the only difficulty encountered was in writing copies of the MS-DOS operating system onto the disks and this is probably related more to the peculiarities of MS-DOS (to my CP/M-oriented mind) than to the Columbia. Other games, including the Microsoft Flight Simulator and even the IBM demo package, worked fine.

The chief designer of the MPC, Columbia's David Howse, came out to Australia for the Melbourne Data 82 show and we were able to have a chat to him. He had similar ideas to our own about such topics as MP/M-86, C compilers and the like, with a healthy scepticism and conservatism in his design approach. This may be one of the reasons why the Columbia seems to do what is claimed for it.

All in all, the Columbia MPC seems like a solidly constructed and well designed computer. Several of its features are so obvious one has to ask 'Why didn't IBM think of that?', and it seems to provide a package of equivalent or superior performance to the IBM PC at much lower cost.

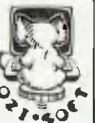
While there is no way the Columbia is going to outsell the IBM PC, it will undoubtedly enjoy a high level of success. The Australian distributor for Columbia is President Office Machines, 100 George Street, Hornsby. A typical two-drive colour system costs \$6356. □



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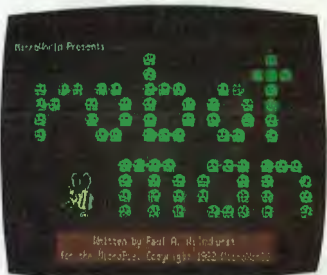
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# MICRO WORLD UPDATE

## NEW 'PLUS' SERIES WITH EXTRA FEATURES

### 16K PLUS

The 16K PLUS with features such as built in music generation, high and low resolution graphics, with a screen display of 16 lines each containing 64 upper and lower case characters. When you also consider all of the standard extras like continuous memory, built in printer and input/output interfaces and parallel port, 4.5 volt battery back-up and self testing BASIC in ROM, the MicroBee 16K PLUS is unbeatable in its class.

### 32K PLUS

All of the standard features of the 16K PLUS with twice as much usable RAM. When you add the new Word Bee ROM Pack, you have a powerful word processing capability which does a lot more than play the many games available for the MicroBee. Add a printer and maybe even the Tasman Turtle and just see what you and your family can now do with your home computer.

### 64K PLUS



The MicroBee 64K is equipped with 56K of user RAM with Battery backed continuous memory and has built-in 80 x 24 screen format as well as 64 x 16 line. All characters are upper and lower case and powerful graphics are readily available. A value packed exclusive feature of the MicroBee 64K PLUS is that it can double as an ADM3A Terminal operating in serial mode at either 300 or 1200 baud (full or half duplex). You can add a modem and use your MicroBee 64 as your personal information window to the world.

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## ROM PACKS WORDBEE — a full featured Wordprocessor.

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**WORDBEE is friendly and easy to use, and has extensive HELP files built into the ROM.** It uses the familiar control key and dot commands from WORDSTAR, the on-line help from WORDMASTER and the on-screen formatting from ELECTRIC PENCIL.

## EDASM — MicroBee monitor and Z80 Editor Assembler.

This ROM pack converts your MicroBee into a combined BASIC/MACHINE CODE/ASSEMBLY LANGUAGE unit and is ideal for those who need to develop programs in machine code. Built in commands include EXAMINE and MODIFY memory, BLOCK MOVE and FILL memory, EXECUTE a program, READ and WRITE to cassette tape, SEARCH and COMPARE code and RETURN to BASIC.

## NETWORK 1

By popular demand we are making this ROM available for networking to other computers over the telephone lines. Contains the software to convert any 16K/32K MicroBee into a 'DUMB TERMINAL'.



## ARCADE GAMES

*Ideal for parties, these action games make full use of the superb graphics and sound effects of the MicroBee. Your friends and family are set for hours of fun and excitement!*

### "ROBOT MAN" — A New Release.

You must move about the maze eating up the power food. Watch out for the Robot Men as they are programmed to destroy you before you complete your mission!

### "MICROSPACE INVADERS"

Yes the arcade favourite! This fast-moving version was written especially for the MicroBee by Tim Morris-Yates and has become one of the most popular programs yet released.

### "MISSILE WARS"

Equipped with radar and ray cannons your mission is to defend your city against the attacking alien invaders. This game is fast moving and very exciting. The graphics and synchronized sound effects will really involve you in the game.



"BEE Quick the Invaders are coming"

"BEE think it Mazing"

## EDUCATIONAL SOFTWARE

*Because the MICROBEE is recommended for use in Australian schools, considerable software is now being written to match the curriculum in several States. Demonstration programs are available on EDPACK I and EDPACK II. Watch for the release of OZLOGO, PASCAL in the near future!*

### TURTLE GRAPHICS

A very clever program allows the student to use the MICROBEE to draw using high resolution turtle graphics. A booklet of procedures is available from the NSW Department of Education. This is a very powerful graphics program which uses the PCG facility in the MICROBEE to its full extent.

### WORK-A-BEE

A new release. WORK-A-BEE is a program which can actually write educational programs almost automatically! Any teacher with little or almost no knowledge of BASIC can insert details as to question and answer, number of tries, marks per question and other controls. Any CAI program can be saved and reused and subroutines have been included to enable the student to go back over his work, printing answers, avoid error traps etc.



## FAMILY GAMES

### "CHESS"

Match your skills against the MicroBee chess master. You can select from 1 to 6 ply and also analyse any position. A built-in 'HELP' feature enables the computer to play YOUR current move.

### "CONCENTRATION"

A real family favourite for 1 to 4 players to test your memory skills. If you call one player MERLIN, the computer will play that turn so watch out!

### "HOUSE OF FRANKENSTEIN." A New Release

The first adventure game for the MicroBee. Needs a 32K machine and can take weeks to resolve. Has built-in game save facility to re-load the game and resume play from your last session.

### "BIORHYTHM/CALENDAR MAKER"

Ideal for parties or carnivals. Requires a serial printer. You can print BIORHYTHMS for anyone — just enter their name and birthday!

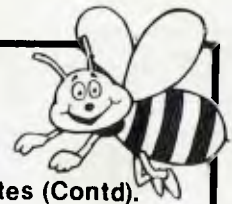


## COMPUTER UTILITIES

*These programs are included as enhancements of the MicroBee computer itself.*

**PCG TUTORIAL — ESCKEY — and DISSEM are three of them.**

# MicroBee PRICE LIST



## HARDWARE

### MICROBEE PLUS SERIES

(See features on previous pages)

110.017	MicroBee 16K PLUS	\$449.00
110.032	MicroBee 32K PLUS	\$549.00
110.064	MicroBee 64K PLUS	\$699.00

**MONITORS** — Three to choose from or you can convert your old black and white television. We recommend the KAGA Green Screen with 18 Mhz bandwidth for serious users and the new MicroBee Monitor with built-in power supply for general purpose, but quality Green Screen performance.

150.020	KAGA High Resolution Monitor	\$299.00
150.022	MicroBee Hi-Resolution Green Screen	\$199.00
150.025	B. & W. Monitor (converted television)	\$149.50

### CASSETTE RECORDER —

High reliability cassette recorder such as National or Sanyo is recommended. We will supply with your MicroBee.

150.030	High reliability cassette recorder	\$39.50
---------	------------------------------------	---------

### BLANK DATA CASSETTES —

For saving your own programs. Made in Australia to our specifications.

110.310	C10 Data Cassette	\$1.20
110.311	C20 Data Cassette	\$1.30
110.312	C30 Data Cassette	\$1.40

## CASSETTE BASED SOFTWARE

### NEW RELEASES —

(As featured previous page).

250.042	Robot Man	\$14.75
250.048	Work-A-Bee	\$14.75
250.049	Turtle Graphics	\$14.75
250.045	House of Frankenstein	\$14.75

### OTHER MicroBee Cassettes

(Also featured previous page)

250.020	Microspace Invaders	\$14.95
250.036	Missile Wars	\$9.95
250.022	Chess	\$9.95
250.021	Concentration	\$9.95
250.027	Biorythm Calendar	\$9.95

### MORE MicroBee Cassettes

**Z TREK** — Captain! The warp drives are disabled, the Klingons are closing in on us, what will we do? In Z Trek YOU are the captain of the starship Enterprise, your five year mission to search out the

### MicroBee Cassettes (Contd).

Klingons and destroy them. There are ten levels of difficulty (0 - 9). Beware of this game — it is strangely addictive.

250.032	Z Trek	\$9.95
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### WUMPUS — THE ADVENTURE GAME

Have you ever played the game Wumpus? If you liked it then you'll like this! The object is the same as the earlier version except that it's a lot harder. To say any more would spoil the fun. Good Hunting!

250.031	Wumpus	\$14.75
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**ESC KEY** — This is a program for all of the two fingered typists in the world. The program allows you to enter BASIC key words in an abbreviated form. For instance, instead of typing "list" the user would type "esc" and then "1". The computer then types out the rest of the word for you. Suitable for 16K and 32K machines only.

250.041	ESC Key	\$9.95
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**GRAPHIC GAMES** — This cassette contains five programs, 'Poker', 'Slots', 'Dodgem', 'Picture', 'Ricochet'. 'Poker' is the main program on the cassette. In this game the computer is the bank and you have to beat it at Draw Poker.

**Warning** — the computer plays a cunning game and is quite prepared to bluff! 'Slots' is a one armed bandit and for 20c a go you can try your luck. In 'Dodgem' the player must guide his car through a forest to the bottom of the screen — this game allows you to drive a car without the random breath tester getting you!! 'Picture' is an excellent game for the children. The final program on the cassette is 'Ricochet', where the player is to decide when to fire a bullet through a hole in the wall. If you hit the wall you're dead.

250.035	Graphic Games	\$9.95
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**PCG SAMPLER** — The PCG Sampler cassette has eight programs on it. These programs show you how the PCG works and demonstrates its capabilities by way of games etc. The cassette is excellent for both beginners and experts. It allows you to design your characters on the screen, so you can see exactly what you are creating. Suitable for all MicroBees.

250.037	PCG Sampler	\$9.95
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**STARSHOOT/HANGAMAN** — Starshoot is perhaps one of the most deceptive games available on computer. It appears to be very easy: it isn't.

### MicroBee Cassettes (Contd).

Hangman is based on the popular school game that everybody knows.

250.026	Starshoot/Hangman	\$7.95
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**ELIZA** — Want someone to talk to? Eliza is possibly the person for you. (If you can get her to shut-up). Eliza is a program that demonstrates artificial intelligence. Eliza is prepared to talk about life, the universe and everything.

250.028	Eliza	\$9.95
---------	-------	--------

**TYPING DRILL/SOLITAIRE** — Want to become a touch typist? Typing Drill enables you to learn touch typing without paying an exorbitant fee to learn. Solitaire is a game in which the object is to remove all of the "pegs" from the board, leaving one peg in the centre of the board. Sounds simple, but, it requires skill to master it.

250.023	Typing Drill/Solitaire	\$9.95
---------	------------------------	--------

**TARGET** — Target is a game of hit and miss. Your task is to aim the cannon at the bottom of the screen and shoot down the U.F.O.'s (ET watch out). There are nine levels of play to this entertaining game thus making it suitable for any player. Suitable for all MicroBees.

250.024	Target	\$9.95
---------	--------	--------

**LUNAR LANDER/HURKLE** — Crash! This game was probably originally designed by N.A.S.A. scientists — after all it's much cheaper than Apollo. The object of Lunar Lander is to land your space craft on the moon without using up all of your fuel. Don't laugh and say that's easy: it isn't.

For a description of Hit the Hurkle please see the Kids Pack.

250.025	Lunar Lander	\$7.95
---------	--------------	--------

**MASTERMIND/NIM** — The Mastermind on this tape is quite similar to the version on the Kids Pack except for the fact that you can enter up to nine digits as the mystery code. This makes the game extremely interesting and mind bending. Nim is also played in a similar style to the version in the Kids Pack except that you can have up to 9 piles of 'matches'.

250.030	Mastermind/Nim	\$9.95
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## ROM BASED SOFTWARE

(See features on previous page)

250.003	Editor Assembler	\$59.50
250.040	Word Bee ROMPAK	\$89.50

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# your computer text file

## Educated Thieves...

ALTHOUGH most microcomputer users are fully aware of the extent of software piracy which is taking place in the community, it is with despair that I have been so often told that the worst offenders may be teachers in our schools.

It appears that quite a few teachers offer a software distribution service to students, who only need to bring a blank disk to school to receive free 'bootleg' copies of almost any software.

It is surprising that Education Departments do not actively discourage this. In fact rumor has it that at many inservice conferences, teachers themselves openly distribute their software acquisitions.

The scarcity of well written educational software on the marketplace is surely a result of the actions of the teachers who have given their profession this reputation.

It is hard to imagine how these teachers can hope to facilitate the moral development of their charges, or even encourage a normal respect for justice and law when they set this sort of example.

While it may be some time before we see individuals being prosecuted under copyright laws, I suggest that either teachers, schools or Education Departments will become prime targets for such actions.

COLIN LEGG  
*Computer Cognition*

## The Whole Truth

MANY THANKS for a fine publication which I look forward to reading each month. I especially like the local news information which is much better than the overseas publications as it relates to Australia.

I am the owner of a Peach Computer and as such also look forward to the articles on this machine. The article on the Peach by Dom Swinkels, in the October issue, was especially informative (and I agree with the comments about 'poor' documentation), but I am afraid doesn't tell the 'whole truth'.

With regard to table 2 and the disk

BASIC starting address, the addresses quoted are true if the system is configured for four file control blocks (FCBs) however, if a different number of FCBs have been set up by the 'CONFIG' program the address will be different by hex 8E per FCB. The easiest way to find the start of BASIC is to examine memory locations 1D and 1E (hex) with the monitor or a peek instruction.

Another problem that a number of people up here have had is using other than the 'standard' printer. The computer can be configured to output either line feed, carriage return or both. My printer (an old Centronics) requires both and the problem can be fixed with the instruction POKE &H112,0 (see page 1-10 in the owner's manual).

I have also included a listing of a small program to change the field frequency of the video output from the Peach (it is set at 60 Hz instead of the 50 Hz used in Australia). This may be necessary if an older monitor (with a small amount of hum in it) or a modulator is being used. This may also save pulling the machine to pieces to change the crystal (supplied with the modulator card). The problem shows up as a wavy or jittery picture caused by a beat (at 10 Hz) between the mains frequency and the computer field frequency.

```
10 HITACHI PEACH COMPUTER
20 FIELD FREQUENCY CHANGE PROGRAM
30 P A STEEN 18/07/82
40
50 POKE &HFFC6,&H4 POKE &HFFC7,&H26 :field frequency set
60
70 POKE &HFFC6,&H5 POKE &HFFC7,&H3 :fine tune frequency
80
90 POKE &HFFC6,&H7 POKE &HFFC7,&H1F :adjust vertical position
100 END
```

The first poke on each line selects the appropriate register in the CRT controller chip and the second inserts the new value. It is not possible to peek these locations to see what is there. Line 70 is a 'fine tune' of the frequency and the value &H3 can be moved up or down slightly to completely remove any hum bars. The horizontal frequency is unchanged and the picture will fill the screen slightly more than it did before.

This program has to be run each time the computer is restarted. I have included this and the printer routines in a program which auto starts each time the computer is switched on.

PHILIP A STEEN  
*Chermside, Qld*

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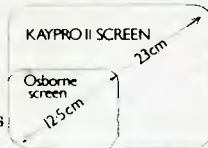
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# Here Comes SuperBee!

By Lindsay Shapero

*Applied Technology's MicroBee is one of the success stories of the Australian computer industry. It was the right machine at the right time, and has captured the imaginations of more than 7000 people already. New peripherals, lower-cost expansion, and an excellent colour version launched this month should ensure its further success. Lindsay Shapero has the details...*

IT'S BIRTHDAY time for the Australian-designed runaway success, Applied Technology's MicroBee – and to celebrate the occasion, the company has launched an exciting new range of options for this brilliant little machine.

The most obvious, even if it won't be the most popular, update is the release of the colour version – the arcade-game freaks will love it. Excellent quality high-resolution colour graphics transform the Bee's display, putting new life into games, business graphics, charts and even word processing packages such

as WordStar (running on disk-based CP/M versions of the machine).

Other new releases will include a modem (currently with Telecom for approval testing) and a surprisingly cheap disk system. The disks, slim-line Hitachi 13 cm units, fit 800 Kbytes on two double-sided, double-density drives in the same size package as a standard single minifloppy unit.

This set-up, at around \$700, allows you to put together a twin-drive 56K CP/M system for less than \$1500!

We've recently had a play (unfortunately, too brief for a review – yet) with a fully specified CP/M colour Bee, and it's impressive. It has several of the advanced features of Morrow Designs' Micro Decision (*Your Computer*, November 1982) such as 'virtual disk drives' and the ability to read disks in a wide variety of popular formats (IBM, Osborne and so on).

The virtual-disk concept is the answer to a single-drive user's prayers: if you try to log on to a non-existent drive, the operating system simply re-assigns drive A: and prompts you to put the disk in there. When you want to go back to the real drive A: it prompts you to change again.

In a single-drive system, this means you can do the formerly difficult tasks of disk copying and file transferring easily, as well as running many applications programs which require two drives. On a multi-drive system, you can have an extra logical drive for those times when two just isn't enough.

An obvious application is for those who want to read files from Osborne disks (or any of the other formats supported) – they simply nominate drive C: as the special format using the Bee's SETDISK program, and access it when needed.

The system can also handle both single- and double-density disks. Cassette tapes as well as disks can be loaded.

## Wide Screen

The Bee now supports an 80 by 24 screen (in fact, it defaults to it in CP/M, reverting to 64 by 16 in BASIC), so in all ways it behaves like a fully professional machine. It really has grown up in a year!

It's already one of Australia's most successful home-grown products – a reasonable price and wide range of

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capabilities have generated sales of 7000 units since its launch in *Your Computer's* February 1982 issue.

Applied Technology's Owen Hill, driving force behind the MicroBee, doesn't plan to rest on his laurels. He believes he'll sell 20,000 units in 1983, many of them to schools. Already there are more than 2500 machines in Australian schools, and with approval from the NSW Education Department and a recently won Education Department contract in Western Australia that figure should grow rapidly.

Owen also plans to take the MicroBee to the rest of the world this year: he hopes it will be manufactured under licence and distributed in countries such as the USA, UK, Germany, Canada, Israel, South Africa, Malaysia and New Zealand.

Further developments are already on the drawing board, or at prototype stage. One of the most enticing is Owen's plan to create a portable business machine by fitting the slimline drives side by side under the keyboard, in a new briefcase-style carry-case. This would increase the machine's height by only an inch or so, making it one of the smallest and lightest portables seen so far.

Add some CP/M software like

WordStar, Supercalc and Microsoft BASIC at an all-in price perhaps up to \$1000 cheaper than the portables currently available and you have a MicroBee that has more than grown up...

## Quality Colour

One of the most noticeable aspects of the colour MicroBee is its high resolution — 512 by 256 bit. It is set up for RGB output, and at the moment can either plug into an RGB monitor or into a modified domestic television set. The modification costs around \$50, depending on the TV, but is well worth it — the quality of the colour display, even in 80 by 24 mode, is among the best we've seen. Naturally, the modification is switchable, so you can still watch Star Trek after playing it.

There is also a wide range of colours available — 26 background, and 26 foreground (the printed matter on the screen), selectable in any combination. We particularly liked the black-on-black, as it made it easy for us to hide confidential text from passers-by...

The colours are not in fixed blocks on the screen, but can appear at the user's will, as individual words or letters and even in intricate patterns and designs. They are supported by BASIC and easily accessed by user routines.



"Most people with small popular computers, like the VICs, will put a border around the edge of the screen because of various display problems, and will end up with 22-40 characters maximum. We have 64 characters minimum, as we use RGB and switch the colour guns directly," said Hill.

### Schools The Target

Applied Technology claims to have targetted the MicroBee initially to education programs, and it is in this field it is having a lot of success.

Recently it won a tender (against IBM, amongst others), for the MicroBee to be used throughout schools in Western Australia. This tender is shared with the BBC (British Broadcasting Corporation) machine made by Acorn, running CP/M - which seems to be fast taking over as the standard for all school computers.

"Schools are moving faster than you realise" said Hill. "In Tasmania they have very advanced networking; South Australia has ambitions of the same, but hasn't progressed as far, and Western Australia is very advanced. However, New South Wales is very much the 'sleeping giant'. We have WA and NSW - one more state and we have a major penetration of the education market."

Demands on a school computers are increasing; toys are not good enough. The MicroBee will be used in secondary schools and technical colleges, although it does have some simple programs for children in lower grades. These programs are for children unfamiliar with letters, and this is where the colour graphics come into their own.

"Education is changing. The computer in this format used to have all information on a teleprinter, then screens, but still with the printing idea. But there is a need to inform younger minds who are getting more experimental - a need to be more graphic - and especially with the use of colours." Hill explained.

"Colours are as necessary as colour pictures in a book. Computers are real enthusiasm generators, and kids can also pick their own colour combination to work in," he said.

Hill sees the education field as one of the big markets of the future.

"In 1984-5, there should be major grant monies for computer studies in schools, like the drive for better libraries 10 years ago. An established \$300 million could be spent on computers," said Hill. "This is not just in Australia - all countries worldwide are now thinking that way."

### Raster Graphics Next?

One of the next steps Applied Technology will be taking is the development of even higher quality, raster-scan graphics (instead of the current programmable character generator, or PCG, system).

This will be especially useful in medical electronics, or conversely just for doodling. It should be available around the end of 1983.

It is one of several advanced developments Owen Hill seems to have crowding the back corners of his mind. Another is the idea of adding on a 68000 processor - and running a multi-user Unix system on the little Bee! It seems he has thought of just about every add-on you could ever want.

If you are now cursing yourself for buying the monochrome MicroBee - don't worry. Applied Technology has set up an independent dealer network in every state in Australia, which can update your model to take full advantage of the new colour capabilities.

In fact, that's an example of one of the Bee's most impressive features: the fact that even the raw board-and-bits kit version can be upgraded to take advantage of all the new developments as they come along.

It's one of the few machines on the market where you really can go from a basic, low-cost suck-it-and-see model to full-blown business power without having to junk it all and start again.

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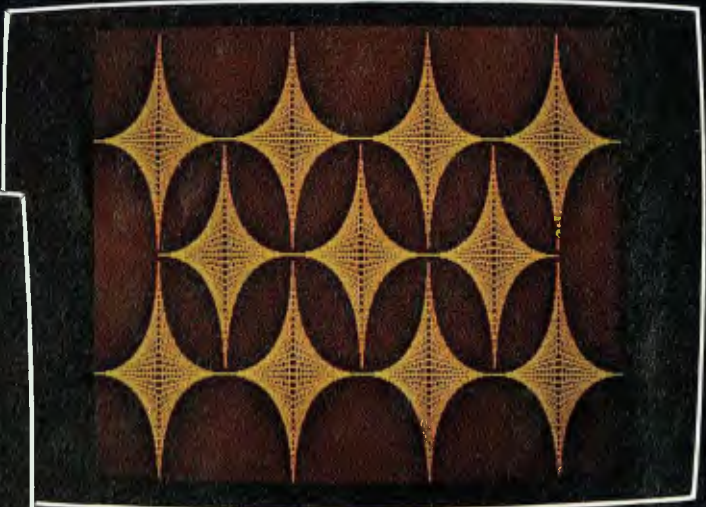
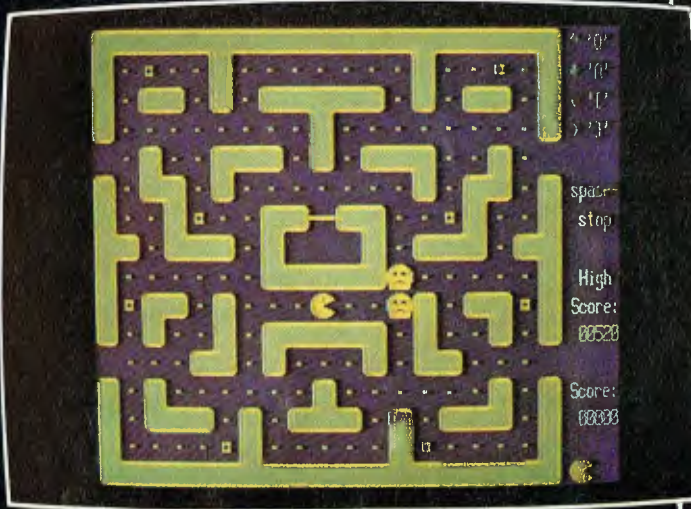
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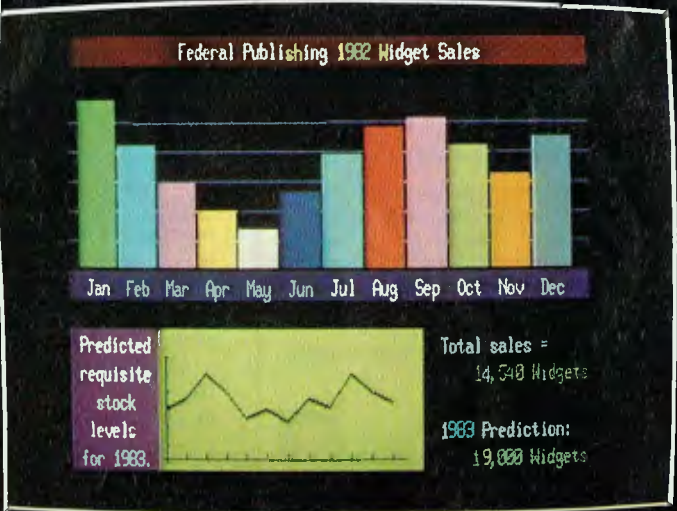


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# Here Comes SuperBee!



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 The quick amber fox jumps  
 The quick aqua fox jumps  
 The quick purple fox jumps  
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 The quick white fox jumps  
 The quick blue fox jumps  
 The quick cyan fox jumps  
 The quick purple fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
 The quick white fox jumps  
 The quick red fox jumps  
 The quick green fox jumps  
 The quick magenta fox jumps  
 The quick white fox jumps  
 The quick violet fox jumps  
 The quick yellow fox jumps  
 The quick grey fox jumps  
 The quick green fox jumps  
 The quick yellow fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
 The quick grey fox jumps  
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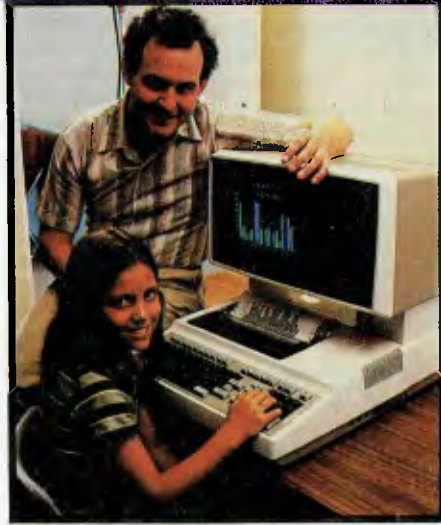
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# muSimple muMaths

By Ron Haines

MICROSOFT Consumer Products' muSIMP-80 is a programming language rather like LISP, and muMATH is a program – or more exactly, a series of programs – written in muSIMP-80. Together, they form a powerful system for performing algebraic manipulations.

Conventional programming languages like BASIC, FORTRAN and Pascal are numerically oriented; you encode a formula in the language to produce a program. The program then operates on a set of data to produce numerical results.

muMATH lets you go one step back – it allows you to operate on the formula itself. With muMATH, you can solve equations, differentiate expressions, expand functions in Taylor series, and invert matrices; these are just a few of its capabilities.

In addition muMATH can perform exact integer arithmetic with a precision of around 600 decimal digits.

These features could let muMATH do for engineering and scientific applications what Visicalc has done for business and commerce.

As an example of muMATH's arithmetic abilities, we could ask it to calculate  $4,576,238 * 5,981,294$ :

```
?4576238 * 5981294 ;
@:27371824891972
```

This type of calculation takes about a second on a 2MHz Z-80 system. The question mark is the standard muMATH prompt character and input to muMATH is generally terminated by a semi-colon. The results of all calculations are prefaced by @:.

The colon is the muSIMP assignment operator so the significance of @: is that the result of a calculation is assigned to a variable called '@'. This provides an easy way of carrying over the result of your last calculation into the next; so if I wanted to calculate the square of the last result:

```
?@ ↑ 2;
@:749216797916777989470048784
```

The up-arrow is the exponentiation operator. As you would expect, muMATH has a factorial operator, a greatest common divisor function and also can input and output numbers in any base from 2 to 36. Fractions are treated using exact rational arithmetic; muMATH cannot do floating point arithmetic in the way BASIC or Pascal does.

```
? 1/2 + 1/3;
@:5/6
```

To run muMATH, you start by executing the muSIMP interpreter which is supplied as a CP/M .COM (command) file. The muMATH system is supplied as 16 text files containing muSIMP source code. Each file provides a particular set of mathematical capabilities. For instance, the ARITH.MUS file contains the exact integer and rational arithmetic functions.

These text files are read using the primitive muSIMP RDS function and converted to a compressed code which is executed by the muSIMP interpreter. Most of the source packages require that other pre-requisite files be loaded before them.

The trigonometry package requires that the algebra package be present and the algebra package in turn must have the arithmetic package loaded. By loading only those packages needed for a particular application, you leave yourself with the maximum amount of free memory to store variables and your own function definitions.

Reading one of the larger muSIMP source files may take five minutes. However, once you have created a system it can be saved as a memory image .SYS file with the SAVE function. Loading a .SYS file only takes about 30 seconds, but

they tend to be rather large (around 24K) and so chew up disk space quickly (especially on standard Apple disks).

In this respect, muSIMP is like Forth or APL in that you save the entire working environment including your function and variable definitions so you can pick up exactly where you left off at the last session. The algebraic capabilities of muMATH are wide ranging.

Here are a few examples:

```
? SOLVE( 2 * X^2 + 4 * X + 3 == 0, X);
@: {X == -1+#I/2^(1/2),
    X == -1-#I/2^(1/2)}
```

```
? DIF( 2 * SIN(X)+3 * LN(X) , X);
@: 3/X + 2 * COS(X)
```

```
? { [ 1, 3],
    [ 4, 3] } ^-1;
@: { [-1/3, 1/3],
    [4/9, -1/9]}
```

In the first example, muMATH is asked to solve a quadratic equation for X. The numerical coefficients 2, 4, and 3 could just as easily have been A,B, and C and muMATH would have returned the solution to a general quadratic equation.

The second example illustrates differentiation with trig and log functions. To do this, you would need the trigonometry, logarithm and differentiation packages

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loaded. If muMATH can't do anything with an expression because a required function isn't loaded it will simply return the expression unchanged.

The third example shows a matrix inversion and again the numerical elements could have been replaced by symbolic names.

Some of muMATH's other abilities include the simplification of trigonometric expressions, evaluation of definite and indefinite integrals, determination of limits of functions and the evaluation of closed form sums and products. When working with algebraic expressions, muMATH uses a list of control variables to determine how to expand or factorise expressions. To use muMATH effectively you need to develop some skill in manipulating these control variables. While muMATH will always give the correct answer, it may not look anything like the answer you want.

There are 13 control variables or flags, one of which is quaintly called NUMNUM. The effect of NUMNUM on the expansion of a simple expression is shown below. The EVAL function causes muMATH to re-evaluate an expression:

```
? NUMNUM:0;
@:0
```

```
? A: 3*X*(4+Y);
@: 3 * X * (4+Y)
? NUMNUM:2;
@: 2
? EVAL(A);
@: X * (12+3*Y)
? NUMNUM:3;
@: 3
? EVAL(A);
@: 3 * (4*X+X*Y)
? NUMNUM:6;
@: 6
? EVAL(A);
@: 12*X + 3*X*Y
```

To fully utilise muMATH, you need to understand something of the muSIMP language in which it is written. This allows you to extend the system in two ways: 1: You can add new capabilities to the existing muMATH packages using the existing source code as a model, and 2: You can combine the existing muMATH functions to produce new functions for a specialised application. muSIMP programs are written as either functions or subroutines and tend to be short and rely heavily on previously defined functions. Again, this is reminiscent of both APL and Forth. The muSIMP language provides loop and conditional constructs and function definitions may be recursive.

The following example shows both recursive and iterative definitions of the factorial function:

```
FUNCTION FACT(N),
  WHEN N=0, 1 EXIT,
  N * FACT(N-1),
ENDFUN;

FUNCTION FACT(N),
  % local variables % I,F,
  I:N,
  F:1,
  LOOP
  WHEN I=0, F EXIT,
  F: I*F,
  I: I-1,
  ENDLLOOP,
ENDFUN;
```

A muSIMP function returns the value of the last expression evaluated before its termination. Functions may have local variables and may be called with fewer arguments than specified in their definition. The EXIT delimiter is used to leave a function, a loop or a block of code. Attempting to write muSIMP functions of moderate length exposes one weakness of the system. You can enter function definitions in two ways: either by typing them in while the muSIMP interpreter is executing or by preparing a text file containing the defini-

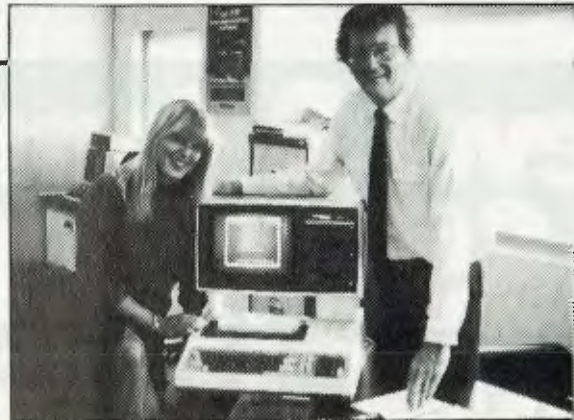
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Kathy McLean and Barrie Meredith from Padmede

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tions and reading it in with the RDS function.

In the first instance, a typing error generally forces you to re-enter the entire function definition; in the second instance an error means going back to a text editor, then restarting muSIMP to try again. Although the interactive nature of the system is ideal for entering algebraic problems, it does not provide a useful environment for development of muSIMP functions. Some sort of built-in text editor would be very useful.

muMATH/muSIMP-80 comes with a single A4 size manual in a three-ring binder. The manual is about 150 pages in length and divided into 18 sections. It begins with a short, well-written overview of the capabilities of muMATH followed by an introduction to computer hardware in general and the CP/M operating system (presumably for people who have bought a computer solely to run muMATH). Running muSIMP programs and saving a memory image comes next. This section, like most of the manual, is tersely written and requires reading at least twice before you really know what's going on.

Following this, each of the muMATH packages are described in sub-sections of 2-5 pages. The description of muSIMP which occupies the second half of the



manual is presented as a reference guide with a complete list and descriptions of the available muSIMP functions and operators.

In respect of both muMATH and muSIMP, the manual alone is not adequate to learn how to use the system. Fortunately, the authors have realised this and provided 10 tutorial programs on disk

which guide the novice user through the system.

In terms of the standards we have come to expect from computer-assisted instruction, these programs are far from spectacular, but they succeed in explaining and drilling the user in the basic concepts of muMATH and muSIMP.

The text of the tutorials is reproduced in appendices to the manual. However, the user is rightly urged to work through them interactively. The muSIMP tutorials are particularly interesting in their own right as they provide an introduction to the style of programming appropriate to languages such as LISP that are used in artificial intelligence applications. The muMATH/muSIMP-80 software package is produced by the Soft Warehouse and distributed by Microsoft Consumer Products. It runs under CP/M or similar operating systems, including Apple CP/M with the Z-80 Softcard (which is the version I am using). The manual recommends a minimum of 24K RAM but to be really useful the system needs 48K or more.

Anyone who does more than a trivial amount of algebra should benefit from muMATH. This includes scientists, engineers and mathematicians. Even parents might use it to do their children's homework. □

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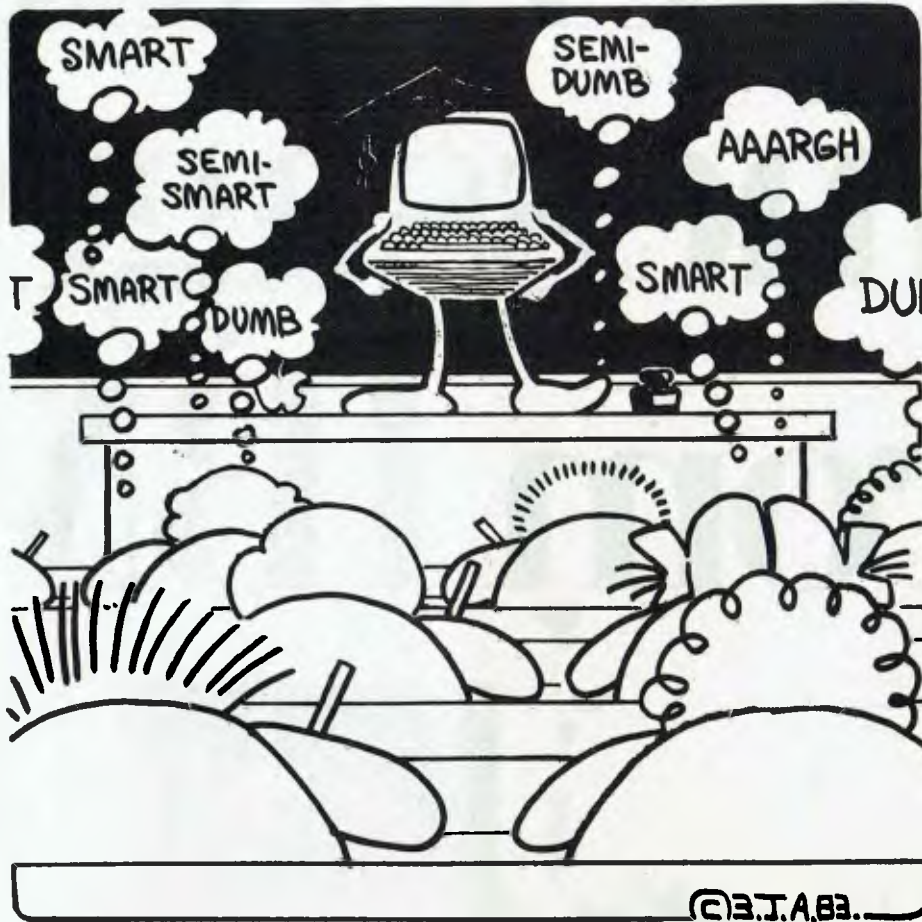


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# MailMerged Micro Tests

By David Bailey



WHEN A school buys a computer for teaching use, and staff members are told the only limits to its use are their imaginations, it's frustrating to sit down at the keyboard and find that your imagination has taken a sickie.

The introduction of computers into schools has been received with a mixed response by teachers themselves. Without even considering little problems, like where the computer will be sited, who will be allowed to use it, when and for what purposes, there's still one major problem for the teacher who has overcome the hurdle of learning to program the machine: "How do I use this machine most effectively for helping my students, and take advantage of its ability to reduce drudgery?"

There are a lot of teachers writing programs for the school micro with educational purposes in mind. In many cases, this is in isolation from work done by other teachers at other schools, and in the terminology of the trade they are frequently rediscovering the wheel. For this reason

there is a great need for publication and sharing of software and ideas for programs—programs which may have an application not just in, say, mathematics, but also in English, history or another field.

In 1981, an article by Dr B Cornish was published by the Higher Education Research and Development Society of Australia (HERDSA, Vol 3 No 1, March 1981). In this article, Dr Cornish described the problem of assessing student comprehension of matter presented in class, and of giving students rapid feedback when they demonstrated that they didn't understand some aspect.

His solution was to set the computer to work preparing assignments for the students on an individual basis—each student has the same stem question, but a different set of data to work with. The student then had to submit a set of answers to the teacher as proof that he had attempted the questions.

These answers could be compared against a list of the correct answers produced by the computer at the same time

as it generated the original data. Marking time is thus reduced to seconds per student instead of five to fifteen minutes. Those students who supplied correct answers could then proceed, while students with incorrect answers would be sent off to produce answers for the questions which were wrong (Cornish supplied a new set of data for the second attempt). If the students still obtained an incorrect answer after a second attempt, they obviously needed help.

The weak students and the competent students identified themselves without a great deal of effort on the part of the teacher, allowing him to devote effort where it was most needed.

Of even greater beauty is that the students could collaborate when attempting the work without the stigma of cheating, since with a different set of data, the answers would be different for each student—but not the method of approach. Neither would the answers be available from the back of the book.

Marks, for those who like Brownie

points, can be awarded on the basis of two for an answer correct on the first attempt, one for an answer correct on the second attempt and zero if no correct answer is obtained: a very simple approach, which could also do away with the need for alternative methods of continual assessment.

Having read this, I was afire with the beauty of the whole approach. I considered writing a program in BASIC to produce the required text, data and answers and started to sweat at the amount of work necessary. So much so, that it got put in the 'too-hard basket' for a long time.

Recently I had cause to explain the problem, how the system worked and what was involved in setting it up, when it occurred to me that I was rediscovering the wheel myself: almost everything required already exists within the Sandy's Word Processor program I use, or in any word processing program with mail merge facility.

For those not familiar with the mail merge facility, it is a process by which a page of text can be merged with a list of names and addresses so that the whole emerges from the printer as a series of personalised letters, which appear to have been individually typed.

To arrange this, it is necessary to prepare the text of the letter with spaces arranged for the name and address of each person. The location of the spaces is sequentially specified by a marker, such as a & character followed by a numerical identifier such as &12 or &23.

The text of the questions can be set up readily on the word processor, with identifiers inserted where required. However, we do need a set of data and that is where a little extra programming is necessary.

Our table shows one such assignment sheet, with two questions concerned with graphical data.

First we need a list of students' names. Assuming a disk drive on an Apple II, this can be obtained with the following program.

```
10 REM NAME FILE CREATOR
20 DS=CHR$(13)+CHR$(4)
30 DIM BS(100)
40 I=0
45 REM START OF ENTRY OF STUDENT NAMES
50 I=1
60 HOME:VTAB 5:PRINT "PRESS RETURN IF NO MORE STUDENTS:PRINT
70 PRINT "ENTER STUDENT ***[NAME ***";:INPUT BS(I)
80 IF BS(I)="" THEN 100
90 GOTO 50
95 REM START OF NAME STORAGE
100 FS="NAME FILE"
110 M=1
120 PRINT DS;"OPEN";FS
130 PRINT DS;"WRITE";FS
140 PRINT N
150 FOR I=1 TO N
160 PRINT BS(I)
170 NEXT I
180 PRINT DS;"CLOSE";FS
190 HOME:VTAB 5:NTAB 5:PRINT "FINISHED"
200 END
```

Similar programs can be written to add or delete other names, or to sort the names alphabetically.

Having set up the name file, your next requirement is a way of generating data in the required form for the mail merge pro-

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gram, calculating correct answers and generating the required file of answers for the teacher:

```

10 REM ASSIGNMENT DATA PRODUCER
20 DS=CHR$(1)+CHR$(4)
30 REM THIS PROGRAM ALLOWS FOR UP TO 100 STUDENTS
40 DIM AS(100,24),CS(100,4)
50 REM OPEN NAME FILE AND STORE THIS IN MEMORY
60 FS="NAME FILE"
70 PRINT DS;"OPEN";FS
80 PRINT DS;"READ";FS
90 INPUT N
100 FOR I=1 TO N
110 INPUT AS(I,1)
120 NEXT I
130 PRINT DS;"CLOSE";FS
140 REM SET UP MAILMERGE INITIAL DATA AS REQUIRED BY SANDY'S
WORD PROCESSOR PROGRAM
150 AS(0,0)="-24"
160 AS(0,1)="-NAME"
170 AS(0,2)="-Y1"
180 AS(0,3)="-Y2"
190 AS(0,4)="-Y3"
200 AS(0,5)="-Y4"
210 AS(0,6)="-Y5"
220 AS(0,7)="-Y6"
230 AS(0,8)="-X1"
240 AS(0,9)="-X2"
250 AS(0,10)="-X3"
260 AS(0,11)="-X4"
270 AS(0,12)="-X5"
280 AS(0,13)="-X6"
290 AS(0,14)="-X7"
300 AS(0,15)="-Y2"
310 AS(0,16)="-Y3"
320 AS(0,17)="-Y4"
330 AS(0,18)="-Y5"
340 AS(0,19)="-X1"
350 AS(0,20)="-X2"
360 AS(0,21)="-X3"
370 AS(0,22)="-X4"
380 AS(0,23)="-X5"
420 AS(0,24)="-"
430 REM START OF ANSWER GENERATION SEQUENCE
440 REM DATA CALCULATION FOR N STUDENTS
450 FOR I=1 TO N
460 CS(I,0)=AS(I,1)
470 REM QUESTION 1
480 REM 0.30 < SLOPE M < 1.20
490 REM 5.00 < INTERCEPT S < 14.00
640 M=0.30+(INT(98*RND(1)))/100
650 CS(I,1)=STR$(M)
660 S=5.00+(INT(98*RND(1)))/100
670 CS(I,2)=STR$(S)
690 FOR J=1 TO 6
700 AS(I,1+J)=STR$(2*J)+".00"
710 AS(I,7+J)=STR$(5+M*2*J)
720 NEXT J
730 REM QUESTION 2
732 REM 5.00 < A < 10.00
734 REM 7.00 < B < 15.00
740 M=5.00+(INT(98*RND(1)))/100
750 T=7.00+(INT(98*RND(1)))/100
760 CS(I,3)=STR$(M)
770 CS(I,4)=STR$(T)
780 FOR J=1 TO 5
790 AS(I,10+J)=STR$(3*J)+".00"
800 U=M*(9+J)+T
810 AS(I,13+J)=STR$(U)
820 NEXT J
830 NEXT I
840 REM END OF DATA PREPARATION START OF DATA STORAGE
850 CS="DATA"
860 PRINT DS;"OPEN";GS
870 PRINT DS;"WRITE";GS
880 FOR I=0 TO N
890 FOR J=0 TO 24
900 PRINT AS(I,J)

```

```

910 NEXT J
920 NEXT I
930 PRINT DS;"CLOSE";GS
940 REM END OF DATA STORAGE START OF ANSWER STORAGE
950 FS="ANSWERS"
960 PRINT DS;"OPEN";FS
970 PRINT DS;"WRITE";FS
980 PRINT N
990 FOR I=1 TO N
1000 FOR J=0 TO 4
1010 PRINT CS(I,J)
1020 NEXT J
1030 NEXT I
1040 PRINT DS;"CLOSE";FS
1050 HOME:VTAB 18:HTAB 6:PRINT "FINISHED"
2000 END

```

The list of answers is shown; it only requires a small program to list it for the teacher.

	No.	Answer
D. BRADLEY	1	1.16
	2	9.92
	3	9.01
	4	13.51
D.BLAINE	1	1.05
	2	10.32
	3	6.34
	4	10.35

The program required is as follows, or a variation of it:

```

10 REM ANSWER LISTING PRDGRAM
20 DS=CHR$(1)+CHR$(4)
30 DIM AS(100,7)
40 US="ANSWERS"
50 PRINT DS;"OPEN";BS
60 PRINT DS;"READ";BS
70 INPUT N
80 FOR I=1 TO N
90 FOR J=0 TO 4
100 INPUT AS(I,J)
110 NEXT J
120 NEXT I
130 PRINT DS;"CLOSE";BS
140 PRINT DS;"PR1":REM TURN ON THE PRINTER
145 PRINT "Student Name Answer No. Answer":PRINT
150 FOR I=1 TO N
160 PRINT AS(I,0);
170 FOR J=1 TO 4
180 HTAB 26
190 PRINT J;AS(I,J)
200 NEXT J
210 NEXT I
220 PRINT DS;"PR1"
230 END

```

### Student #1

#### Instructions

All questions must be attempted, and the answers only returned with seven days. Your answers will be marked as correct or incorrect. If incorrect, you will be required to attempt the question again and supply a second set of answers. In the event that the answers are not correct at the second attempt, you are required to discuss your approach to the problems with your teacher.

Q 1. Plot the following data on to graph paper and determine the slope of the graph and the intercept on the Y axis.

Y #2 #3 #4 #5 #6 #7	ANSWER	SLOPE =
X #8 #9 #10 #11 #12 #13		INTERCEPT =

Q 2. The following data are obtained from the equation of the form

$$y = a^2 X - b$$

Determine graphically the value of a and b.

Y #14 #15 #16 #17 #18	ANSWER a =
X #19 #20 #21 #22 #23	b =

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# C No Evil

*Jack Dikian and Grace Theodorou continue their occasional series on modern computing languages with a look at the 'in' tongue of the Eighties — C...*

THE COMPUTER language C, originally written and implemented on the UNIX operating system by Dennis Ritchie at Bell Laboratories, is a small, all-purpose structured language.

It's designed to be flexible enough to access the machine architecture, while at the same time provide the features of a higher level language such as those found in Pascal. This makes it an ideal language for system programming. In fact, over 75 per cent of the current UNIX operating system is written in it.

C evolved from the older languages BCPL and B, in the same way Pascal was

developed from Algol 60 and Algol-w. C has been widely available for many years. For example, it is implemented on most (if not all) DEC systems, IBM System/370 and Honeywell 6000. More recently, versions have been written for a wide range of micros, including Cromemcos, Zenith Z89s, DECs and other CP/M-based systems.

We cannot hope to cover all of C in an article such as this. Rather we will try to convey a feel for the language to the non-C programmer through a description of the following language aspects: basic data types, control structures, program structures and some input-output.

We mentioned earlier that C was a small language. This is due to the fact that C is very heavily dependent on a library of functions and general routines.

This library is implemented with the compiler to carry out such things as input/output (I/O), storage allocation and many other operations. For example, C does not provide string handling routines such as those found in Basic. There are, however, functions found in the library which can be called by C to handle these operations.

For example, if we want to compare two strings, a call to the function STRCMP(S1,S2) will compare string S1 to string S2 and return 0 if they are equal. Similarly, all I/O is carried out through function calls found in the system I/O library.

## Data Types

C, like Pascal, has the facility to allow for the definition of new data types using the types already defined in the language. Some of the basic data types include the integers, reals, characters and, of course, arrays of the above types. C arrays are very much similar to those found in most BASICs, where the indices range from zero to some positive integer.

C also provides a certain number of type directives. These directives are used with simple types to determine the size and, often, access speed of the particular variable. For example:

```
long int x; /* will declare x to be a variable of
            type integer, it may use 32 bits
            to represent the number.
            */
short int y; /* will declare y of type integer, it may
            use 16 bits to represent the number.
            */
register char B; /* will declare B of type character, the
            compiler will place it in a machine
            register for increased speed.
            */
```

Some of the more powerful, but common data types provided in the language are described below.

## Structures

A structure, like an array, is made up of many components; however, unlike an array which has a homogeneous set of components, the C structure has components made up of many different types.

These are grouped together and accessed by single name. Let us demonstrate this by defining a structure to hold a description of a person.

```
struct PERSON {
float height,weight;
int age;
char hair_colour[10];
char eye_colour[10];
char sex;
};
```

Variables of type PERSON can now be declared in exactly the same manner, as they would for type INT say.

It should be pointed out that only eight upper/lower case letters and digits are significant in variable names. The underscore character is also considered legal, and is often used in C variable names.

For example the statement:

```
struct PERSON Achilles, Tortoise;
```

Will declare both Achilles and Tortoise of type PERSON.

```
struct PERSON Tortoise = {170.5,60.0,19,
"black","brown","m"};
```

will set Tortoise to be of height 170.5, weight 60.0 and so on.

A component of a structure can be selected through the use of the name of the structure (PERSON in this case), and also the name of the component, separated by a period. For example:

```
A_height = Achilles.height;
T_weight = Tortoise.weight;
```

C also provides a thing called a UNION which can hold values of different types at different times. For example, suppose we require a variable to hold a character at one stage in a program, and then the same variable to hold an integer at some different point in the same program block.

This is useful if we do not know the size and/or the type of a quantity we are to read (that is, float, integer and so on). Let us see how a UNION might be declared.

```
union unknown {
int is_int;
float is_real;
char is_char;
float buffer;
};
```

buffer can now hold any of the above defined types. It may, at first seem as if it can take part in any mixed mode operation. Of course this is untrue and the effective type of buffer is that of the most recent assignment to it.



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## The Pointers

A pointer is a variable which holds the address of an object, usually another variable.

Unlike Pascal pointers, which can only point to objects in the heap, C pointers can point to both dynamic and static objects, thus allowing them to point to any variable as well as functions.

In this article, we will only mention that pointer operations are very common in C, and give a few simple examples of their use.

The statement: `address—contents = *address ;` will assign to the variable 'address—contents' the content of what-ever the variable 'address' is pointing to.

The statement: `address = &objects ;` will assign to the variable 'address' the address of object.

The following examples demonstrate two uses of C pointers:

```
array_pointer = &STORE[0] ;
index = *(array_pointer + 3) ;
```

will refer to the contents of STORE[3].

```
char *string ;
string = "hello out there" ;
```

will assign to 'string' a pointer to the characters.

## C The Expressions...

Before considering the C expressions, let us first consider the more unusual Logical/Relational operators found in C.

The Relational operators (less than, greater than and so on) are fairly common in most computer languages, but the operators '=' and '!=' are perhaps not. These are the equality operators, and are used in the following way.

```
if ( x==1 )..... /* does x equal to 1 */
if ( x != y )... /* is x not equal to y */
```

C provides the McCarthy AND and OR Logical operators using double ampersands and double vertical bars respectively.

For example, the BASIC code: if (x=1 and y=1) will be coded if (x==1 && y==1) in C.

These operators are more powerful than the ones provided by BASIC and Pascal, as evaluation of these expressions can terminate on encountering the values False, and True.

We mentioned earlier that C was able to get fairly close to the machine. One of the contributing factors for this is the existence of the Bitwise Logical operators.

An example, of the use of the Bitwise might be:

```
READY_FLAG = READY_FLAG | INTERRUPT ;
```

This will set all Bits in READY—FLAG corresponding to set Bits in INTERRUPT. The vertical bar symbol is the Bitwise inclusive OR operator.

## Assignments

The '=' symbol represents the assignment operator. For example, `y=2.0` and `x=z=3` will result in y being equal to 2.0 and both x and z having values of 3.

An operator to increment or decrement a variable is provided rather conveniently, by the following feature: the operator ++ increments the operand by one, while the operator -- decrements the operand by one. For example, ++counter is equivalent to counter = counter + 1;

C does not support true boolean types and expressions; instead, a regular expression is used. A return of non-zero is 'true' while zero represents 'false'.

Like Pascal, C requires a semicolon at the end of every statement. However, unlike Pascal where the semicolon is used as a statement-separator, the semicolon in C is used to terminate a statement.

The curly braces are used in C to group a number of statements together in order to form a BLOCK. This is somewhat similar to the 'begin — end' construct of Pas,yx 'or example the statements s1,s2 and s3 of the following code will only be executed if the expression is true.

```
if(expression)
{
    s1;
    s2;
    s3;
}
```

## Looping Structures

C provides three looping structures. These are the FOR, WHILE, and DO-WHILE. A BREAK, and CONTINUE, is also supported to exit, and 'jump' to the next iteration of the loop.

The for loop has the following syntax:

```
for (expression1;expression2;expression3) {
    S1;
    S2;
    S3;
}
```

In most cases, expression2 is a test, while expression1 and expression3 are assignments. Therefore, as long as expression2 is true (that is, non-zero), statements S1, S2, S3 will be executed. For example:

```
for(counter =0; counter <= 10; ++counter) {
    sigma = sigma + counter;
    fact = fact * counter ;
}
```

We would like to point out one thing in passing: C's FOR loops are extremely powerful compared to those found in most other common languages.

This is due to the fact that the expressions in the FOR structure can be as complex as desired. In the above example, counter is incremented by one until it is greater than 10.

The WHILE loop found in C is very much similar to that of Pascal. It has the following syntax:

```
while(expression) {
    S1;
    S2;
    S3;
}
```

The statements S1, S2, S3 are ex-

ecuted repeatedly until the expression becomes true. The expression is evaluated in every iteration.

For example, let us consider a function that returns the largest common divisor of two integers.

```
GCD (x,y) /* greatest common divisor */
int x,y ;
{
    int remainder ;
    while( y != 0) {
        remainder = x % y ; /* x mod y */
        x = y ;
        y = remainder ;
    }
    return(x) ; /* return value of x */
}
```

The DO-WHILE is similar to the WHILE loop, but instead of having a test at the top of the loop, it performs a test at the bottom of the loop. This makes it very similar to the Pascal REPEAT loop. The syntax is:

```
do
    statements
while-(expression) ;
```

It should be realised that statements will be executed at least once, which is some times desirable. Let us see how this might be used by writing a function to return the square root of the argument using Newtons' method.

```
square_root(x) /* find square root */
float x;
{
    float root,epsilon,temp;
    epsilon = 1.0e-6 ;
    if(x == 0) return(x); /* return zero */
    else {
        root = 1;
        do
            root = (x/root + root)/2 ;
            temp = x/(root * root)-1;
            if ( temp < 0) temp = temp * -1 ;
            while (temp < epsilon);
        return(root);
    }
    /* end of square root */
}
```

## Input/Output

So far, we have avoided the discussion of input-output. We did, however, mention that C does not provide any input-output facilities.

All input-output facilities such as reading from terminal, writing to terminal, reading to, or from file are accessed through function calls to routines found in the input-output library. We will only consider a few simple features in this article, as a complete description would run into many pages to say the least.

The simple way to write a character to output, is by using the function putchar(). This function will write a single character argument on the output stream. Printf() and fprintf() will write to standard output, and the named file output stream respectively.

To print the string 'hello' on the screen, for example, the statement `printf('hello');` will suffice.

Printf can be used in a much more general way. For example we can write out values of variables in decimal, floating point, octal, hexadecimal, and so on. The following example should demonstrate this.

```
a_real_number = 10.9 ;
an_integer = 42 ;
printf("%f %d", a_real_number, an_integer);
```

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The easiest way to read a character from standard input is by using the function `getchar()`. `Getchar()` will return the next input character every time it is called. For example, `c=getchar();` will place in `c` the next character from the input buffer.

`Getchar` can be used with a file name argument to specify the input stream. Some of the more unusual features include: `ungetc()`, which pushes back the argument on the input stream. `scanf()`, which reads characters from an input stream, interprets them according to some specified format, and stores the results in its argument list.

The following example will demonstrate how we might use `getchar()` and `putchar()` to convert a lower case input file to an upper case output file. Also note this is a complete program for performing this task — C programs begin executing at the beginning of main.

`Main()` is the only compulsory function needed in C programs. The `main()` function, (that is, the program) can itself have its own parameters, but we will not go into this at this stage.

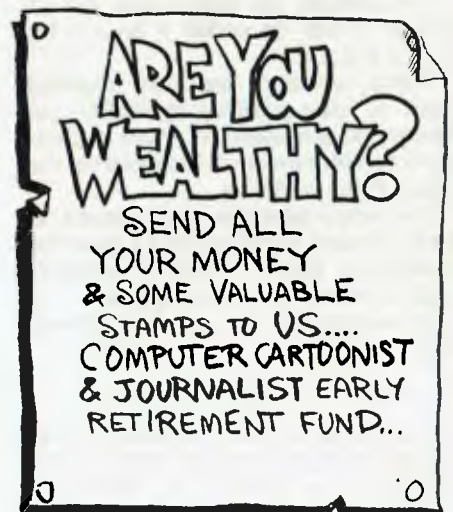
```
main() {
    char character;
    while ((character=getchar()) != EOF)
        if ('A' < character && character < 'Z')
            putchar(character + 'A' - 'a');
        else
            putchar(character);
}
```

### What We Think

C's high level data and control structures, together with its ability to come close to the basic machine, has allowed it to gain importance in both large-scale systems programming, and many micro utilities.

It turned out, for example, that the communications utility *Your Computer* used to get this article over the phone was written in C.

For further reading, *The C Programming Language* by Brian W Kernighan and Dennis M Ritchie (Prentice-Hall) can not be more highly recommended. □



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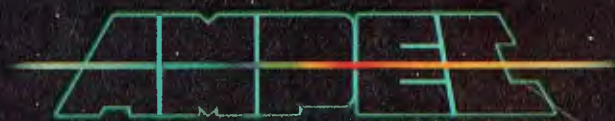
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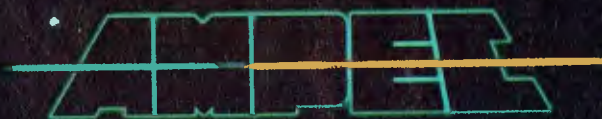
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tutorial

# Understanding Assembler

## Part XI

*Continuing with the development of a general-purpose monitor program, Les Bell this month looks at examining and changing memory and running a program under the monitor.*

LAST MONTH WE got the basic monitor going, with the ability to dump memory to the display as well as exiting back to CP/M, under which the monitor is being developed. This month, we shall move on to a method of changing memory and of jumping to subroutines.

The first problem we can solve in much the same way as DDT uses to examine and change memory: the S (for substitute) command. The user types S, followed by the address at which substitution is to start, and the monitor responds with the contents of that location, then waits for a new value to be input.

If no value is entered, the old contents of the memory location are left unchanged, and the machine goes on to examine the next location. Data input is terminated by input of a full stop.

We have already written many of the subroutines which will be necessary for this job. For example, we already have a line input routine with primitive editing, which will allow us to enter values, and we have routines to input a hex value from the line and to output a hex value to the console.

Writing the substitute command, therefore, should simply be a matter of calling these subroutines in the right order, with a bit of loop control tacked on.

And so it turns out. Our first job, when we enter the routine, is to parse the rest of the command line, to get the address at which the substitute command will start operation. The scanner

will already have positioned the cursor just after the letter S of the command line, and so we must first skip spaces to get to the first non-blank character, and then get that number into the HL register pair:

```
subst:
    call    spskip        ; skip over spaces
    call    getparm      ; get start address
```

There's nothing very complex about that. Next we must output the address, followed by a space, then get the contents of that memory location, and print that, followed by another space.

Since we will have to do some hex conversion work in HL, we save the address pointer on the stack for later:

```
subst1:
    call    h16          ; output address
    mvi    c,' '        ; and then a space
    call    putch
    push   h             ; save address on stack
    mov    a,m          ; get memory contents
    call   h8            ; output byte in A
    mvi    c,' '        ; space in C
    call   putch        ; and output it
```

Now we need to get a hex number from the keyboard. We just point to the line input buffer and call the *getln* routine:

```
lxi    h,buff          ; point to buffer
call   getln           ; get a hex number (or whatever)
```

Having got either a hex number, or a decimal point, or nothing, into the buffer, we now have to examine it and figure out what to do.

If it is a dot, we jump back to the mainline, and if it's a carriage

return, we skip over the code which changes the memory location, continuing round the loop.

```

lxi    h,buff      ; point to beginning of buffer
shld   cursor      ; set cursor there
mov    a,m         ; get first char
cpi    '.',        ; is it a dot?
jz     mon1        ; back to mainline
cpi    acr         ; if it's a cr, don't change
jz     subst2      ; skip over change code

```

Now we've worked out that it's not a special character, the rest of the line should contain the hex value to be placed in memory. So the first thing we do is get the value into the HL register pair, using the getparm routine written before, and then move the lower half of that sixteen-bit value into the accumulator.

A POP H instruction will now restore the pointer to memory, and we can store the accumulator into memory using a MOV M,A instruction. The loop is completed with an increment pointer instruction and a jump, and that completes the major part of the code.

```

call   getparm     ; get hex number
mov    a,l         ; mov byte into a
pop    h           ; get back address
mov    m,a         ; and store byte
inx    h           ; move on to next
jmp    subst1      ; and loop round

```

The only thing that remains to be taken care of is the code to balance the stack and increment the pointer without storing to memory in response to a carriage return:

```

subst2:
pop    h           ; restore stack
inx    h           ; move on
jmp    subst1      ; and loop round

```

That completes the 'substitute' command code. To implement it as part of the monitor, you should use a text editor to read it into the monitor source code file (monitor.asm) and then reassemble the monitor.

You will need to change the entry for 'S' in the scanner jump table to read 'dw subst', so that when the monitor is reassembled, the S command will jump to the routine.

### Jumping to Programs

One of the major reasons for using a machine code monitor is the ability to develop routines and programs. For this reason, we need to have the ability to transfer control to a program and return to the monitor upon completion.

Ideally, we should also like to set breakpoints, that is, points at which the program will stop running and hand control back to the monitor so we can see what is happening.

However, let's not try running before we can walk. We'll get to breakpoints in due course; meanwhile, we'll add a 'Go' command to the monitor which will allow us to jump to locations in memory and then return control to the monitor.

The first thing to notice about the go command is that we want to leave a return address on the stack: either the entry point of the monitor or the address of a routine (which can directly follow) which will manage the return. In this case, I've chosen to return to the monitor entry point.

The technique is very simple. We know, upon entry, that the remainder of the command line should contain the address to jump to, so we use the existing spskip and getparm routines to get that address into HL.

We then save that address in DE (using the xchg instruction) and load HL with the address of the warm boot routine. After pushing this onto the stack, ready to act as the destination of a return instruction, we exchange the DE and HL registers again, and load the program counter with the contents of HL. That's it.

```

*****
*
*                               go command
*
*****

```

; go (jump) to an address from command line

```

go:   call   spskip      ; skip over spaces
       call   getparm    ; get address to go to
       xchg   ; save in DE
       lxi   h,wboot     ; get return address
       push  h           ; and place it on stack
       xchg   ; get go address again
       pchl  ; and go

```

The program under development will now run normally (or abnormally – it's under development, after all), and will terminate by performing a RET instruction which will bring it back to the warm boot entry point of the monitor.

Now, this routine can be incorporated into the monitor in exactly the same way, using a text editor to read it in and changing the 'G' entry in the scanner jump table. However, there is one other thing that will have to be changed in the monitor program.

As it stands, the mainline transfers control to the scanner routine through a CALL instruction, pushing a return address onto the stack. Now, if this routine re-enters the monitor by a straight jump to the warm boot entry, as things stand that return address will never get popped off the stack, which will grow down in memory until it overflows. Not good.

The monitor will have to be modified slightly so that the warm boot routine sets up the stack, and not the first entry in the mainline code, as it currently is set up. This is left as an exercise for the reader; next time we print the monitor in its entirety, you'll see how I've chosen to do it.

Next month, breakpoints.



I.M.

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# Basic For Birdwatchers

## Part XV

*As we draw to the end of this course in BASIC programming, Les Bell turns his attention to error handling and debugging. . .*

WE ALL make mistakes from time to time; yours truly is no exception — I do things like inputting silly values into programs by accident and then wondering why the program just collapsed into a quivering heap.

This month, we'll learn how to avoid such disasters.

When that I was but a little boy, learning programming for the third time at University, we engineers used to use a fair sized time-sharing mainframe. It used to be a favourite game of spotty little first-year wimps to try and crash the system. While the system was armoured against such facile ploys as dividing by zero there were other ways of bringing the system to a halt and thereby losing everybody's work.

With a single-user microcomputer, there's no need to armour-plate your program against other users but it is still advisable to try to make your program as fool-proof as possible. In any program, there are all kinds of ways that invalid data can be input or can somehow be derived during a run, giving rise to any of a number of curious error messages from the BASIC interpreter or, if you're unlucky, total silence or even a scrambled disk file.

Microsoft BASIC, the most common variant, has 39 or even more error messages. These can range from a terse '?SN' issued by the smaller versions of the language to the slightly more comprehensible messages of the extended and disk versions. What this means is that there are 39 or so things that can go wrong while your program is running, and it may be that your operator will be confronted by a cryptic error message.

Wouldn't it be better to have the computer 'trap' that error and either attempt to do something sensible to correct it or explain the situation to the operator in a rather more (dare I say it?) 'user-friendly' way. MBASIC provides a way to do that using the ON ERROR statement.

This takes the form ON ERROR GOTO xxxx, and enables error trapping. After this statement has been executed, any error will cause a jump to the specified line, which should be the first line of an error handling routine. Error trapping can be disabled using the statement ON ERROR GOTO 0, which will cause MBASIC to issue its standard messages.

The error handling routine may perform several different functions. The first thing most routines will have to do is identify the error type, which is stored in a 'reserved' variable named ERR. The line number at which the error occurred is also stored, in the variable ERL.

Once the error has been identified, an

attempt can be made to recover from it or, alternatively, the program can be aborted. If recovery is attempted, normal operation is resumed with the RESUME statement. This takes several forms. RESUME will resume execution at the statement which caused the error, while RESUME NEXT will resume at the following line. RESUME xxxx will resume at line xxxx.

### Examples

A common mathematical problem is finding the roots of a quadratic equation; that is, an equation of the form:

$$ax^2 + bx + c = 0$$

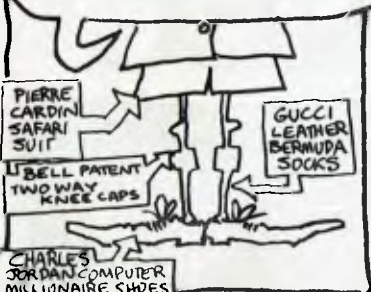
There are several possible results: either the two roots will be real, and possibly equal, or they will be imaginary. The formula for finding the roots is:

$$R1, R2 = (-B +/- \text{SQR}(B*B-4*A*C))/(2*A)$$

If  $B^2 - 4 * A * C$  is negative, then the roots are imaginary; the problem is that we will be attempting to find the square root of a negative quantity and BASIC will normally respond with an 'Illegal Function Call' error message.

The obvious thing to do is to test before performing the square root calculation to find if the argument is negative and jump to the appropriate routine, but for the sake of demonstrating error handling, we'll do it differently. We'll go ahead and try to take the square root, trapping the error if

...AS WE NEAR THE END (I THINK) OF THIS COURSE, WE TURN OUR ATTENTION TO ERROR HANDLING AND DEBUGGING....



...HOW DO YOU HANDLE A FERRET...?



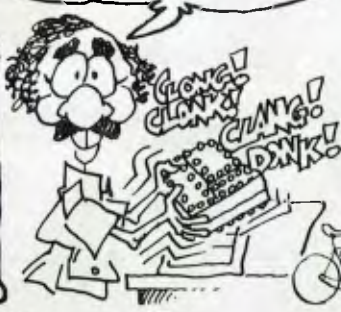
...WE ALL MAKE MISTAKES FROM TIME TO TIME... INPUTTING SILLY VALUES... CONSIDER THE SILLY VALUE OF A BRACE OF DEAF GREMLINS....



...WHEN I WAS A LITTLE BOY ENGINEER, LEARNING TO TIME SHARE 1ST YEAR WIMPS AT A SPOTTY UNIVERSITY, MY SYSTEM WAS ARMOURD AGAINST FACILE PLOYS...



...THERE'S NO NEED TO ARMOUR PLATE YOUR PROGRAMS... THEY WON'T FIT INTO THE DISK DRIVE...



...INVALID DATA CAN GIVE RISE TO CURIOUS ERROR MESSAGES...



...IN THAT CASE, THERE'S ONE THING TO DO!



...KEEP WITH THE SPIRIT OF THINGS... TAKE YOUR COMPUTER... OR... LIKE ME... COMPUTERS...



AND GO ERROL TRAPPING



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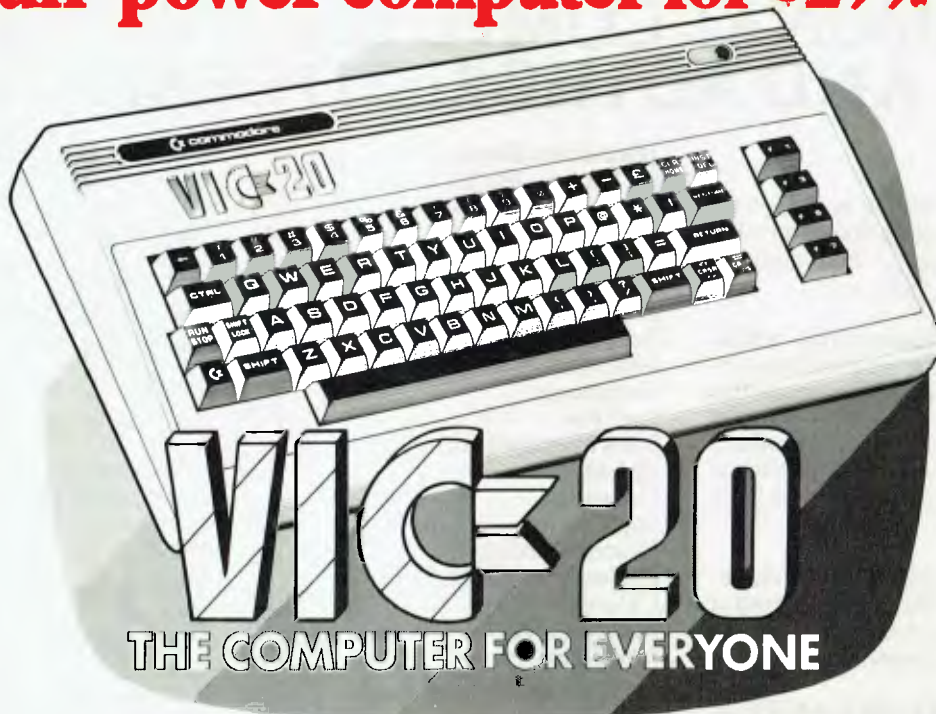
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the argument is negative and then jumping to the imaginary root routine.

Here's one way to do it:

```

100 REM      *** QUADRATIC ROOT FINDER ***
110 REM      *** WRITTEN IN MBASIC 5.2 ***
120 REM      *** 2/10/83, LES BELL      ***
130 REM
140 PRINT TAB(16);"Quadratic Equation Solver"
150 PRINT: PRINT:
160 INPUT "A";A
170 INPUT "B";B
180 INPUT "C";C
190 ON ERROR GOTO 1000
200 D = SQR(B*B-4*A*C)
210 R1 = (-B + D) / (2 * A)
220 R2 = (-B - D) / (2 * A)
230 PRINT:PRINT:PRINT "Root 1 is ";R1
240 PRINT "Root 2 is ";R2
250 END
1000 PRINT:PRINT:PRINT "Imaginary Roots"
1010 R1 = -B / (2*A)
1020 I1 = SQR(ABS(B*B-4*A*C)) / (2 * A)
1030 PRINT "Roots = ";R1;" +/- i";I1
1040 END

```

This program will calculate the roots of a quadratic equation, given the values of a, b and c. It's a little unconventional, but does demonstrate the operation of the ON ERROR GOTO statement in line 190. The routine at 1000 takes care of the case where the roots are imaginary.

Another use of ON ERROR GOTO is in file handling. Occasionally it will happen that a file does not exist, or a disk may be full, and rather than a cryptic message, an error handling routine can offer the

operator the chance to recover from the error.

Here's an example where a file is opened for input (this is only a program segment, but it makes the point):

```

130 INPUT "File Name";A$
140 ON ERROR GOTO 3000
150 OPEN "I",1,A$
160 INPUT#1,C$,N
.
3000 IF ERR = 53 AND ERL = 150 THEN GOTO 3100
.
3100 PRINT "File does not exist!";CHR$(7)
3110 INPUT "Try another";A$
3120 RESUME

```

Line 140 sets up the address of the error handler, and line 150 tries to open the file. If the file is not found (error 53) control is passed to line 3000, which tests for that particular error using the ERR and ERL variables and then jumps to 3100.

This is the error handler proper, which offers the operator the opportunity to enter another file name. The RESUME statement transfers control back to the statement at which the error occurred, to try again.

### Tracing Program Flow

Often when a program is executing, you may have no idea of what it's actually doing. However, Microsoft BASIC provides a very useful facility for tracing your program as it executes.

The TRON statement turns the trace option on, and from then on the line number will be printed (inside square brackets) as each line is encountered by the interpreter. TROFF disables the tracing. Both statements may be entered from the keyboard, the usual way, or they may be used as executable statements inside a program, to enable tracing of a section only of a program.

Here's an example of TRON at work: in this case tracing the quadratic root finder above:

```

BASIC-80 Rev. 5.2
[CP/M Version]
Copyright 1977, 78, 79, 80 (C) by Microsoft
Created: 14-Jul-80
15430 Bytes free
Ok

```

```

LOAD "QUAD"
Ok
TRON
Ok
RUN
[100][110][120][130][140]
Quadratic Equation Solver
[150]

```

```

[160]A? 1
[170]B? 4
[180]C? 4
[190][200][210][220][230]

```

```

Root 1 is -2
[240]Root 2 is -2
[250]
Ok
RUN
[100][110][120][130][140]
Quadratic Equation Solver
[150]

```

```

[160]A? 1
[170]B? 1
[180]C? 1
[190][200][1000]

```

```

Imaginary Roots
[1010][1020][1030]Roots = -.5 +/- i .866025
[1040]
Ok
SYSTEM

```

Notice that even REM statements show up in the trace, as do all the other PRINT, INPUT and LET statements. You can clearly see in the second run how the program jumps to line 1000 after line 200, because it can't calculate the square root of a negative number.

Similarly, I used this facility to trace the operation of the file opening program segment above. Here's what it looked like:

```

BASIC-80 Rev. 5.2
[CP/M Version]
Copyright 1977, 78, 79, 80 (C) by Microsoft
Created: 14-Jul-80
15430 Bytes free
Ok
LOAD "ERR"
Ok
TRON
Ok
RUN
[130]File Name? FRED
[140][150][3000][3100]File does not exist!-
[3110]Try another? GROT
[3120][150][3000][3100]File does not exist!-
[3110]Try another? ^C
Break in 3110
Ok
SYSTEM

```

The other major debugging technique used in BASIC is inserting PRINT statements throughout a program to print the values of variables as loops are processed, and so on. For example, in the quadratic root finder, the value of the intermediate variable D could be helpful in debugging.

In the case of the sort routines we worked on earlier, the index pointers and other loop variables would be helpful – and in fact this technique, combined with TRON, was exactly how I debugged those programs.

This brings us to the end of this introduction to BASIC – next month I'll round off with a look at CBASIC and North Star BASIC, the two other major BASIC variants.



# HEARD ON THE BUS

Leon Yendor

EVERY SO often those of us who have been around the microcomputer scene for more than a couple of years have to be reminded that there is a continuing flow of newcomers to our world of low cost computing. By thinking back and relating some of the experiences that got us where we are now, maybe we can save the beginners some of the pain of finding it all out the hard way and, at the possible expense of treading on some toes, I'll try to put across some pointers.

Like most of us who can do lots of things with this micro stuff I'm pretty opinionated and you may care to ignore any of this advice you find wanting in your particular case – but please, please have a good reason. As with rules having exceptions there are often extremely good reasons to contravene what I advise but only when you understand why and certainly not for haste.

Unless you are a hardware freak with a solid background of assembler code always buy a matched set of hardware. The old days of having a CPU from one maker, memory from another, I/O from a third and a disk controller from a fourth are gone if you want simple progression into the future with your system.

You would be somewhat better off finding out that the maker you chose to supply a complete system did a lousy job than to have lots of problems with each supplier blaming another. At least you'd have some chance of avoiding that brand in future. You can take some liberties with memory as long as it is static. Dynamic memory from another maker is always a good whipping boy when your disk system plays up.

With added complexity creeping in to operating systems too it pays to choose hardware from someone who can tie it all together and not leave you with the tiring or expensive lash-up you'll need to fit together your pot pourri of boards. Consider

too the future additions you may need. Yes, you may be partly locked in but the really solid suppliers are in much too competitive a market with their complete systems to be outrageous in the pricing of their add-ons.

When choosing a VDU for your system please make sure you like it rather than buying lots of features you may never use. It is hard to find a terminal that wasn't designed for a mainframe application rather than a micro but you will have to just ignore some of the block functions.

The main thing is that you find the screen pleasant and easy on the eyes and that the keyboard layout and feel suits *you* and this is much too subjective to leave to some 'expert' opinion. As Les Bell is fond of stating, the keyboard/screen is your interface to the system – as long as the computer is reasonably reliable all you will really experience is the VDU so make it pleasant to work with.

Printers are still mostly mechanical monsters and will suffer more from wear than any other part of your system although many of them tolerate more too. You should have some idea of the duty cycle required of your list device and buy accordingly as mostly you get what you pay for – in that case the el cheapo with the same claimed performance will likely clap out in less time if you drive it too hard.

I won't preach to you about smoking but if an old pipe lover like me can throw away his trusty meerschaum you'd better believe there is something to be said for banning smoking in your computer room. Go outside to do it if you must but having seen an amazing reduction in disk errors in an installation where both the manager and his chain-smoking programmer swore off after a particularly hard night on the turps, I'd have to believe that there's at least one good thing can come from a hangover.

Whilst on the cleanliness kick let me warn you about carrying things too far in

the other direction. Keep the brooms and vacuum cleaners well away while the equipment is uncovered and any floppies are exposed. They all stir up some dust which ends up in the wrong places.

Good air-conditioning can help if you can't keep the smokers out but if you want to avoid the fatal static system zappers make sure the humidity is kept up. All of us have experienced this problem when it is really dry like a Brisbane winter with a westerly wind.

## Other Tips

I know you know all about backups of your disks. Here is the real lifesaver: keep at least one copy of your masters somewhere where you'll have to explain why you want them. This way the dreaded midnight chain of destruction will hopefully be broken when in your overtired state you give up until tomorrow and so don't wipe out the grand-daddies of your data.

Don't do any serious programming in a language or dialect that you can see any limitations in from your present position. Sure you will want to make a change when you expand your horizons but at least pretend you'll be stuck with your present choice and see if you'd still choose it. The number of people I see putting up with that famous BASIC for every job when it is really only suitable for a programmable desk-top calculator makes me cry.

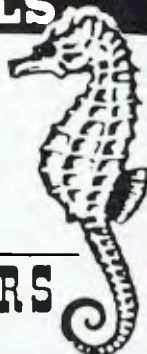
Finally, until you have good reason don't believe any opinions (mine included) until you know how reliable the source is on that particular subject, and if that opinion applies to your case.

Good luck – and while it is still fresh in your mind, please tell some others both the right and wrong things you did. When you are new to the system there is no shame in some mistakes and there is a lot to be said for warning those about to tread the same path. □

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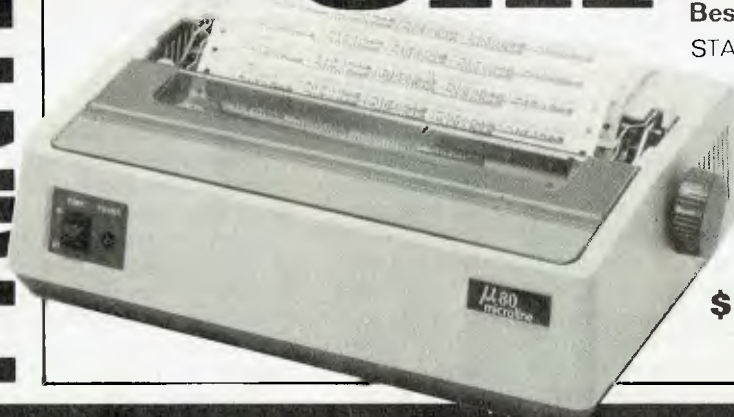
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WELL, I'M still suffering from a case of "show overload" or "journalist's ear"... I talked to so many people during the CP/M '83 trip that at one stage that all their faces just became a blur in my memory.

After I got home again and went through the bag of literature that I lugged back with me, it all started to make sense again and I could really start to remember what happened.

## The Show

When I was talking to the organisers the day before it opened they were expecting around 30,000 attendees – the final total was about 60,000. The Moscone Centre, where it was held, is a large complex, mostly below ground level, in downtown San Francisco. It was an excellent venue for the show and was easy to get to.

There was a fairly even mix of software and hardware suppliers at the show but there were a few "biggies" (like Micropro who were just across the bay) that weren't there. Rather than try to cover the great mass of stuff on show for this first report I'll just stick to the Digital Research products and one or two other items.

## CP/M Plus

DRI (Digital Research Inc.) has taken to calling CP/M 3.0 "CP/M+", probably in an effort to suggest that it is an additional product to CP/M 2.2 rather than a complete replacement. CP/M+ uses the version 3 BDOS that was introduced with MP/M 2 and MP/M-86 and will eventually be implemented for CP/M-86 and Concurrent CP/M-86 as well.

The good news is that for those with additional banks of RAM in their system, CP/M+ is going to be well worth the effort. The bad news is that for those of you without banked RAM or with extended address RAM, CP/M+ is probably not for you. Up to 16 banks of RAM could possibly be accessed by CP/M+.

File accessing has been improved dramatically, from 3 to 10 times the speed of CP/M 2.2. This has been achieved by hashed directory access, record buffering, and multi-sector disk I/O. Most sequential directory searching has been eliminated by the hashing technique used to directly access directory information. The record buffering uses a LRU (least recently used) scheme and will eliminate many disk accesses for some types of programs. The multi-sector disk I/O will allow reading and writing of up to 16K of data in one

operation.

The file system is extended from CP/M 2.2 and is upward compatible. If you use the extended features of the CP/M+ file system you may not be able to do much with those files under CP/M 2.2, perhaps read them only. Time and date stamping is available (but slows down directory accesses). Disks are automatically logged-in when they are changed – gone is the need to hit Control-C. Disk sizes may now be up to 512 Mbytes and individual files to 32 Mbytes.

Simple console I/O redirection is available at command level. Additional system primitives allow programs to determine the free space on a drive, truncate files and chain to another COM file. System errors can be trapped and processed while the infamous "BDOS" error message now says "CPM" error!

The operating system can be customised on a selective basis. RSX modules can be attached to the base of the operating system where they intercept system function calls and either perform the function or forward the call to the operating system. SID (a new version I think), MAC, RMAC and LINK-80 are included with CP/M+ to assist with system-level programming.

The CCP now loads at 100H just like all other transient programs, rather than loading in high memory just below the BDOS. Of course CP/M+ can be run in a non-banked memory system, but the system is larger than version 2.2 so the TPA space in a non-banked system will be smaller (just ask an Osborne 1 user, for instance, whether he really wants a smaller TPA). Also, not all the features are available in a non-banked version of CP/M+.

New utilities supplied with CP/M+ are:

**DEVICE** which sets the communications protocols and baud rates for character I/O devices. It allows the user to change device assignments and to assign program output to multiple devices.

**GET** redirects console input to be read from a disk file.

**PUT** redirects console output to a disk file.

**SET** will set various file attributes and time/date recording mode.

**SETDEF** displays and defines the disk search order. With this command the user can make CP/M+ search more than one drive for a command file. Users can set CP/M+ to execute SUB files directly without having to type SUBMIT.

**SHOW** displays information about the characteristics of a logical device such as capacity, number of directory entries and directory label information.

Additionally, SUBMIT has been changed so that XSUB is no longer required. A SUB file can contain input to CP/M+ command lines and to applications programs and SUB files can execute other SUB files. In terms of implementing CP/M+ the BIOS functions needed are basically the same as CP/M 2.2 with the addition of "Select Memory Bank" and (optionally) "Time and Date".

However, implementing CP/M+ will be a non-trivial task and DRI really thinks that not too many end users will try to do it. It recommends you wait for your hardware supplier to implement the new version. At the show at least three versions of CP/M+ were already on sale...for the Apple II (packaged up with a memory board), for SD Sales S-100 systems and for the Wavemate "Bullet" SBC.

## Too Little, Too Late

While CP/M+ is going to be attractive for some users, my feeling is that it should have been introduced 18 months ago for it to really be successful. With the advent of new processors and cheap memory, banked memory schemes have gone out of favour and have been replaced by extended addressing technology...so it is disappointing to see a new version of CP/M+ needing banked memory to deliver its full performance. Indeed, it will be very tricky to implement CP/M+ in an extended memory system.

The only editor supplied is still ED. I cannot understand why DRI has not caught up with screen editor technology and offered at least a basic screen editor. It said it didn't want to compete with independent software vendors (ISVs), but to me a screen editor is as much a basic system maintenance tool as an assembler or debugger.

For many users with single-board computers (such as Osborne-1, Kaypro II, Big Boards and so on) who cannot easily expand their system's memory, CP/M+ may be a liability. Not all of the new features are that useful, and many of the useful ones have already been implemented in public domain programs such as "ZCPR" or commercial programs such as "Microshell".

Additionally, many CP/M-80 users will have their sights set on moving up to a 16-bit system sometime within the next two years or so. For them the drive to swap to

a different operating environment will be met by the change to 16-bit systems.

Commercial development of new software for eight-bit systems has effectively stopped (CP/M+ was the only new eight-bit product worth mentioning to come out in the last four or five months) so I expect that few applications programs will ever take advantage of the extra system features offered by CP/M+.

While there is a substantial body of popular micros (like the Osborne-1 and so on) which won't really support CP/M+ well, any new software developed for CP/M-80 will probably just stay at CP/M 2.2 compatibility level for maximum market penetration. It's only relatively recently that we have seen many commercial programs that have started to use the "new" features of CP/M 2.2, as CP/M 1.4 compatibility was needed for best market penetration.

### CP/M-86 For IBM

All you proud new IBM PC owners now have a second source for CP/M-86 - DRI has released its own version for the IBM

PC. The company was upset at IBM's marketing of CP/M-86, especially at the pricing and the fact that IBM is still issuing version 1.0 which had numerous bugs.

DRI has released its own version 1.1 CP/M-86 for the IBM PC which will sell for \$US60 rather than the \$250 that IBM wants. What's more, the DRI CP/M-86 has a screen handler that is consistent with Concurrent CP/M-86 for the IBM so users will be able to easily move back and forth between both operating systems.

### CP/M-68K Shown

CP/M for the Motorola 68000 micro was shown by several vendors at CP/M '83. It was still at Beta test level but looked stable. Included with CP/M-68K is a "C" language compiler which is compatible with UNIX software. Also included is an assembler which supports Motorola MC68000 assembly language and linker which produces absolute or relocatable load modules.

There is a utility to convert CP/M-68K load modules to Motorola S-record form. The RSX system of resident system ex-

tensions mentioned above for CP/M+ is also available in CP/M-68K. The file system is compatible with existing CP/M and MP/M file systems while the BDOS system interface uses identical call numbers to existing versions of CP/M. The system is shipped on five single density diskettes! DRI has a data sheet on CP/M-68K if you need more details.

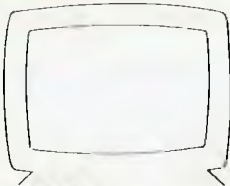
DRI has said that its range of languages will be made available for CP/M-68K. A large number of software developers that I spoke to were very excited about the prospect of being easily able to move their applications packages written in CBASIC and so on across to a 68000 environment.

While on new versions of CP/M: Zilog had a preliminary version of CP/M-Z8K (for the Z8000) on show. While this is a very early version it did work and shows Digital Research's commitment to porting CP/M across to as many popular micros as possible.

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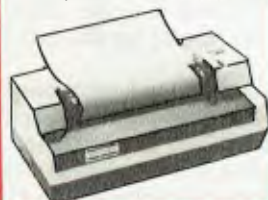
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ported to new processors is that DRI has adopted the C programming language in the 16 bit area and has rewritten CP/M into C. The first two C versions of CP/M to be implemented are the 68K and Z8000 ones.

In the future DRI will port CP/M to the NatSemi 16032 and Intel 80286 using this C version of CP/M. The 8086 version is presently written in assembler and is likely to remain so for the time being; however, a version based on the C source code is likely to become available later as maintaining consistency between an assembler source version and a C version is likely to be fraught with traps.

As new versions of CP/M are implemented, C compilers will be made available as part of the supplied utilities for the system. The C compilers supplied will be sufficient for porting basic utility programs to new environments only. A full-feature C compiler for each processor will be available as a separate product.

The first full C compiler to be made available will be for the 8086 and should be delivered from April/May this year. It is said to be fully compatible with the compilers supplied with UNIX level 7 as well as having function library extensions to handle CP/M system calls. DRI sees its C compiler as a bridge between UNIX and CP/M systems.

## Graphics

DRI showed its GSX graphics system extension to CP/M running on several different micros with widely different graphics displays.

A set of demonstration programs was run on all the machines with no alteration, though the display quality depended on the resolution of the graphics display. GSX consists of three components:

**GDOS** The Graphics Device Operating System is like the BDOS and contains the device independent part of GSX.

**GIOS** The Graphics Input Output System is like the BIOS and is the device dependent module that provides the link between the GDOS and the protocols of the particular graphics device.

**GENGRAPH** A utility which configures a graphics application to run in the GSX environment.

The GDOS intercepts and services graphics calls by loading the appropriate device driver module and then passing it on to the GIOS. GSX ensures the proper driver is loaded as needed. Only one device driver resides in memory at one time.

The programmer interface is the proposed ANSI/ISO Graphics Kernel System

(GKS) which provides source-code portability. The device level interface addresses the ANSI Virtual Device Interface (VDI) to provide object code portability. DRI is a member of the ANSI graphics standards committee.

Additional packages such as GSS-KERNEL (2D Graphics primitives), GSS-PLOT (library of high level functions for program interfacing), GSS-4010 (Plot 10 library), GSS-GRAPH (Interactive graphic creation) and GSS-DRAW (Interactive charting) will become available to fully support the GSX graphics interface.

I have a demonstration GSX system for the NEC APC which I am starting to get some sort of feel for and it certainly looks good. One demonstration program is a 3D cube which rotates in real time...neat!

As virtually all the new 16-bit micros support some form of graphics a device-independent graphics interface such as GSX is urgently needed if graphics software is going to happen in both quantity and quality.

## MSDOS v CP/M-86

For quite a while there was no reason to believe that either MSDOS or CP/M-86 had a clear advantage or was likely to obtain one in the short term. Now I think that has changed. DRI has aggressively moved into concurrent processing, graphics and spreading CP/M to a wide base of processors. Microsoft is concentrating on improving the user interface to MSDOS but seems unlikely to port it to other processors at this stage.

From my discussions with Microsoft it appears to have no plans to implement a device-independent graphics interface along the lines of GSX. I see business graphics as being one of the crucial areas for the next stage of development of microprocessor systems. The operating system which supports graphics well may well be the winner in this race.

Also, I think the ability to port applications source across a range of processors will be very attractive to software developers and DRI is certainly ahead of Microsoft in this area.

Microsoft is pinning its hopes of software portability on XENIX, but it remains to be seen whether UNIX-like systems will turn out to be suitable end-user environments.

## ZCPR Version 2

The major public domain software announcement of CP/M '83 was from Richard Conn who has developed version 2 of his popular ZCPR program which is

a greatly enhanced CCP for CP/M 2.2.

This new version implements a UNIX-like directory structure for CP/M as well as many other enhancements over the previous version 1.6. Many of the features of ZCPR version 1 have appeared in CP/M+.

For those who cannot easily support CP/M+, ZCPR 2 may be an excellent alternative – in many ways CP/M 2.2 with ZCPR is a more attractive proposition than CP/M+.

ZCPR version 2 will be available in the public domain in the SIG/M User Group collection in the near future. Look for news of it on the Software Tools RCPM system.

## The Breakfast

One of the highlights of CP/M '83 for me was a breakfast sponsored by Microsystems magazine.

A total of 28 people who are deeply involved in the distribution of public domain CP/M software met together to discuss that distribution.

We have started a dialogue which may take some time to come to an end, but some of the tensions and animosity which has existed between various groups distributing public domain software was dissipated and channels of communications opened up.

As well as taking part in that a very stimulating discussion I had a chance to meet some people who have reached "folk hero" status in the CP/M hacker community. Ward Christensen, Bruce Ratoff and Richard Conn were there as well as others I'd talked to on the phone but never met before.

Quite a bit of Australian CP/M software has now appeared in the SIG/M User Group collection and some of our local hackers are starting to build reputations in US CP/M user circles. While at the show I picked up SIG/M volumes 76 through to 93 which should soon appear on the Software Tools RCPM system.

## PAMS News

Since this column is being hurriedly written to squeeze in between my return and an immediate deadline I've been unable to check up on the status of some of the new systems due on-line soon. Next month I hope to be able to tell you more about them.

CP/M User Group volumes 68 through 90 are now available online by request on the Software Tools RCPM system. I seem to have missed out on volumes 83 through 85, does any reader have them? □

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to skip forward by minutes or hours, in seconds. During this time, an automatic pilot is assumed to be on and the distance to go, fuel consumption and elapsed time are continually updated as they would be in real-time. Even air resistance at altitude has been taken into consideration as has the stalling speed which remains dependent upon the plane's weight, height and power setting.

Realising that not everyone can fly a 747, we have included a 40 page manual. Part one is a treatise on the theory of flight and how to control an aircraft. The second half of the manual contains instructions on running the program and flying a 747. This part has been written by one of the authors of JUMBO, a professional 747 pilot.

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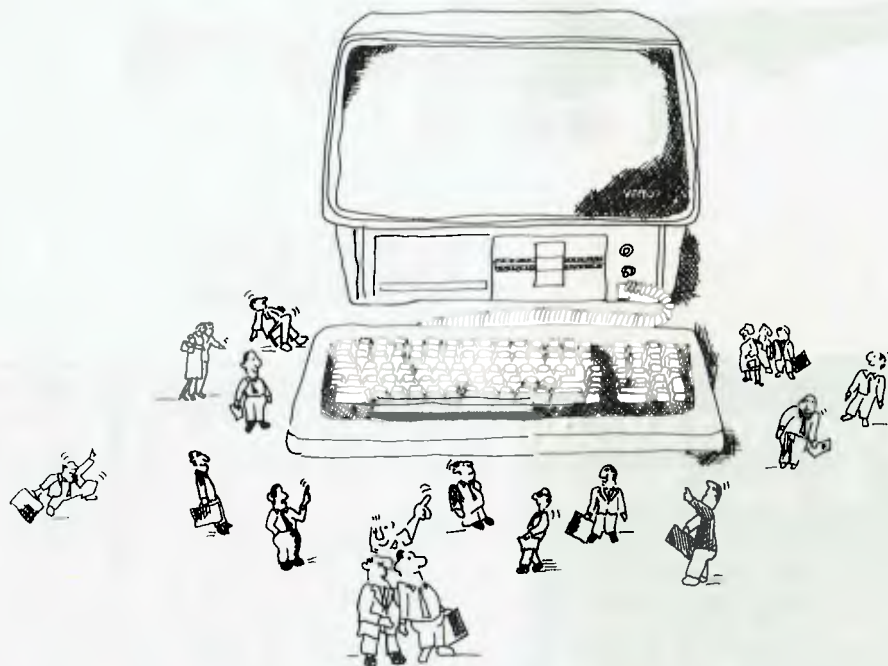
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# Sinclair Goodies

By John Crabb

## ZX-80 Home Computer Package

L-L SOFTWARE Laboratories In California has produced some exciting (as well as useful) software for Sinclair ZX-80 and ZX-81 owners. In addition to its home computer packages, business packages, disassembler and memory tester, L-L produces a whole series of computer games. These include Lunar Lander, K-Trek, Life, Mastermind, Blackjack, Roulette, Craps and Slot Machine.

As I am using my Sinclair for 'practical' purposes, I have not tried any of the games. However, the more utilitarian packages are exciting to run.

**Super Z:** This pack is strictly for the new owner of a ZX-80. The software comprises seven machine code modules that add the following facilities to your ZX-80: TAB, Scroll, Mem (unused memory available), Pause, Read, Restore, Data.

For your money, you receive a comprehensive manual; cassette which contains four programs – Table of Contents, the Super Z program to build your own modules selected from the range of seven available, a complete module, and a demonstration run – each recorded at least three times for safety; a handy card containing operating instruction notes; and reference card, recording key facts.

All these items are contained in a transparent 'zip-lock' pack. The documentation is good throughout and, at \$US9.95 (including postage), the Super Z is good value for money.

## ZX-80 Business Package

This is my favourite package of the offering, but perhaps I am biased, as it represents my area of special interest.

For your money, you get Search and Save (a file storage system which allows retrieval by use of a key); VideoComp (a program which allows you to operate on three columns, each with up to sixteen rows); and VideoGraph (a machine-code routine allowing you to automatically 'chain' to this graphic program from your VideoComp output and thus produce a full-screen graph of your VideoComp results).

The documentation is excellent. The coloured overlay really eases the keying in and running of the program; the File-Format sheet is a useful aid to laying out your filing system; and the two reference cards supplied provide all the vital information in condensed format.

The documentation (of both the manual

and the reference cards) is clear and leads the user step by step through each of the program routines. The VideoComp overlay is cleverly planned to aid running the program, so that if you read the manual (not just skim it), then place your reference card alongside your computer and insert this overlay on your keyboard, you are all set to successfully run VideoComp and VideoGraph.

Value for money? Undoubtedly. At \$US9.95, where else could you get these three very useful programs on one cassette?

This package carries the warning that because of different power cycles compared to those in the United States, some components may not operate in overseas countries. Perhaps some whizz kids can make the appropriate adjustments – I'm not in that category.



The package contains these programs: Etch-a-Screen (text and graphics within a 32 by 16 display); Electric Billboard (a continuous display of up to 210 characters moving across your screen until you 'break'); Composer (with the help of a keyboard overlay, you can compose and store up to 225 notes which can be broadcast to your own AM radio placed near your Sinclair computer); Calculator (allows your ZX-80 to have high-precision floating-point arithmetic); Chequebook Balancer (you can keep your own records, even if you're lucky enough to have a balance as high as \$32,767.99!).

Apart from the usual manual, the cassette and useful reference cards, this package contains two keyboard overlays (one for the Chequebook Balancer program, the other for 'Composer') and a blank screen-display sheet (for use in de-

vising graphics). All are enclosed in the usual 'zip-lock' plastic bag.

With this package, you're taking a chance, so: for the whizz kid, probably yes; for the tinkerer or hacker, maybe; for the novice, definitely no.

## ZX-81 Disassembler and Memory Test

This package represents a clever piece of marketing, combining a 'one-off' item (the memory test) with a multiple usage item (the disassembler).

With tales of faulty 16K memory packs going the rounds, it was a big relief to run the memory test and see those beautiful words 'Memory OK' appear on my screen and know that my RAM module was in order.

If you're unlucky enough to have some faulty memory locations, each is detected and listed. The test runs from location 16527 to the top of the stack, automatically adjusting for memory size.

Once having checked your memory, it is not something that you undertake frequently unless problems arise. However, the other program on this cassette – the disassembler – does come in for frequent use.

With the disassembler, you can open the 'secrets' of Sinclair's 8K ROM, as well as other items of machine coding. After loading the program, a prompt appears, asking you for a starting address. When you comply, the address of this byte will be displayed, together with other information such as displacement.

After a 20 second pause, the next item in sequence will appear on the screen. The user is in control of the program through a series of options available – for example, individual items may be held on the screen for a longer scrutiny, the program run may be halted, you may speed up the appearance of the next item on your screen, and you may 'jump' by way of entering a new starting address.

What do you get for your money? A manual which, apart from the operating instructions, contains 10 pages, each with two columns of keys and mnemonics, an operating and reference card and the cassette.

Value for money? Yes, definitely. At \$US9.95, this is value for those owners who want to discover more about the workings of their computer (and, incidentally, who want to check out their memory pack). □

# your TRS80 computer

By Rod Stevenson

THERE SEEMS some unwarranted confusion about whether programs written in other versions of BASIC will convert to the particular type of Microsoft BASIC used by Radio Shack. Being Microsoft, there are a great many BASICs that are very similar of the rest, it's simply a matter of determining just what a particular function does, then re-writing it in our BASIC.

To actually find out what the statement in question is for is very much like debugging any program, although it is done on paper rather than with the computer's help. Actually, there is a technique of 'desk-checking' a program, rather than typing it in and seeing if it works bit by bit. Indeed, this is the way to write in assembly or a compiled language — we've been spoiled by the 'friendliness' of BASIC. And it's this technique that is needed when working on a program written for another computer: trace it through on paper and determine what the areas of mystery are doing.

It may be that whole sections of code need to be re-written, but it will almost certainly be possible to do the same thing somehow.

An example is the MOD function, which can be easily re-written into a one-line formula, and the DEF FN function which needs only be typed out in full each time it occurs. In fact, some programmers use DEF FN only when writing the initial program, then take it out in the final version in their quest for optimum speed.

## Garbage Collection

Right at the top of the memory layout is an area reserved by BASIC for string handling. This is nominally 50 bytes, but can be changed by the CLEAR n statement, where n is the number of bytes required. This string area is used by the computer for working on strings as it needs to, whether they come from the program itself, or as inputs.

For example, if the program assigns a value to A\$ and to B\$, there is no use of string space because there is no work to be done on either string. But if the program assigns the value of C\$ as A\$ + B\$, there is work to be done to determine the final value of C\$, and the operating system needs somewhere to do this work.

Thus far, all is clear and eminently logical, as can only be expected. But what is not clear is the actual operation

of the string-working mechanism. Instead of over-writing the values used in earlier calculations, string space continues to be taken by using the rest of the CLEARED space until there is not enough left. And only then is something done about re-organising the earlier unwanted values. While this re-organisation is taking place the computer 'hangs up', and appears to have stopped functioning.

Depending on the size of the string space being re-organised, this 'hang up' can vary up to some minutes — and this non-productive time is not to be confused with the running of the program, which at times can cause one to wonder if the computer has suffered a seizure.

Because of the way Microsoft has chosen to operate the string-handling facilities of BASIC (and our BASIC has a great many and more powerful string facilities than some), this 'lost time' (called 'garbage collection') cannot be done away with, or even recovered in any way. What can be done is to make its effects less disturbing.

The initial thought is probably not to use the string facilities more than absolutely necessary. To my way of thinking, this is to mistake the purpose of a computer — to work for me. The more practical way is to redefine string space and thereby affect the operation of the 'garbage collector'. Not to redefine it during the program — this will lose all the variables — but to plan, right at the start of the program, just how much will be needed and set it then, which is where string space should always be set.

There is a compromise to be considered. If string space is defined as small, garbage collection will be frequent, but of short duration, since there will not be much to collect. If string space is defined as large, garbage collection will be less frequent, but of longer duration. So the programmer gets a free choice within these constraints.

There is a way of 'forcing' garbage collection, irrespective of the size of string space. When you issue a FRE(A\$) command/statement the operating system is forced to do a re-organisation of the string area to see what is left.

It's recommended this should be done before each time data is read from tape, but otherwise I'm at a loss to see the advantage of doing so. Seems to me one might as well have defined small string space in the first place. But, then,

I don't seem plagued by the long garbage collections of which other complain.

Or perhaps I'm less demanding?

## Keybounce?

I thought the keybounce problems in Model 1 keyboards had been eliminated by the new ROM's but, judging by requests for advice, it seems there is still a need for a word on this subject.

The whole problem is really an electrical one which is seen in all manner of electrical switches (even those on overhead power lines). It's caused by the key not making a single clean contact for each press but, as the name suggests, by 'bouncing' back into contact, as though pressed twice.

The way that Tandy overcame it was first to issue a (free) key-debounce program that simply slowed down the scan rate that looks to see if a key is pressed. Then it incorporated this idea into a ROM. Some commercial programs offer a user-variable delay so that a quick typist could finely tune the response speed of the keys.

Clearly, this was a software solution to a hardware problem (which worked), and those with keybounce can still use this solution.

The other solution is to clean the offending keys — usually it's only a few. Simply take off the plastic keytop by carefully prising it with a small screwdriver — it comes off vertically, so prise the two sides. You'll then see the two contacts that close together when the plastic insert is pushed down. All that's necessary is to open these with the same small screwdriver, and when you hear a click you've probably done the job.

For a lasting job, spray a non-conductive electronic cleaner, such as Freon, down the gap while pushing the plastic separator up and down. This can be done with the power on so that you can see the immediate result, and identify troublesome keys. It will also show where to replace the keytops!

## Strike Force

I've recently received a copy of 'Strike Force' for review. It is for Models 1 and 3 — a different version is on each side of the same cassette — and is compatible with Alpha Product's joysticks, which seems to be becoming a 'defacto standard'. The cassette recording was unusually good for a mass-duplicated one,

with good pitch and unwavering volume.

The object is to save five cities on your planet from attack. The cities have an adjustable force-field to protect them while you're fighting the missiles, bombers, smart bombs and fighters. To assist you, there is a radar display and it is by this the instructions suggest fighting. Unfortunately, the radar doesn't show the height of your own cities, so you can easily destroy yourself with no enemy help!

After the first few attempts to play this game, I gave up because I couldn't immediately identify the various graphics depicting so many various types of enemy craft, each with its own attack characteristics and each needing its own method of defeat. It also annoyed me that there appeared to be no way of getting straight titles each time.

I found the sound effects less than imaginative. To me, they sounded more like 'static' from a radio!

Sadly Strike Force is just one more in the seemingly inexhaustible line of too many similar games. I'd very much like

to see some without the space scenario as their background.

### Errata

The following two paragraphs were combined into one in my column in the December issue and, in doing so, the section in italics was inadvertently omitted:

If the address is given in hexadecimal (four digits, possibly including alphanumeric characters A of F), things are considerably simplified. The first two digits will be the MSB, the last two digits the LSB. All that remains is to convert each into decimal *and POKE* as detailed below'.

If the address is given in decimal (four digits), a more complex arithmetic will be needed. The address must still be separated into its MSB and LSB - the MSB is the address divided by 256, the LSB being what's left. Or, in 'computerese': MSB equals INT(ADDRESS/256) : LSB equals ADDRESS-(MSB \* 256).

Simple wasn't it?



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AUSTRALIAN BEGINNING IDENTIFICATION No. SUSSFREECAUL

THE SECOND meeting of the Aus Borne user group was held on January 23 at the offices of Osborne Australia at Artarmon in Sydney.

The club is an independent group of users who are organising themselves to provide a forum and meeting facilities for Osborne users. About sixty owners were present, many of whom brought their own machines along on the night.

The club is still at the formation stage but it is envisaged it will be providing the usual club facilities of newsletters, technical queries and club libraries for public domain software.

Though not involved in the club, Osborne Australia has helped with its formation by providing a venue for the first few meetings – but if the membership grows as quickly as it has to date, a much larger venue will be needed in the near future.

At the time of printing the venue for the next meeting had not been decided but information can be obtained from the temporary club president Ian Napier on (02) 635 0177 during business hours. If anybody has information about any other groups please let me know (through YC) and I will be happy to let the rest of us know about your group.

Incidentally, the American magazine of FOG (First Osborne user Group), *Portable Companion*, is now available through most Osborne dealers and provides some valuable background and technical information.

## MailMerge Labelling

There have been several enquiries from readers asking how to use Mailmerge to print labels two or three abreast from a name and address file.

The parameters below will provide two abreast labels. They can be modified to suit the particular labels you may be using:

Set up and save a file with the following dot commands. This is the file you will specify when Mailmerge asks you for the file to merge-print

- .RM 132**  
(set the right margin to 132)
- .PL 6**  
(set the page/label length to 6)
- .MT 0**  
(remove top margin)
- .MB 0**  
(remove bottom margin)
- .PO 0**  
(sets page offset to the left hand edge)

80

## .OP

(removes the page numbering)

## .DF MAILLIST.DTA

(the name of your mail list file)

## .RV NAME1,ADD1,CITY1,STATE1, POSTCODE1

## .RV NAME2,ADD2,CITY2,STATE2, POSTCODE2

Now delete all the tab stops and insert a new one at 37 (and 73 for three-across labels). Set the right margin at 132 and remove hyphen help and right justification.

Now list the variables in the order you wish them to be printed on the labels enclosing the variable names between '&' symbols in the sequence shown below.

Enter &NAME1&, then control-P-RETURN, press TAB and jump to position 37 and enter &NAME2&, RETURN. Note that although &NAME1& and &NAME2& appear on different lines on the screen, they still have the same line number as shown on the status line at the top of the screen.

Enter the remaining field names the same way, using the control-P-RETURN sequence to overprint the second set of values on the same lines as the first:

- &ADD1& control-P-RETURN
- TAB &ADD2& RETURN
- &CITY1& control-P-RETURN
- TAB &CITY2& RETURN
- &STATE1& control-P-RETURN TAB
- &STATE2& RETURN
- &POSTCODE1& control-P-RETURN
- TAB &POSTCODE2& RETURN

## .PA

(set page boundary)

When printing, answer no to the question on whether to use form feeds. Also, note that this procedure will void the 'omit null variable' /O command).

## For The Studios

A new book has just been released by T.G. Lewis called *Using the Osborne 1 Computer*.

It makes a good training manual to supplement the sometimes-dry user manual by providing more background information and working examples of how to use the Osborne and all its standard software packages and languages.

It is priced at around \$25 and comes highly recommended for those users who have little or no previous experience with computers.

## More Cable Connections

To continue the series of cable interfaces, here are the pin connections for the Centronics 737 printer.

OSBORNE	CENTRONICS
1	3
3	5
5	7
7	9
11	1
15	21
17	27
19	25
2	11
4	13
6	15
8	17
12	37
16	16
18	24

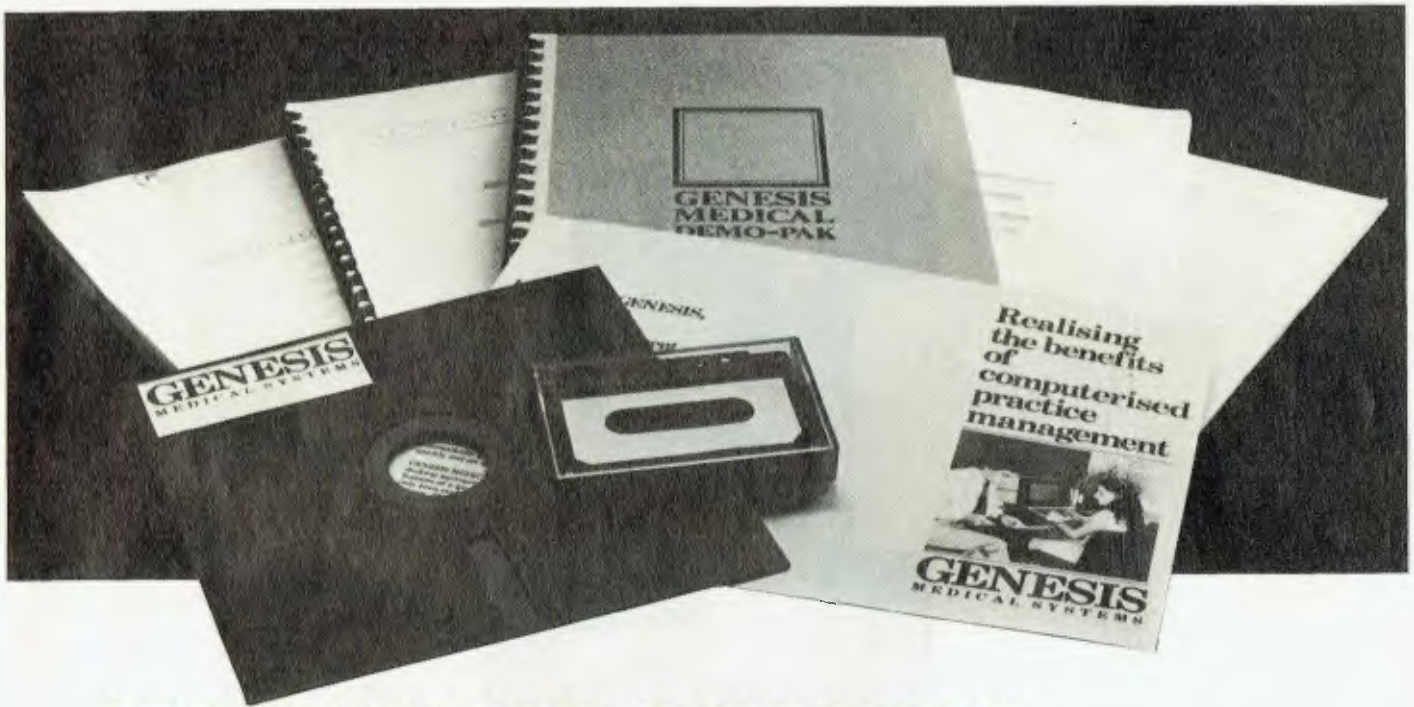
Ditto below for the Smith Corona TP1 printer.

OSBORNE	TP1
1	2
2	6
3	3
4	7
5	4
6	8
7	5
8	9
11	1
12	16
15	11
16	17
19	13

Keep the cable length to 2.5 metres maximum and set the Wordstar install program to "Teletype-Like Printer With Backspacing Capabilities". Set up as usual for a Centronics-type printer. □



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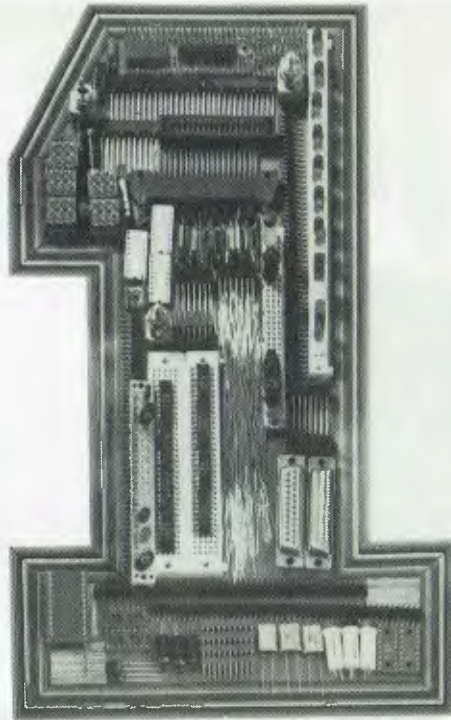
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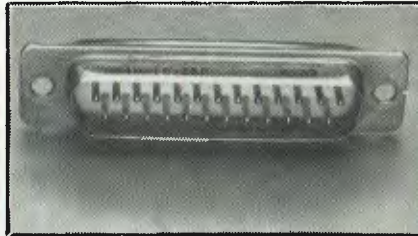
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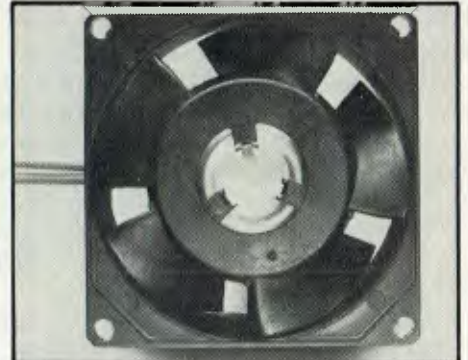
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# your APPLE computer

By Loch Bloomfield

I WOULD like to review for you some fairly new games that are among my favourites.

**Taxman:** this is another Pac-Man clone (yes, another one!). It is one of the best I have encountered, having many features in common with the arcade machine.

The idea is to consume all the dots in the maze while avoiding the ghosts. After eating all the dots in one maze, you move on to another, more difficult set. In the centre of each maze is a bonus treat, which comes and goes. These treats differ from level to level and, when eaten, differing numbers of points are awarded.

The four ghosts chasing you are very clever, and keep you on your toes. However, when one of the four special power pills in the maze is eaten, the ghosts change colour and shape and can be eaten for varying points.

The ghosts change back into monsters after a while and begin to pursue you again. However, if eaten, their 'eyes' return to the middle of the maze, where they turn back into ghosts. The higher the level, the less time you have to eat the ghosts before they become inedible again.

You are given three taxmen per game, and get another at 10,000 points. The game has good, colourful graphics and impressive sound effects. However, if you do not have a colour monitor, you can play in the black and white mode, which is another program developed so you don't have to play a game made up of dots, dashes and lines – a very useful feature for the user who doesn't own a colour monitor.

Your taxman is controlled by the two

arrow keys for sideways movement and the A and Z keys for up and down, respectively: the keys are easy to get used to. There can be five players per game.

In my opinion, it is great value for money and holds the player's interest for hours.

## Falcons

In this game from Piccadilly Software, you enter space to encounter Falcon strike forces. Your object is to fight your way to the Mother Ship and destroy the alien commander... in as few shots as possible – that's the hard part.

At the start of the game, you find yourself trying to shoot down a squadron of super-intelligent falcons (and I mean intelligent: they know exactly where you are, and where to fly in order to kill you).

So you got through that set? Now you have another squadron in a different pattern. Through that one too? The next two sets are a series of eggs flying from side to side, which soon hatch into deadly birds. These sets are the hardest of all, and are very unpredictable.

Once all the birds are killed, you arrive at the Mother Ship. To kill the alien commander, you must shoot a tunnel through the ship and then through a conveyor belt until you can shoot the commander.

Just to make things more difficult, eight falcons from the first two sets are buzzing around your ship, shooting at you. After you have succeeded in killing the commander, you return to the start. You can receive from zero to 9000 points for destroying the commander, depending on the number of shots you take to kill it (him?). The manual states that the game

gets harder after killing the alien commander – it does, but not considerably.

At any time during the game a shield can be activated, which will protect you from enemy fire and will kill all types of enemy forces when they come in contact with it. The shield lasts around four seconds, and cannot be used again for five seconds.

There can be one or two players per game, each player having three ships. A bonus ship is awarded at every 10,000 points.

The game has great graphics and sound effects. Another advantage is that it can be played with either the Apple II or III keyboards, paddles or joystick. The joystick is preferable, as it's easiest to learn how to use. Falcons is an exciting and fast-moving game, and is great value for money.

## Gorgon

"The Earth has entered a time warp... and the battle has just begun," states the manual. In this game, you are a fighter pilot whose job is to defend the earth.

On your screen is a cross-section of the earth, and as you fly over the strange terrain you see an occasional human on the ground. These are the people you must defend. Attacking them are four types of aliens, each with different features. One of these aliens flies along the bottom of the screen, picking up the humans. Once it has one, it will take it up to the top of the screen, where it will drop the human to its death – if you don't come to the rescue.

You can save the people while they are being taken away by shooting the alien carrying them and by catching the humans as they fall to earth. Successfully placing a human on the ground gains you 100 points, but by letting a human die it will cost you 50 points.

Another two aliens fire space-mines, which follow you around the screen until they finally disappear. You can't shoot these mines, so you must just avoid them. You can be killed by running into an alien or by a space mine (one thing the manual doesn't tell you is that there are only ever eight aliens flying around above earth at one time).

The display of Gorgon is unusual compared to other games: the lower four fifths of the screen is the cross-section of the earth, while the rest of the screen contains a scanner. This scanner shows the whole cross-section on a smaller scale, letting you know where all the aliens are

*Continued on Page 93*

## GAMES SOFTWARE REPORT CARD

Program:	Taxman			
Made by:	H.A.L. Labs			
Available for:	Apple II			
Ratings:	excellent	very good	good	poor
Ease of use:		✓		
Speed:	✓			
Entertainment value:	✓			
Educational value:			✓	
Documentation:		✓		
Value-for-money:	✓			
Holds interest for Hours				
Price:	\$35.95			

# your KAYPRO computer

By Jeff Richards

THE SCREEN control commands that are available on the Kaypro II personal computer are dealt with fairly lightly in the User's Manual.

The basic character set consists of 128 displayable characters. These are the usual characters found on a keyboard, plus 32 special characters, mostly selected from the Greek alphabet. Codes less than 32 decimal are used for screen control commands, while a number of escape sequences are used for special purposes.

There are a few unusual points to note. First, ASCII 3 (Control/C) has been listed as a system reboot. This is not a characteristic of the screen, but it is the effect that SBASIC produces when asked to print CHR\$(3). It has been included here as a warning. Similar considerations apply to ASCII 0 - SBASIC ignores it and

will display nothing.

The display hardware supports flashing characters, but there appears to be no way to instruct the monitor to turn on the flash characteristic. The hardware responds to the high-order bit set to invoke flashing, but the monitor treats the high-order bit differently. The monitor tests for control codes before stripping off the high-order bit.

Therefore, printing CHR\$(7) will ring the bell, but printing CHR\$(127+7) will display special character number 7. This is usually an easier way to display special characters than using ESCAPE G, but it's a pity the characters can't be made to flash.

The cursor-control characters generally correspond to the ADM-3A terminal configuration. This is probably the terminal that is referred to as 'Lear Seigler' in

the Profitplay installation menu. If the Kaypro is used with WordStar, the codes for 'clear to end of line', 'insert line' and 'delete line' should be patched into WordStar during installation, as they make a significant difference to the speed of updating the screen display. The locations are ERAEOL, LININS and LINDEL respectively.

Listing 1 is a small program to display to complete character set by poking the values directly into the screen RAM. It can be entered and run using the DDT 'A' option (see page 3 of the DDT manual). To enter it, use 'A8000' and to run it type G8000,8032. Use control-C to return to CP/M. Note that it has to be run in memory above 4000h, as low memory is mapped out when the screen is mapped in. 8000h has been chosen as a nice round number.

Incidentally, under no circumstances should the code control-E be used. According to the manual, this has the effect of 'physical end of life'...and we all know that manuals never lie.

You have been warned.

Decimal	Hex	Name	Keyboard	Effect
0	0	NUL	Ctrl/Shift 2	None
3	3	ETX	Ctrl C	Reboot
7	7	BEL	Ctrl G	Bell
8	8	BS	Ctrl H	Backspace
9	9	HT	TAB	TAB
			Ctrl I	
10	A	LF	Line Feed Ctrl J	Cursor down, and scroll Screen if necessary
11	B	VT	Ctrl K	Cursor up
12	C	FF	Ctrl L	Cursor to right
13	D	CR	Return Ctrl M	Cursor to left Margin
23	17	ETB	Ctrl W	Erase to end of screen
24	18	CAN	Ctrl X	Erase to end of line
26	1A	SUB	Ctrl Z	Clear screen and home cursor
27	1B	ESC	ESC Ctrl/[	Escape sequence (see Table 2)
30	1E	RS	Ctrl/Shift 6	Home cursor

Table 1: Screen Control Commands

<b>ESC E</b>	Insert a blank line, moving lines below it down and dropping the bottom line
<b>ESC R</b>	Delete the cursor line, moving lines below it up and inserting a blank last line
<b>ESC G</b>	Display any following lower-case characters as their special character equivalent
<b>ESC A</b>	Switch lower-case display back to standard lower-case characters
<b>ESC = p q</b>	Position cursor at row p-32 and column q-32; row and column numbering starts at zero.

Table 2: Escape Sequences

MVI E,1A	MOV A,B
MVI C,2	CPI 0
CALL 5	JZ 802C
IN IC	ANI 1F
ADI 80	CPI 0
OUT 1C	JNZ 8015
MVI B,0	MVI L,0
LXI H,3200	DAD D
LXI D,0100	JMP 8015
MOV M,B	IN IC
INR B	ANI 7F
INX H	OUT 1C
INX H	NOP

Listing 1: Character Display Program

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PLEASE CALL US FOR MORE DETAILS

GETTING cartridges in and out of your VIC can be hard at the best of times and expanding it to take more than one cartridge used to be an expensive undertaking. However, now you can add a three-slot expansion board for around \$60.

Having spoken to owners of larger boards I came to the conclusion that three slots was ample for most applications and purchased one from Ozi-Soft, Australian distributor of the board.

The board allows me to run the Super Expander, Programmer's Aid, Machine Code Monitor and the 16K RAM cartridge simultaneously. If you didn't lose count you might have noticed that I'm running four cartridges through three slots.

The trick is pretty simple, but involves a fair bit of careful desoldering. Commodore has left space in the Super Expander for an additional ROM. This space can easily be filled by the ROM from the VIC-MON or the Programmer's aid cartridges.

By unsoldering the ROM from either of the above cartridges and placing it in a socket in the spare holes of the Super Expander it is possible to run both cartridges through a single slot. Digital Concepts - (02) 918 9712 - is now offering this modification for the VIC.

Hardware and software are continuing to be churned out at an alarming rate. Amongst the latest additions are the Scott Adams Adventure series on cartridge, a relay control cartridge (VICREL), word processors and, soon to come, a 64K memory board which will be closely followed by a 40/80 column card in black and white.

Commodore has also released a series of cartridges aimed at small business applications. Titles include VICWRITER, SUPERCALC, STOCKCONTROL and VICFILE and should all be available by the time you read this.

## VIC Tips

PEEK (183) Returns the number of characters in the last file name used. This is useful for locating hidden characters and control codes.

CURSOR characters, colour control codes, and screen clear characters may be embedded within a file name and have the same effect as if they were printed.

PEEK (198) Returns the number of characters in the keyboard buffer (between 0 and 10).

PEEK (631-640) The keyboard buffer is stored here.

Programs such as adventures, teaching aids and Data base systems which are

very long are often best broken down into smaller programs which can be run one part at a time. It's useful to have the first program run and load the second; however, this often gives rise to a problem which can be overcome using our knowledge of the keyboard buffer.

When a large program loads and runs a second program an out-of-memory error occurs unless the first program is deleted first. If we place a new at the end of the first program this error can be overcome but we can no longer automatically load and run the next part.

By placing the CHR\$( ) values of the letters in the commands LOAD and RUN in the buffer we can successfully get around this if we then poke location 198 with the number of characters we have POKED into the keyboard buffer. At the end of each command there must be a carriage return - CHR\$(13) - so the VIC will execute the commands in the buffer.

The following routine may be inserted at the end of any program and carries out the necessary POKES to perform the commands NEW, RUN and LOAD.

```
1000 FOR Q=631 TO 636: READ D:
POKE Q,D: NEXT:POKE 198,6:NEW
1010 DATA 76,111,13,82,117,13
```

The commands are compressed using the standard VIC BASIC abbreviations for LOAD and RUN (L-shift-O and R-shift-U) as the maximum number of characters that may be placed in the buffer is ten.

Many people are still suffering from the one disadvantage of adding extra memory. Due to the way memory is configured on the VIC the screen area must be moved up in memory when you add extra



"WELL... I CAN'T UNDERSTAND WHY IT ISN'T WORKING. WE'LL HAVE TO CALL IN THE ENGINEER...."

RAM. As a result programs which use screen POKES to place characters on the screen will not run on an expanded VIC. Unless you can easily switch off extra memory, pulling cartridges in and out of the back socket can be a bit of a hassle not to mention somewhat damaging to the contacts on the cartridge slot.

A simple way around this is to fool the VIC into thinking it's a normal unexpanded machine by using a simple program to change a few pointers in memory.

## 5 REM PROGRAM TO SIMULATE UNEXPANDED VIC

```
10 DATA 169,0,141,129,2,141,131,2
20 DATA 169,16,141,130,2,169,30,
141,132,2
30 DATA 141,136,2,32,24,229,108,0,
192
40 FOR I=1 TO 27
50 READ A:POKE 8191+I,A
60 NEXT:SYS 8192
```

Novel applications for the VIC are being found far and wide; however the most interesting I've seen yet popped up in video arcades across Sydney early last month. The VIC, somewhat disguised, was hidden behind an electronic juke box which played the video clips to a selection of 30 tunes. The whole operation was controlled by a VIC 20 hidden beneath the coin slots and selection buttons.

Last month I mentioned an interesting peek which is useful for games and word processor input routines. The location was 197 and it returns the keyboard matrix value of the key currently being held down. This is useful as the keyboard buffer is not accessed and the latest keyboard response only is given thus providing fast reaction to key presses.

Below is a list of the values which are returned by peeking (197):

KEY PRESSED	VALUE RETURNED
1	0
3	1
5	2
7	3
9	4
+	5
\$	6
DEL	7
LEFT ARROW	8
W	9
R	10
Y	11

Continued on Page 93

# your MICROBEE computer

By Richard Pakalnis

IT'S HERE at last, the colour Bee – and what a fine piece of machinery it is too. Read the overview, you'll probably be impressed too!

This month, let's study some particularly helpful hints sent in by fellow Bee owners.

Robert Moyle, of Wembley in Western Australia, contributed this item for us. He writes:

## Life After Death

Or, how to recover your program after an inadvertent 'new' command on the MicroBee.

BASIC programs in the MicroBee start at (decimal) location 2304. This contains the high byte of the first line number and 2305 contains the low byte (*...and I'll be in Scotland before ye... Er, sorry – Ed.*). The end of the program and the storage area for variables is marked by two consecutive bytes containing 255. The memory location of the second byte is pointed to by locations 2258 (low byte) and 2259 (high byte). When the 'new' command is entered, the interpreter writes values of 255 into locations 2304 and 2305 and the 2258/2259 pointer is reset to point to location 2305. A few other pointers are also reset but the rest of the program is not altered.

To recover a NEWed program we need to restore 2304 and 2305 to the first line number value (line number 256 x contents of 2304 then add contents of 2305). If you can't remember what line number the first line is, don't despair, make it 1 by writing 0 into 2304 and 1 into 2305. This covers all possibilities as 1 is the lowest allowable line number. We then need to read through the memory locations from 2306 onwards until we encounter two consecutive 255s (marking the end of the program) then write the location of the second 255 into 2258/2259 pointer.

Another pointer at locations 1758 (low byte) and 1759 (high byte) shows where variables used in immediate mode commands are stored, and since the restore program must be entered in the immediate mode, we set the 1758/1759 pointer to a location near the top of user memory so that no overwriting of the program we are trying to restore occurs.

To magically restore your lost program type in:

```
POKE 1758,0:
POKE 1759,63:
POKE 2304,0:
POKE 2305,1:
FOR X=2307 TO 16384:
```



```
IF PEEK (X) = 255 AND PEEK (X-1) = 255
THEN POKE 2259,X/256:
      POKE 2258,X-256*(X/256)
ELSE NEXT X
```

Note: The values in the first two POKES and the value for the end of the FOR loop are for the 16K MicroBee.

## Printer Problems

Is it ESP or just a common problem? Four letters all dealing with Tandy line printers appeared on my desk within the space of a week. Each seemed to answer the other's questions. So David Stafford of Elsternwick, Victoria, read on. David has a 32K Bee and is interested in connecting it to a Tandy line printer VII.

Master A Goodison of Broadford, Victoria, wrote to us pointing out that a parallel printer such as the Tandy Quickprinter, LP VII and others can be operated via the parallel port with an easily constructed interface (the circuit is available from Applied Technology).

One problem created when using the parallel port (OUT L1) is that HIRES mode overwrites the INT vector at 80 hex, and the computer will hang if asked to LLIST or LPRINT to the parallel port after HIRES has been used. Issue POKE 128,8 to reset the INT vector. This solves the problem.

A second difficulty arises with most printers which do not expect to receive CHR\$(13) in a program LLIST. As was mentioned in a previous article, most computers delimit each line with a null (CHR\$(0)). However the Bee uses CHR\$(13) – line feed. When listing the Bee uses CHR\$(13) as a legitimate character, then issues its own line feed/carriage return for an end of line. Hence the LLISTing is double spaced and wastes paper.

The logic circuit below (added to the in-

terface from A.T.) checks for CHR\$(13), converts it to CHR\$(12) and leaves all the other characters unchanged. CHR\$(12) is ignored by most printers including those mentioned above. If using LPRINT in a program, use LPRINT CHR\$(26) at the end of your program to clear the printer buffer.

Roger Cooper of 6 Beaufort St, Woodford, 2778 has some pertinent comments to make – and he also has something to offer to those of you without printers.

Roger states: "please promote the users group AUSBUG in your magazine. I have just received the first edition of the bi-monthly newsletter, and it is excellent. The group must depend on the support and contributions of its members if it is to be worthwhile, so please draw attention to it."

I feel that, wherever possible, your magazine should insist on program contributions being submitted by way of computer printouts to ensure they will work (*If you read our guidelines for contributions on page 98 you'll see we do just that; the only problem is that printers aren't as common as computers – Ed.*)

A program in the December issue could not work because of duplicated line numbers. For those readers, like me, who like to make good use of programming it is very annoying to type all those lines only to find it does not work.

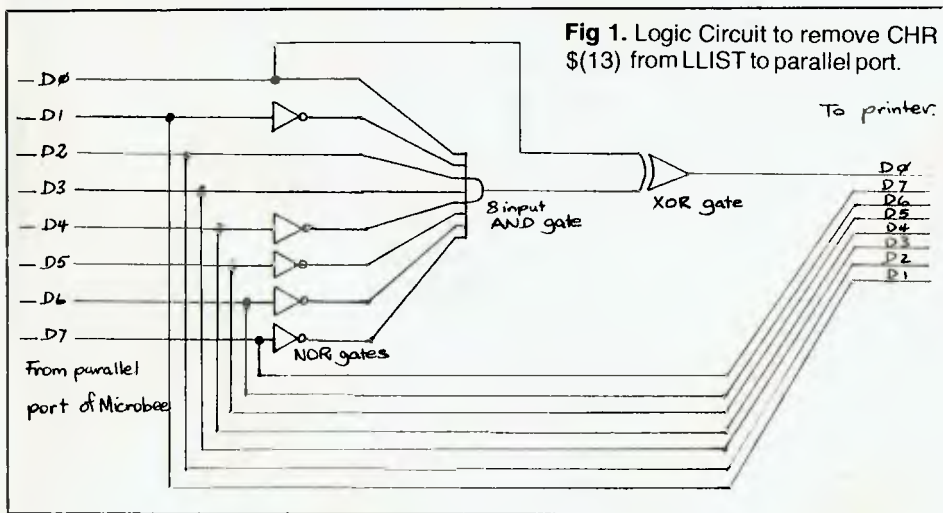
To help people without printers who want to contribute a program for publication, I will (if they send me a tape), send them a printout in return for getting a copy myself. For those who have a WordBee fitted they can also use this to get instructions and so on printed out. Please mark cassettes with name and address (I lose letters instantly) and supply postage.

The printer I am using is a Tandy Line Printer VII using serial interface at 1200 baud. The lead Tandy supplies will not match the MicroBee without some modification. If anyone wishes to use a Tandy printer please give me a call on (047) 58 7238 and I will let them know how to do it.

## One More Word

Just to finish off this little sojourn into the realms of printing: Lindsay Ford of Dreamcards Software (Lindsay is the author of that fabulous program PSYCHOTEC, but more on that in a future issue) wrote to me some time ago about the data rate incompatibility of the Bee and the (you guessed it) Tandy line printer.

He said: "it is necessary to use a spe-



ton switch between 3 and 15 of x3 (connector on the right of the top board) you can also wait the CPU while you switch clock speeds – which means you can do it in the middle of a program.

This mod not only makes the CPU go fast but also the PIO. Thus the speaker frequency and tones are higher and the tape speeds are doubled to 600 and 2400 baud! Having the switch still allows you to load other cassettes.

I have run my Bee like this for four months after seeing one at Applied Technology.

Note: For this to be successful one must have a Z80-A CPU and PIO, as these can run up to 4Mhz.

cial software routine to make them work together. A program written by Errol Delaney to do this was in the September 1982 issue of the MicroWorld Report. Unfortunately this program only takes us to the point of printing out a BASIC source listing, but with a little fiddling it can be used as a rudimentary word processor.

The program shown here is Errol's routine with a little extra logic to let it do the job. Simply key it in and the appropriate machine code sequence will be written into RAM starting at address 32000 (\$7D00H). Now all you need to do is type in your letter or whatever as though it were in BASIC, starting each new line with a line number (use the AUTO command) and a set of double inverted commas to prevent the text on the line being changed to upper case.

If you want any particular part in the bold typeface then the word or symbol should be preceded by an up-arrow and followed by a tilde to revert to normal. Once the text has been entered (either by typing or by tape) simply enter USR(32000) and it will be printed.

Note that the text may be worked on in much the same way as BASIC using the Bee's powerful editing commands.

```

100 CLS:FOR A=0 TO 219:READ B:
   POKE A+32000,B:NEXT A:CURS 1,6
110 PRINT "RAM LOAD COMPLETE.Note
   that '^' BOLD TYPE '~' returns type
   to NORMAL. ENTER USR(32000)":END
120 DATA 0,0,62,255,211,3,62,223,211,3,
   33,0,9,219,2,203,95,40
130 DATA 250,126,254,255,200,0,0,0,35,
   35,35,126,254,13,40,20
140 DATA 203,127,40,5,205,97,125,24,
   241,205,202,125,219,2,203,95
150 DATA 40,250,24,230,62,13,205,60,
   62,35,24,207,14,9,183,31

```

```

160 DATA 31,31,211,2,205,88,125,31,
   13,32,247,62,255,211,2,205
170 DATA 88,125,205,88,125,201,22,204,
   21,32,253,0,0,0,201,245
180 DATA 229,230,127,71,33,211,187,5,
   40,8,126,35,203,127,32
190 DATA 247,24,248,126,203,127,32,
   12,205,62,125,219,2,203,95,40
200 DATA 250,35,24,239,230,127,205,62,
   125,225,241,201,245,197
210 DATA 213,229,86,35,94,235,1,240,216,
   205,184,125,1,24,252,205
220 DATA 184,125,1,156,255,205,184,125,
   1,246,255,205,184,125,125
230 DATA 198,48,205,62,125,225,209,193,
   241,201,62,48,213,93,84
240 DATA 60,9,218,187,125,61,107,98,209,
   205,62,125,201,254,34
250 DATA 200,254,94,32,2,62,31,254,126,
   32,2,62,30,195,62,125

```

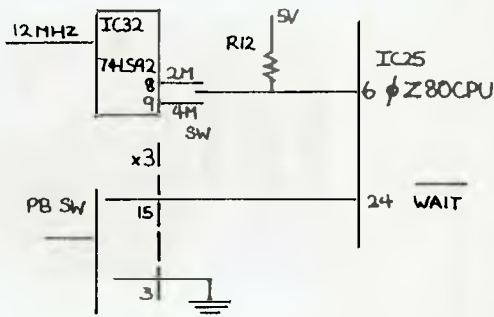
To use this program on a 16K system first alter the data in lines 120 to 250 by changing all the 125s to 62s. As each 125 is changed the number preceding it should also be altered by subtracting 2. Thus the end of line 250, for example, becomes "...60,62". Now change the two 32000s to 15872s and away you go.

### Hot Mod

Trevor Routley of East Brunswick has successfully managed to run his Bee at 4Mhz! In his words, "boy, does Space Invaders fly"!

The mod, according to Trevor, is simple. IC32 (it should be a SN74LS92) is where the 12 Mhz from the crystal is divided down to 2Mhz on pin 8. But on pin 9 of this IC is A/3, that is, 4Mhz.

By slightly bending out the pins and placing them through a switch to the left of R12 (which goes to pin 6 of IC25, through clock input of the Z80) you can switch backwards and forwards from 2Mhz to 4Mhz. By also placing a push but-



(Richard's note: I would advise anyone who is not familiar with electronics NOT to attempt this modification. The best option would be to speak to the service personnel at A.T. Or, better still, *nicht fingerpoken in der machinen!*)

### Is This Music?

Short programs such as this are usually kept for the Pocket Programs section but I was quite curious about this little offering from the Land of The Long White Cloud (you know, that place where the last person to leave has to switch the light off).

I will make no comment save to say that when you input this please ensure you put in Jim Wilkinson's name so you will always know who was responsible...

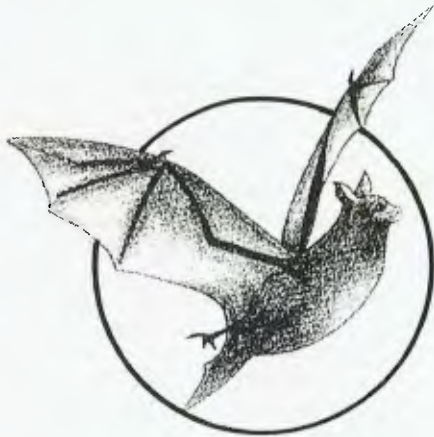
```

100 REM RANDOM MUSIC GENERATION
110 REM IN THE KEY OF C MAJOR
120 REM BY JIM WILKINSON
130 REM WAIKANAЕ,N.Z. 5 FEB 83
140 CLS
150 CURS 23,8:INPUT "NAME PLEASE";N1$
160 CLS
170 CURS 22,8:UNDERLINE:
175 PRINT "SONATUS DISHARMONIOUS"
178 :NORMAL
180 CURS 28,10:PRINT "IN C MAJOR"

```

Continued on Page 94

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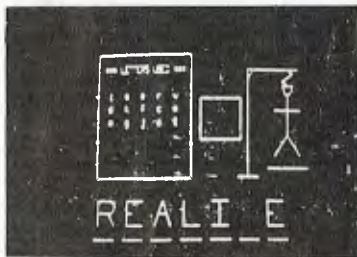
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# Here's A BetterBee

your computer

*Bee owner Colin Johns, who has reported on the machine in these pages before, comments on recent improvements – and offers some tips for the new user.*

THE MICROBEE has been more popular than Applied Technology could possibly have imagined, and this, coupled with wharf delays and shipping strikes, has meant that units still cannot be purchased off-the-shelf.

However, the delays may be a blessing in disguise for many customers, as experiences with earlier units has led to some worthwhile improvements. For example, the MicroBee now comes completely assembled and tested for about the same price as the kit.

The new case looks smarter and is a better fit around the keyboard, while the plug-pack power supply is a big improvement on the inadequate units supplied with early kits (my kit unit's plug-pack has been changed, and the Bee now runs for hours without any power supply problems).

The BASIC ROMs have also been re-programmed, and a new self-test feature is incorporated, along with improvements to the global search routines. The ROMs were responsible for the keyboard doubling problems on early units, and replacing them is a great improvement.

However, one of the best improvements is the complete re-writing of the MicroBee User's Manual, which now incorporates the tutorial booklet in one, improved spiral-bound book. The manual opens flat and will stand up to use much better than the original plastic-bound edition (*It may be better, but it's still far from perfect-Ed*).

There are a few typographical errors, but at last there is an explanation and example of the use of PCG characters. Unfortunately, there is still no print-out of the extra graphic characters, and there is not enough background information on the memory-mapped display.

The MicroBee's memory – those unique non-volatile integrated circuit chips which hold the program information and values needed to make the programs work – has a unique address of 8 bits, and each address has the ability to store eight 1's or 0's to represent a character, command or value.



## OWNER REPORT

Some addresses are set aside for the microprocessor as storage for important information. The first program instruction is stored at location 2304, and the space from there to within 255 addresses of the highest possible memory location in your system (depending on whether you have 16K, 32K or 48K of memory installed) is used for storage of program information.

A separate memory chip, corresponding to memory locations 61440 to 62463, is used to store the information needed on the screen. Memory location 61440 corresponds to the top left-hand corner of the screen, and 62463 to the bottom right. Any information placed into these locations – from 61440 to 62463 – will immediately appear on the screen.

The PEEK instruction can be used to examine any memory location, and the POKE instruction to directly put information into any memory location. So POKE 61984,65 will cause character 65 (the letter A) to appear in the middle of the screen. This is obviously quicker to program (once you get the hang of it) than CURS 544: PRINT "A", which does the same thing.

Try this short program to see some Graphics Characters which are not listed in the MicroBee manual:

```
10 FOR X=1 TO 32
20 POKE 61440+X,X
30 NEXT X:END
```

You will have to make a list of the most useful characters, although I expect No 7 will get a real hounding from "Space Invaders" freaks!

Now, those low-res graphics blocks. You can use the same POKE instruction

in the low-resolution mode to obtain those block characters by POKEing codes greater than 128. The block is divided into six portions:

1	2
4	8
16	32

Just add the values of the bits you want and add 128 to get the code for the shape you need.

Of course, you will usually have to use more than one screen location to make up the shape (or message) you want. Try this elementary message, made up of low-res characters:

```
10 CLS:LORES
20 POKE 61530,157:
   POKE 61531,149:POKE 61532,170
30 END
```

This is one way making up large characters on the screen.

Finally, this short program will demonstrate some more features, easily obtainable by directly POKEing screen locations.

After running this program, you will know how to hide some important words in your programs from your friends, at least until the program is run, and also how to make characters and words flash on and off:

```
10 CLS:INVERSE:X=0
20 POKE 61980,77+X:POKE
   61981,65+X:POKE 61982,82+X
30 POKE 61983,84+X:POKE
   61984,73+X:POKE 61985,65+X
40 POKE 61986,78+X:POKE
   61987,83+X:POKE 61988+33+X
50 FOR I=1 TO 100:NEXT I
60 A=INT(RND*539):POKE
   61440+A,7
70 B=INT(RND*412):POKE
   61990+B,7
80 IF X=0 THEN LET X=128:GOTO
   20
90 X=0:GOTO 20
```

You can, of course, control the flashing of the sign by varying the values in line 50. Lines 60 and 70 were added only for fun!

# your PEACH computer

By Dom Swinkels

COMPUTERS CAN be used in education in three distinct ways. First, and most often, they are used to teach about computers themselves. Secondly, they can be used in administration to maintain student records or to tabulate examination results. Finally, the biggest potential use of all is the use of computers to teach all kinds of subject matter, from multiplication tables to medical diagnosis.

The Peach is very suitable for educational use, since it has excellent colour graphics capability and can be made very easy to use without having to have computer knowledge. The only other requirement – and the reason why the Peach is not used a great deal in education – is software.

Various terms have become common in the literature on the use of computers in education. The most common is CAI (Computer-Assisted Instruction). This refers primarily to drill or practice type programs, in which the computer paces the user through a set of tests, such as spelling practice or multiplication tables. A program of this type might flash a word on the screen long enough for the user to recognise the word, but not long enough to imprint the exact spelling clearly on his mind. The user must then spell it correctly to score.

CAL (Computer-Assisted Learning) refers to the process whereby the student acquires new skills or knowledge via the computer. It therefore includes CAI as drill and practice will generally improve the user's skill, but also covers tutorial programs, in which new information is presented. A CAL program generally involves some degree of testing to determine whether the student is ready to go on to the next stage of new information.

Finally, CMI (Computer-Managed Instruction) refers to the use of a computer to direct the student through a series of learning activities, which may be only partially computer-based, records the student's progress through these activities and modifies them accordingly.

Most educational programs have elements of each of these characteristics. The different types of educational software can also be looked at as a progression from simple drill and practice programs (easy to write but of limited scope) and, finally, to simulations, on which the computer is programmed to behave like a complex real-life system. The user then learns by experimenting with the model rather than the real world system. Business games and war games fall into this category.

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What are the features we look for in good CAL software? Educators will no doubt argue a great deal about the details, but here are some of my requirements:

1. *The user should learn something:* this may be obvious but since some CAL programs are disguised as games, it is possible for the game aspect to become dominant and the learning aspect to be lost. We learn by doing and practice makes perfect, which is the justification for the drill type programs. But a program of this type must obviously be aimed at the right group. This leads to the second feature of good CAL software.

2. *The program should hold the interest of the user.* This can be achieved in a great number of ways. The presentation of the material is obviously important. The use of colourful graphics and sound can add a great deal here and it is important that the level of material presented is challenging without being so difficult that interest is lost. An average success rate of 70 to 85 percent is probably a good level to aim for.

Programs should therefore clearly aim at certain groups – for example, early primary school or first-year university chemistry students. Ideally, a program should have several levels of difficulty, which the student selects at the start or the program should adjust level of difficulty depending on performance.

3. *The user should get feedback on his performance.* This could be regarded as a method of maintaining interest but I believe this to be important enough to rate special mention. The popularity of computer games is achieved by holding the interest of the user with visual and audible effects and by feedback (scoring, gaining ground or possessions, destroying the enemy or beating the computer). If we could make CAL programs as absorbing and as popular as the video games then we would have some of the most educated youth in the world.

4. *The program should be easy to operate.* It is clear that the user should be able to give his full attention to the learning features of the program and not be distracted by the operational requirements of the computer. It should require little or no computer knowledge. The program should therefore be self loading and should ensure that keyboard errors do not crash the program.

The Chemistry Department of the Australian National University in Canberra has produced a set of about 30 programs for use in the teaching of chemistry in the

first year of university. The programs are currently produced on 13cm SS/SD floppy disk, which auto boot and will automatically execute NEW ON xx to suit the requirements of the programs on that particular disk.

The programs are grouped under eight headings and include enrolment and record-keeping programs to maintain class performance records and statistics. The chemistry topics include stoichiometry, oxidation states, stereochemistry and bonding, organic nomenclature and structure drawing routines.

Many of the programs use the high resolution graphics capabilities of the Peach to good effect and all make excellent use of colour. Much of the effect would, therefore, be lost if the programs are used without a colour monitor.

Though the Chemistry Department is planning to combine nine Peaches into a network around a 10MByte disk, other users may wish to start with the 13cm floppy disks. The programs are available, at a nominal cost, to other educational institutions. Write to Dr Malcolm Rasmussen, Chemistry Department, Science Faculty, Australian National University, Canberra, ACT 2601.

## Peach Sound

To add interest to any game or CAL program, various sounds are usually added. The Peach contains a speaker, which is connected to memory location 65491 (&HFFD3). Every time you address that memory location and change its value in such a way that the most significant bit is changed, a single click is produced in the speaker (since the most significant bit is equivalent to 128, it is necessary to alternate between values of 128 or higher and values of less than 128).

The click produced is the same as the click that accompanies each key press and its volume is controlled by the volume control next to the on/off switch.

If we repeat the clicking operation often enough and fast enough, the ear can no longer distinguish the individual clicks and it becomes a low tone. If we further speed up the rate of clicking, we increase the frequency of the tone and get a higher note. Finally, we can change the frequency in various ways and make siren type noises or whistles, explosions and so on. The only thing we cannot do in software is change the volume.

That all seems pretty easy but, unfortunately, this is where the slowness of BASIC becomes a serious handicap.

The program given in Listing 1 provides a number of choices to make various sounds. The first four choices are several ways of using BASIC statements to access the memory locations controlling the speaker. As you might expect, taking out unnecessary line numbers results in a slightly faster execution and hence a slightly higher tone. Using a variable instead of a decimal or hexadecimal number is also faster and gives a higher note.

Line 410 gives a continuous tone and this is the highest tone which you can get using purely BASIC statements. This particular line is of interest as you can slow it down while it is running by making BASIC do more work. You can do this by depressing one or more keys on the keyboard.

Though most keys normally have no apparent effect on the running of the program, the operating system is continuously being interrupted by the keyboard and must then determine whether the key pressed is one on which action must be taken (for example - Control-C). While line 410 is being executed, you can clearly hear the effect of a keyboard interrupt. You can in fact slow the tone down to an occasional click by depressing most of the keys at the same time.

To produce anything approaching a musical note, we must send clicks to the speaker at a faster rate than BASIC can cope with, and so we have to use a machine language routine such as the simple routine in option 5. The data poked

into memory locations 32770 to 32796 in line 510 produces a machine language routine which we then execute by the EXEC 32770 command in line 540.

The routine requires that we first POKE two more numbers, which determine the time between clicks (the wave length of the sound) and the number of clicks or waves to be produced. Because machine language is very fast we must, in fact, slow it down to get a clicking rate which the speaker can cope with and we can hear. The first number is, therefore, a counter which is counted down to zero between each click and the second number is the number of times we repeat the procedure.

I suggest you experiment with various values of L, the time between clicks, and find the numbers which produce a sound similar to the musical scale. If you're musically inclined, you can then write a tune by reading a data line containing the numbers for each note, and POKE each into 32768 in turn as in line 540.

One problem which now remains is that the length of each note varies with the tone because instead of making each note last a given time we have made it last a given number of waves or clicks. It is possible to calculate for each value L what the value of N must be to give a constant length for each note and I leave that for you to try also. Alternatively, we could write another slightly more complex machine language routine in which the second number is used to control the duration of the tone directly.

For the more down-to-earth users, try the value 30 for L in line 530. This will sound very similar to the BASIC command BEEP. In fact, when you use BEEP, BASIC eventually finishes up at a short machine-language routine located in ROM at &HF7A7.

This routine does a very similar thing to our little program but always uses the same value for the count down to zero between clicks so that the same sound is produced each time. To check this, you may wish to use the command EXEC &HF7A7. This executes the machine-language routine starting at &HF7A7, which produces the BEEP.

### Peach ROM Notes

More information on the ROM locations which contain the machine-language routines executed when we use each BASIC command may be found in *Peach ROM Notes*, recently published by the Software House. The authors, Bruce Rossell and Howard Viccars, have clearly done a lot of homework on their Peach.

Ever since Apple decided to make available full details of that operating system and ROMs, the microcomputer community has come to expect the same level of information for other machines. This type of detail has been sadly lacking for the Peach but *Peach ROM Notes* goes a long way toward filling this gap. If these had been available six months ago, they certainly would have saved me a great deal of time. But then I might never have started this column, either.

The notes are more than just notes about the ROM contents. They consist of more than 150 A5-size pages of well-produced and bound summaries of the inner workings of the Peach.

I was particularly interested in the section "Bugs, Anomalies and Some Fixes", as I had observed some of these myself. One of these is the change in the apparent size of a file stored on disk when the FILES command is executed. This can be caused by removing a diskette from the drive with a file left open and inserting another disk. It can, in fact, corrupt a disk and this may well have happened in some of the cases when I thought the loss of a disk was due to dirt or electrical noise.

The authors suggest a patch for Disk BASIC, which will give a "File Already Open" error message when an attempt is made to execute FILES while there is a file open on that drive. While this restricts the use of the FILES command a little, it may be preferable to losing a disk if you're

*Continued on Page 94*

```

10 REM..."SOUNDS"...by Dom Swinkels.
20 CLS:LOCATE 0,10:INPUT "Select sound test (1-5):";S
30 ON S GOSUB 100,200,300,400,500
40 GOTO 20
50 END
100 REM...Slow clicking.
110 FOR J=1 TO 200
120 POKE 65491,255
130 A=A+1:REM...Change this statement for various delays.
140 POKE 65491,0
150 NEXT J
160 RETURN
200 REM...Faster clicking.
210 FOR J=1 TO 200
220 POKE &HFFD3,&HFF
230 POKE &HFFD3,&H0
240 NEXT J
250 RETURN
300 REM...Faster still.
310 A=65491
320 FORJ=1TO200:POKEA,255:POKEA,0:NEXT
330 RETURN
400 REM...Continuous clicking.
410 POKE 65491,255:POKE 65491,0:GOTO410
500 REM...Various tones.
510 FOR J=0 TO 26:READ A:POKE 32770+J,A:NEXT
520 CLS:LOCATE 0,10
530 INPUT "Enter wave length and number of waves (1-255):";L,N
540 POKE 32768,L:POKE 32769,N:EXEC 32770:GOTO 520
550 DATA 182,128,0,95,83,247,255,211,74,38,250,182,128,0
560 DATA 95,247,255,211,74,38,250,122,128,1,38,230,57

```

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**ZX81 Club:** Members wanted, \$5 year ... Newsletter, free offers etc. Please write to R Skelton, C/- Harbourside Orchard, Waiuku, New Zealand.

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**MicroBee Fanatic:** wishes to meet other owners in Dee Why locality. Phone (02) 981 4651 after 4 pm.

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and helping you keep an eye on them. On the scanner, your ship is represented by a " and the aliens are shown by squares. Beside the scanner, the number of shops remaining is shown - you are given three. Scores and remaining fuel are shown at the bottom of the screen.

As you are always losing fuel, you must go into 'Base Approach' at certain intervals and fly your craft through a series of satellites until you reach the base. From there on, your ship is refuelled automatically.

To move your ship, the A and Z keys are used for up and down respectively, and the arrow keys for horizontal directions. Pressing these keys in rapid succession results in continued motion, rather than a stop-and-go motion. The space-bar fires a laser. Pressing ESC allows you to freeze play. Control-R will restart the game. Control-S turns the sound effects on and off.

This game has unbelievable colour graphics, particularly when the aliens materialise and when your ship explodes. It is one of Sirius' best, and a game with a difference. Its only faults are that, at times, it is slow-moving and, when first tried, the keys are difficult to get used to. □

I	12
P	13
*	14
RETURN	15
	16
A	17
D	18
G	19
J	20
L	21
;	22
CURSOR LEFT/RIGHT	23
STOP	24
	25
X	26
V	27
N	28
,	29
/	30
CURSOR UP/DOWN	31
SPACE	32
Z	33
C	34
B	35
M	36
.	37
	38
FUNCTION 1	39

	40
S	41
F	42
H	43
K	44
:	45
=	46
FUNCTION 3	47
Q	48
E	49
T	50
U	51
O	52
@	53
UP ARROW	54
FUNCTION 5	55
2	56
4	57
6	58
8	59
Ø	60
-	61
HOME	62
FUNCTION 7	63
NO KEY PRESS	64

Soon I hope to add the Commodore 64 to this column; it's likely to be very popular amongst VIC fans who are looking for some way to upgrade their machines in one step. □

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Picode

BRUER PYM 2380

## your PEACH computer

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in the habit of frequently swapping disks.

The authors provide some very useful SS/SD DOS modifications which allow both 32K and 40K Disk BASIC to auto-boot and another one which allows the FILES information to be written across the screen rather than in a single column. This prevents some of the information being scrolled off the screen, when you have a large number of files.

All in all, I'm very impressed with the information in Peach ROM Notes. It is a must for any serious programmer. Some of the contents may be a little difficult for beginners, but with a copy they will not stay beginners very long.

The notes are well cross-referenced but there is no index, and the Disk BASIC information refers to single-density disk system only. Double-density systems are different. Perhaps we can look forward to a second edition in a little while, or an addendum covering double-density disk systems.

However, at \$28 for the notes and \$5 for a memory display and the DOSMOD program on a 13cm diskette, it's a bargain. Contact the Software House at PO Box 70, Weston, ACT, 2611.

## your MICROBEE computer

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```

190 CURS 28,12:PRINT "BY ";NLS$
200 DIM A1(10)
210 FOR Y=1 TO 8
220 READ A1(Y)
230 NEXT Y
240 FOR S=1 TO 100
250 PLAY 16
260 Z=INT(RND*8)
270 M=INT(A1(Z))
280 PLAY M
290 PLAY 4
300 NEXT S
310 CLS
320 CURS 25,8:PRINT "THANK YOU MAESTRO !"
330 END
1000 DATA 4,6,8,9,11,13,15,16

```

### Northside Hive

Colin Tringham, acting president of the Northside MicroBee Users Club, wishes to tell you all about this new club, recently started on Sydney's North Shore.

They meet on the third Saturday of each month, from 1pm to 5pm, in the McMahons Point Community Centre at the corner of Lavender St and Blues Point Road. It's just a short walk from North Sydney Station.

The club was started to allow MicroBee owners access to more information on their machines and also to allow mem-

bers to exchange, buy and sell their own software and so on. Meetings will consist of a short business session then demonstrations of MicroBee aspects. A newsletter with tips and hints, software reviews and readers ads will be produced each month. Membership is \$20 a year.

For further information call Tony Williams on (02) 267 7747 during business hours or send a stamped addressed envelope to MicroBee Users Club, C/- 6 Tunks Street, Waverton 2060.

Well that about wraps it up for this month. Keep those letters coming. I can never get too many for I find problems that arise are extremely similar in nature and one response usually solves four or five others. Before I go I just want to give a free plug for a couple of young fellows who have started their own software business, fresh out of school and eager to give themselves a good start in this competitive market.

Michael Fackerell and friends have formed a company (registered) called Dynamic Software (their quarter page ad is nearby) and will be selling programs for the Bee. Their work is imaginative and will develop as the months go by. I wish them luck in their new venture. God knows we need more people to get off their bums and do a bit for themselves. Recession? Bah, humbug!

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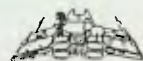
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