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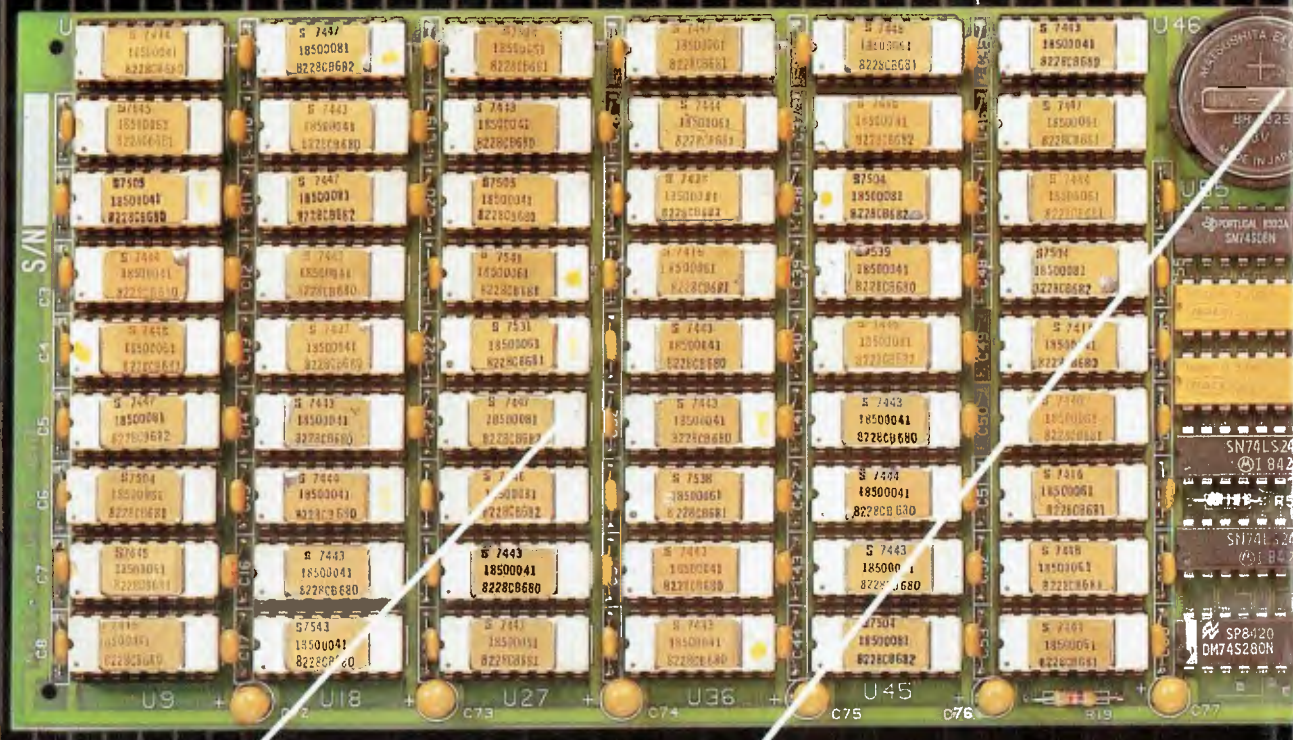

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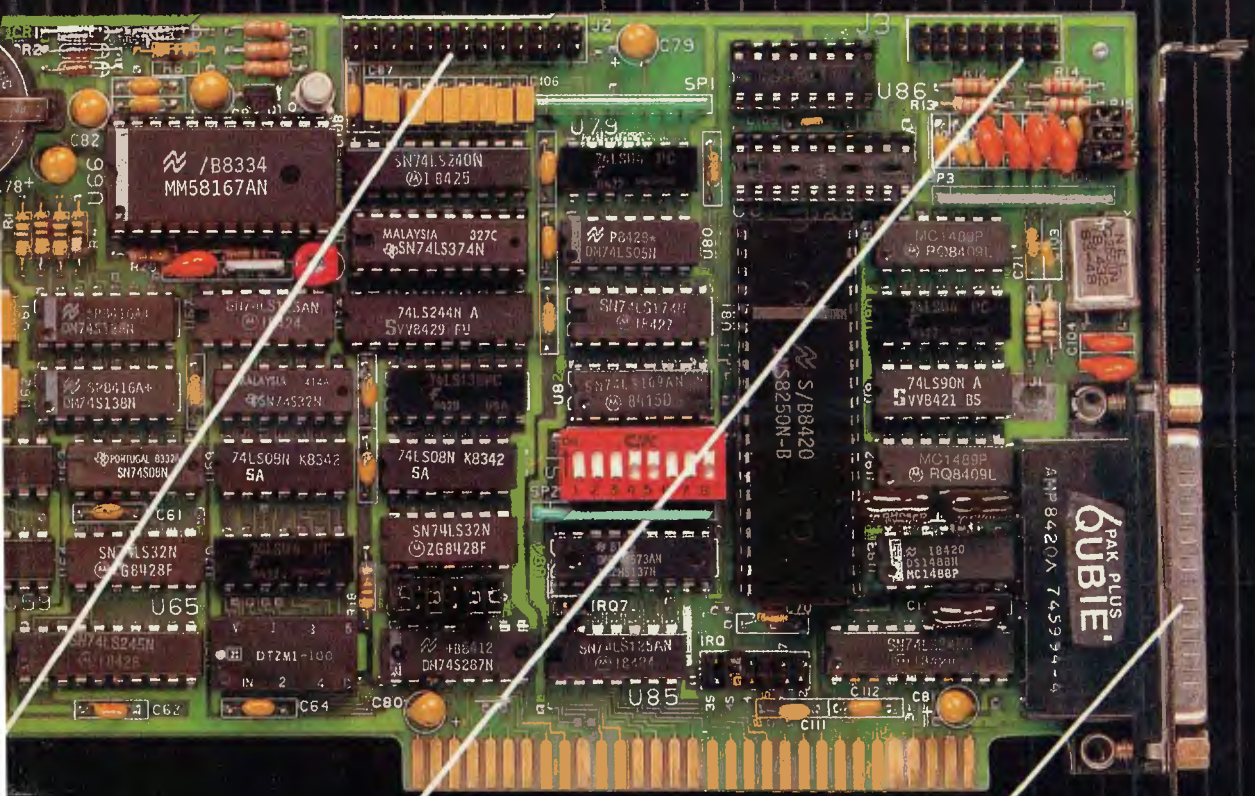

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EDITORIAL

Ten Years After

In November last year, I celebrated 10 years of writing about microprocessors, microcomputers and personal computers. From that perspective, the personal computer revolution looks more like an evolution — but what an evolution!

Back in 1975, there was only one 'personal computer' available, in kit form. That was the Altair 8800, a box which looked more like a minicomputer than today's svelte boxes. Based on the 8080 microprocessor, the Altair had no keyboard or display — instead, programs were entered in binary form by flicking sets of switches on the front panel. In the massive memory space of 256 bytes, about the most exciting program that could be run was 'chase', a game in which the player tried to flick switches in time with the flashing front-panel lights.

Magazines sprang up — *Byte*, *Dr Dobbs'*, and others — full of adverts for add-on boards: memory, TV typewriters (video boards), input-output ports, paper-tape readers and, later, cassette interfaces.

In the following year, competitors appeared: the IMSAI 8080, which was near-identical to the Altair, and the Processor Technology Sol, the design of which pre-dated the similar Apple II. Still the intending user needed to build the computer from scratch — and then get it working. After all that, it still couldn't do anything very useful.

Today, nobody — but nobody — builds their own computer. Nobody keys programs in in binary, and the game of chase would be regarded with scorn by dedicated game-players.

Today's technology is dramatically more advanced; machines are more powerful, not so much because the processor chips are more powerful, but because computer designers and programmers have developed much smarter ways of doing things. Operating systems like Unix, languages like Pascal, C, PROLOG and others, applications programs like spreadsheets, word processors and databases were beyond the ken of the early hackers. While feasible (they were all implemented sooner or later on the Altair), these programs existed only on mainframes or large minis, and they bore little resemblance to the sophisticated tools we use today.

Without the personal computer, and the concepts of high-quality, low-cost, highly interactive software which it made possible, software technology would be dramatically different today. The personal computer made it possible for programmers to explore new ideas at low cost, pursuing their own ideas without endorsement or backing from the large corporations who controlled mainframe computing power. It is this, as much as any other influence, which has shaped the face of personal computing today. Improvements in the silicon of processors has had much less influence.

Where will we be in 10 years time? Thirty-two-bit processors will be commonplace, with at least 1024 by 1024 bit-mapped graphics. Operating systems will be multi-tasking and windowing, allowing users to switch their attention between tasks. Networks will be common, with most PCs attached to either a local-area network or a public packet-switched network.

Most PCs will also have a CD-ROM drive attached, usually devoted to a dictionary, graphics library and other large databases. Mass storage will possibly be a laser disk in the one-gigabyte range, although I can still see a long future for conventional rotating magnetic disks — a typical hard disk would be around 300 Mbyte capacity in 10 years time, I would guess.

Incidentally, if you come across this article in 1996, I don't want to know . . .

LES BELL

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PC86 In Sydney

The Sixth Australian Personal Computer Show, PC86, will be held from 12 — 15 March at Centrepoint, Sydney, with 71 exhibitors set to show off their new and not-so-new wares.

Some of the companies on show will be Anitech, Arcom Pacific, Telecom, Apple, Vizden, Polaroid, Sanyo, Sourceware, Ericcson, IBM, Tallgrass, Microbee and Imagineering. Companies planning to introduce new products shortly before the show include Apple, Epson, Microsoft and Barson, and their new releases will be displayed at PC86.

The show will provide the first chance for most people to see local manufacturer Microbee's exciting new Gamma (previewed elsewhere in this issue), its Alpha-plus and the Telecomputer. IBM will display its IX, Hewlett-Packard the Vectra PC, and Vizden will display the whole range of recent Kaypro machines.

The Australian Computer Society (NSW Branch) will once again run a conference concurrently with the show. The conference will feature some big names from the microcomputer industry, notably Microsoft chairman Bill Gates, and John Sculley, president and chief executive of Apple.

Mr George Walker, executive director of the Australian Computer Society, said the major aim of the conference is to provide an industry update. Registration for the three days costs $450, and the conference will be held at the Masonic Centre. □

Bill Gates, founder and chairman of the Microsoft Corporation.

dBase User's Group

The Sydney dBase User's Group has moved house and given birth to a special interest group. The new meeting place and postal address for the group is:

The Australian Computer Society,
1st Floor,
72 Pitt Street,
Sydney 2000.

Meetings will take place on the *third* Tuesday of the month at 6.30 pm.

The first meeting for this year will be held on February 18, and topics will include a presentation on Clipper, the dBase III compiler, and a discussion on dBase II version 2.43*.

The group will also discuss the possibility of forming a *Framework* special interest group, so anyone interested in Framework should also attend.

The group would like to thank the Australian Computer Society for its support. More information on the group may be obtained from Katherine Rosenbrauer on (02) 74 1961. □

Apple Australia Takes International Award

Apple Computer Australia has taken the Apple Computer Inc. International Founder's Award for attaining the most extraordinary sales growth of any Apple subsidiary.

Named for Mark Markkula — the US computer industry entrepreneur who was instrumental in establishing Apple in 1976 — the Founder's Award is presented to the country achieving the greatest growth over target in one year.

In the financial year ended September 30, 1985, the Australian subsidiary achieved 152 per cent revenue growth and 123 per cent unit growth over the previous year, winning the award by a narrow margin from Apple France. □

ISR Tackles the World

A small, privately owned Australian software research company has hit the international marketplace with its 'fifth-generation product', XL.

Melbourne-based Intelligent Systems Research says it is negotiating for the language to be introduced internationally — into some of the world's biggest banks — by a multi-national computer company. (See our December 1985 article on the prospects for XL.)

Development of XL began four years ago. It is a Unix-based system using data-directed technology, originally developed as a knowledge-engineering tool for universities, colleges and corporate research groups. However, after its initial release the sales feedback immediately indicated there was promise for far broader markets than originally expected.

Encouraged by these findings, ISR's latest forecasts for the product are a little less modest, with the managing director, Alan Page, suggesting the longer-term potential for XL and its applications could run into hundreds of millions of dollars. □

The $1,000,000 Switcheroo

In what must be one of the biggest giveaways in the computer industry, Micro Database Systems — the maker of Knowledgeman — is offering $US800,000 for the best "Why I switched to Knowledgeman/2" testimonial. All you have to do to get $US32,000 annually for the next 25 years is buy a copy of Knowledgeman/2, register it, and write what the judges consider the best 500-word essay describing why you chose to buy Knowledgeman/2 instead of any other database.

Considering what a good product Knowledgeman is (it was joint winner of our 'Great Database Search'), MDBS has not been entirely effective in marketing it. The $1,000,000 Switch is an attempt by the company to make inroads into Ashton-Tate's domination of the database field.

In addition to the $US800,000 first prize, two prizes of $US100,000 will be awarded as incentives to Knowledgeman dealers and value-added marketers. If you're having some difficulty choosing a database, even (especially?) after our extensive reviews over the past 18 months, this may be just the inducement you need to make a decision. Obviously, MDBS is hoping it will

be. If you want more details on the competition or the database itself, contact the local distributor, Database Network, on (03) 523 8222. □

AUSTRALIANS AT COMDEX

Five Australian firms which showcased their products at the world's largest computer show, Comdex Fall '85, say they are negotiating sales of more than $US3 million, and estimate sales over the next 12 months at $US6 million.

The firms which exhibited on the Australian National Stand were BBJ Computer Services, Datatran and Pulsar Electronics of Victoria, and Nucleus and Time Office Computers of New South Wales.

Ian Hay of Time Office Computers said the level of interest his firm's ergonomic workstation and portable lap computer elicited at the show had resulted in significant sales deals now under negotiation.

Datatran has moved its exporting plans ahead by six months as a result of participating in Comdex. It has signed two US distributors and is currently negotiating further distributor agreements.

Exhibitors on the Australian stand received 5000 visitors and 1000 serious trade enquiries during the show, where a total of 1250 US and international firms exhibited computer software, hardware and related equipment to some 80,000 visitors. □

OUTBACK COMPUTING

The Community College of Central Australia recently conducted three computer courses in remote outback areas in order to satisfy the demand from communities for introductory and specialist courses.

Lecturers Colin Hodges and Andrew Kovac loaded a College vehicle with five Apple IIes and set off for Avon Downs, 900 km from Alice Springs on the Queensland border. The visit was timed to coincide with the annual Avon Downs Cricket Match — one of the few occasions when the Barkly community is gathered in the one place.

Three courses were conducted over a two-day period: Computer Applications for Stock Inspectors; Computers and Cattle Stations (a course for owners, managers and station personnel with some previous computer experience); and a short session for jackaroos and jillaroos, Introduction to Computers.

The next stop on the tour was the small township of Elliot, 700 km north-west of Avon Downs. Taking the Mystery Out of Microcomputers was followed the next afternoon with specific applications for small business owners and operators.

After a short hop of 250 km to Tennant Creek, the Barkly TAFE Centre provided the venue for a further two workshops: an in-depth version of Taking the Mystery Out of Microcomputers and, as a follow-up to a previous seminar held in Tennant Creek in September 1985, a specialist course on the use of integrated software was conducted the following day.

The College's Department of Computer Studies has plans to further the process of taking courses to people in remote areas, and is looking forward to the time when communicating and transferring information will take place via local computer systems. □

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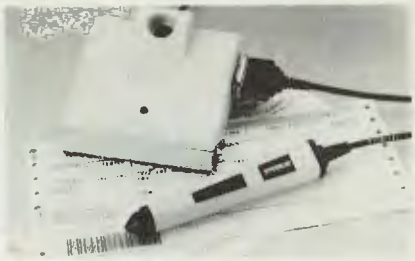

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● Gee-whizz, effective, shazzam, whoopeedoo... Streets ahead of any competition. *Australian Electronics Monthly (October 1985).* ● Top marks... A big bouquet to James Tucker for his documentation. *Your Computer (September 1985).* ● If you need any kind of enhancement to Wordstar this is the one. The ads don't do it justice. *First Osborne Group, USA (Foghorn, July 1985).* ● Excellent value for such a useful piece of software. *John P. Carney.* ● **FLASHPRINT!!** is everything you said it would be. *Terry Bibo.* ● I had been going to buy Smartkey, but **FLASHKEY!!** will do all the changes I want. *Peter Carnell.*

● It represents the best value for money of any software I have purchased. *Gordon Woolf.* ● Every Wordstar user should have this one. *Kaypro User Group of Victoria.*

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evidence of unauthorised distribution of the program AutoCAD was found on its premises.

The evidence was obtained after a Melbourne Supreme Court judge granted Entercom an order to search the premises and preserve evidence. Entercom is the Australian distributor of AutoCAD, and it sought the order together with the copyright owner, Autodesk of California.

Tony Zammit, the managing director of Entercom, said Autodesk had requested he take firm measures to eliminate the distribution of unauthorised copies of AutoCAD in Australia.

After the seizure of the documents, the proprietors of Computers Galore agreed to pay an undisclosed amount of damages, and to co-operate in tracing faulty copies.

"Leaving aside the possibility of faulty copies, purchasers of the unauthorised copies are locked out of all future enhancements to the product," said Mr Zammit. "We have been charged with the duty of both protecting the AutoCAD user and the name and reputation of the product." □

RISKS IN HOME BREW MACS

Apple Australia has warned that 'home brew' modifications to Macintosh computers could result in the loss of warranty and eligibility for service through authorised outlets.

Apple's technical manager, Greg Buchanan, said the hand-soldering processes used in many non-Apple memory upgrades (from 128 Kbytes to 512 Kbytes) could jeopardise the integrity of the Macintosh system. According to Buchanan, some home brew upgrades for increased memory, composite video parts and hard disks can permanently damage the multi-layered circuit boards and surface-mounted devices installed within the computer.

"It is important for users to note Apple has always honoured a policy of allowing continuing upgrades to existing equipment when enhancements are released, but we cannot guarantee that any modified systems will work with upcoming hardware and software", said Buchanan.

Apple has confirmed the standard limited warranty accompanying new Macintosh equipment is voided by non-Apple upgrades, that modified computers are not eligible for the Applecare Carry-In Service programme, and that modified circuit boards are ineligible for the Apple exchange module programme. □

MACINTOSH BULLETIN BOARD

Gary Clarke, of software house Imagineering, is setting up a bulletin board especially for Macintosh users as part of his company's service to computer users.

The bulletin board will expand the use of a Mac by providing up-to-date information of interest to Mac users, allowing them to transmit and receive messages from other Mac users, and enabling them to download programs from local or international databases.

Clarke is using a Corvus 20 Mbyte hard disk to support the board. "It is one thing to have the Mac totally dedicated to the bulletin board," he says "but I also want to use the information on my disk for other purposes. Therefore, I need a hard disk which has a multi-user facility.

"All you need to plug into the bulletin board is a Mac, a modem and communications software — and a telephone." The bulletin board will operate 24 hours a day, and Gary Clarke can be contacted on (02) 662 4499. □

LAYOFFS AND REDUNDANCIES

UK computer manufacturer Apricot has announced its first employee redundancies. The company is laying off 120 staff in Britain, and closing its subsidiary in West Germany.

Apricot is expected to announce pre-tax losses of about $6 million for the first half of the financial year, a disturbing trend for the company which currently holds about 20 per cent of the British market for business personal computers, trailing only IBM in this area.

The layoffs follow the recent announcement of a new Apricot

model — the Xen — which features 512 Kbytes of RAM, twin 720 Kbyte disk drives and the 80286 processor.

Another British company, ICL, has announced it is retrenching 75 staff from its Australian subsidiary, in order to 'revitalise' its operations (what an attractive name for sacking staff), and Texas Instruments Australia has lopped a dozen from its staff in recent months, following reduced third-quarter profits and a lowering of the corporation's worldwide performance. □

New Programming Design Tool

Sydney company Grouse Bell and Associates has released a program design tool which is claimed to dramatically increase programmer productivity while cutting program maintenance costs.

Our own Phil Grouse (what did you think he'd look like?) showing off his structured programming tool, Stylus.

The package, *Stylus*, automatically forces correct structured programming style while providing program documentation.

Does the company name ring a bell? Regular readers will probably recognise the combined talents of our consulting editor, Les Bell, and regular contributor, Phil Grouse, at play. Stylus is, in fact, an updated version of Speedit, the program Phil has used to illustrate his series on structured programming.

Based on a concept called the flowblock (developed from Nassi-Schneiderman diagrams), Stylus enforces structured programming practices by breaking large programs up into modules automatically and supporting the structured set of flow control statements. It also builds documentation into the source code and has an extensive online help system.

The Stylus editor and a BASIC translator (which converts your flowblock design into BASIC code) cost $150. Other translators are available (or in the pipeline), including dBase, PL/I, C, and COBOL. The extra translators cost $60 each, or less if bought with the initial program. The program runs on IBM PCs and compatibles with 192 Kbytes of memory and (preferably) a colour screen. Grouse Bell and Associates can be contacted at PO Box 297, Neutral Bay Junction 2089; (02) 908 3458. □▶

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AMERICAN GRAFFITI

BY HOWARD A. KARTEN

THE FUTURE OF 8-BIT COMPUTERS

Microcomputing's future clearly lies in the 16-bit and 32-bit arena; few healthy manufacturers today are still making 8-bit hardware, and those who do, such as Apple, clearly see the writing on the wall and are moving towards the 16-bit world.

But that doesn't mean all 8-bit hardware should be chucked out. To get an unbiased perspective on what's happening in this world, we spoke recently with Dr Alexander Randall V, owner of The Boston Computer Exchange Corporation. BCE, according to Randall, is the world's largest broker of used computer wares, from software to mainframes.

We chose to interview Randall, in preference to a vendor or other person involved in the sale of new hardware or software, because his business activity gives him a certain objectivity or independence. As he explains:

"I am not anyone's dealer, sales rep, or salesman. There is no one I have to suck up to. There is nothing I have to sell. My business is therefore demand-driven: people call and say 'I want to buy an X'. They don't call and say 'Sell me something'. I'm the only person I know who can as easily sell you an IBM, as an Apple, as a Compaq, as a Digital, as a Kaypro, as a mainframe, as anything else!"

Q. *How much of your current activity is related to 8-bit hardware and software?*

A. Around 25 to 30 per cent.

Q. *Over the years, how has 8-bit hardware kept its value?*

A. it's been dropping constantly. Osbornes trade at around $US250 to $US300 now, compared with $US500 a year ago and $US700 18 months ago. Kaypros are the same story; they are a bit more valuable now, but they are not anything like what they cost new.

Q. *How does 8-bit Apple hardware stand today?*

A. At the moment, my bottom-end Apple II+ is $US300 — that's for 48 Kbytes, no drives, no monitor; just a bare-bones machine. So it's about a third the price of a new IIe or IIc.

Q. *But can you make a rough estimate of how much used Apple Ii hardware costs today, compared to new, comparably equipped hardware?*

A. The price of used equipment is usually about 30 to 50 per cent below current new prices for comparable gear. It's hard to be specific because each system varies. For example, at the top of my Apple II+ list is a $US1000 system with 64 Kbytes, two drives, green monitor, accelerator card, Vydex cards, hundreds of programs, and on and on. Every system is unique; the general trend is year- old equipment is worth around 30 to 40 per cent less than new, comparable hardware.

Q. *The interesting thing about Appie hardware is it's eight years old, and it has still kept a tremendous amount of its value.*

A. It still does exactly what it did when it was brand new. The reality is the competing new equipment doesn't do all that much more than the original Apple II did. The spreadsheet on the PC might be a bit faster or friendlier or have more functions added, but if all I want to do is run a spreadsheet, I can run it on anything. So they *do* retain their value, because they can still do what they could do when new.

Q. *What are the biggest sellers in the 8-bit market today?*

A. Apples, Osbornes and Kaypros.

Q. *So what is actually happening to all the 'used' hardware, particularly hardware that may have been traded several times?*

A. Apple era stuff is still being bought and sold. I had a week recently when it seemed like all we did was Apples and Commodores.

Q. *Are any vendors making products to soup up 8-bit machines?*

A. There is a lot of that hardware still trading, but I'm unaware of anyone in the 8-bit world who's starting a new enterprise to sell boards to 8-bit machines. It's not where the action is.

Q. *How long do you think 8-bit hardware will still be around and in active use?*

A. How long have Model-T Fords been around? I agree with Steve Jobs that the Apple II will live forever. One hundred years from now, people will still be banging on that machine.

Q. *What advice do you have for owners of 8-bit machines who are happy with their hardware, but who may be tempted by all the talk of alleged obsolescence of 8-bit hardware?*

A. Develop their user group! The most useful thing a person like that could do is develop a user group — a community of people who work with the same machine.

COMDEX

The general consensus is the recent Fall Comdex show, held every year in Las Vegas, was dull, with little pizzazz or few truly innovative products launched. This may not augur well for the coming year in the microcomputer industry, given the severe shakeout that's been occurring in the past six months and the significant fall-off in growth, compared to previous years, in new computer shipments.

Prominent by its absence at Comdex this year was Lotus Development Corporation. Two facts make Lotus' absence interesting. First, Lotus launched 1-2-3 at Comdex several years ago, and second, traditionally, Lotus has courted dealers assiduously at computer trade shows, which usually made its parties the talk of the town.

One of the more interesting product launches was Maxell's 2-1/2 inch (6.5 cm) floppy disk, capable of holding 360 Kbytes of data (the same amount that can be stored on a standard 13 cm IBM diskette). Although smaller disks offer several advantages over larger ones — for example, they're easier to mail and store, have faster access times in disk drives, and permit the downsizing of computers — the prevalence and substantial base of 13 cm disks throughout the industry and the world have made it difficult for manufacturers to change the standard, or to encourage secondary standards.

Thus, given two current de facto standards — 13 cm and 9 cm (as used on the Macintosh) — Maxell surely faces an uphill battle. Indeed, in many ways, the company's smaller disk faces the classic problem that has plagued almost everyone in the computer industry from its beginning — how to gain vendor and consumer acceptance of a product which may have some technological advantages, but which competes against a solid installed base.

UPDATES AND PREDICTIONS

■ Several months ago we reported on the Hardcard, a 10 Mbyte hard disk on a standard-sized, plug-in board. The vendor recently began shipping the $US1095 board to consumers, and the tone of early reviews has been almost uniformly favourable. Several reviewers have praised the ease of installation of the device — both physical installation and software installation — and it is reportedly quite shock-resistant as well. One measure of the success of the concept is at least two other vendors are selling hard-disks-on-card — one of them, a 20 Mbyte device ..

■ Apple is expected to launch a faster, larger-capacity, enhanced version of the Mac at its January stockholders meeting, which is the traditional occasion for the launch of new Apple products. Reports circulating in the software-development community indicate the new machine (at present it's apparently called the Mac Plus) will have a base configuration of 1 Mbyte (expandable to 4 Mbytes); a redesigned keyboard adding a traditional, calculator-style keypad; a method of attaching peripherals made by other vendors; and a double-density, double-sided (800 Kbyte) disk drive. Rumours also abound of plans afoot at Apple to switch to an 'open architecture' policy, such as that followed by IBM since the PC's inception ..

■ Atari will probably introduce a 1 Mbyte version of the 520 ST, complete with built-in floppy drive. Company officials are believed to be shooting for a machine around the $US1000 mark ..

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THE AMIGA

Rumours abound that the Commodore Amiga will make its appearance in Australia in March. Whenever it does appear this year, it will be worth looking at.

A preview of the Amiga by Commodore late last year certainly made the machine look tantalising: every now and then in the computer industry, something comes along which is a leap in technology and genuinely exciting. The Amiga appears to represent such a leap (as does the new, and cheaper, Microbee Gamma).

A brief tour of the Amiga shows a Motorola 68000 processor at its heart (the same processor used by the Macintosh); 256 Kbytes of RAM, user-expandable to 512 Kbytes and expandable externally to 8.5 Mbytes; 192 Kbytes of ROM containing multi-tasking, graphics, sound and animation-support routines; built-in 880 Kbyte 9 cm floppy disk drive; and three custom chips to control graphics, audio and peripheral I/O.

The custom chips take a lot of the load off the central 68000, and the Amiga functions considerably faster than the Mac, with beautifully smooth scrolling, and fast loading of multiple applications. The proprietary operating system provides support for multi-tasking, superb graphics and a choice of icon-driven or command-driven interaction. The only thing lacking so far is a good range of software — the same lack which caused Apple problems when it introduced the Mac. The Amiga will run IBM PC software if you add a 13 cm disk and some software, so it won't be totally softwareless.

Apple is going to have to do some impressive footwork to outgun this new Commodore entry on the market. If you're thinking of buying a machine of the Mac ilk, wait for the appearance of the Amiga and the Gamma. They'll give you a lot to think about. □

JACARANDA SOFTWARE AWARDS

Educational computing has escaped from the maths-science stranglehold of a few years ago, if the entries in the 1985 Jacaranda National Educational Software Award are any indication.

The inaugural award of $1000 was won by *The Tycoon Itch*, a simulation that requires students to act as a shipping and commodity trading company's board of management. The program demands the use of skills in geography, economics and accounting as the board guides its ship from port to port. The authors, Cyril Balkisson and Sydney Sanders, both work at Bramfield Park Primary school on the outskirts of Perth. Their package will be published by Jacaranda Software in the middle of this year.

Hume and Hovell, by Clive Millsum of Cranbourne, Victoria, won second prize because of its combination of excellent graphics with a carefully researched historical recreation of the explorers' journey. Dave Healy of Kingsley, Western Australia, came third with *Numerama*, a simple, challenging, open-ended maths activity. The judges agreed that although the central idea of the program was not new, it was the only package of its kind suited for use in the middle primary school.

The judges were Di Ryall (Apple Computer), Tony Salvas (State Computer Centre, Melbourne), Eric Davis (Centre 2000, Brisbane) and Bruce Mitchell (Jacaranda Wiley, and *Your Computer* columnist). The Jacaranda Award was established to encourage programmers and software designers to co-operate in the creation of innovative software packages that provide educational opportunities beyond those offered by 'traditional' learning activities. □

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HERE COMES

SUPERBEE

Four years after the release of its original 'bag-of-bits' kit computer, Microbee Systems is set to advance the state of the art in Australia with three spectacular new releases. It's fitting that Your Computer, the vehicle for that first launch, again has the exclusive inside story on the newest local trend-setter. Matt Whelan spent enough time snooping around the company's new research facility in Sydney to come up with the goods on all but one of the new developments ... ▸

Superbee!

A stunning new lineup of advanced computers will be launched by Australian success story Microbee Systems in March.

The new machines — a completely revamped version of the original Bee, an all-new multi-processor machine to rival the Commodore Amiga and the Atari ST, and a still-secret competitor to Telecom's Computerphone — represent a giant leap forward for mass-market high technology in Australia.

While we haven't yet had a close enough look at working versions of the more advanced models to say they're world-beaters, we believe they're among the most exciting developments ever on the local technology scene.

The most dramatic new development is the Macintosh/Amiga/Atari challenger, code-named Gamma.

It's based on the 32-bit Motorola MC68000 and has a graphics/window-based operating system — yet still runs all software written for the earlier Z80-based Bees. And if you think Microbee Systems should have gone the IBM way instead, take heart — an 8086 board will allow you to run MS-DOS as well!

Perhaps even more significant than the Gamma in some areas will be the Delta machine, which we managed to glimpse during our sneak preview at Microbee's new Research and Development department at North Ryde, Sydney. There's not much we can tell you about the Delta yet we are, however, trying to unearth its secrets in time for the March issue), except that it looks like a revolutionary entry into the big-growth communications area.

Not to be forgotten is the Alpha-plus, the 'ultimate development' of the original Alpha series Bee, the machine we all know and love (well, many do ...). It's a complete re-design at the circuit board level, with huge improvements in standard equipment and graphics capabilities.

Look Through Any Window

How would you like to have your choice of CP/M, Microbee, Unix and MS-DOS software running all at once, together, in a window-based multi-tasking environment?

That's the essence of the Gamma, one of the most adventurous local design tasks ever undertaken. I suspect it will be a little while before it does all those things completely successfully, but Microbee isn't making any grand claims yet either. For example, there isn't a Unix port for the machine, but in the meantime the home-grown operating system manages a fair emulation. It's also able to run CP/M-68K software under its own operating system.

The Gamma runs an 8 MHz 68000, with no slow-down for video output and so on, so it's a powerful engine which drives the new Bee. If that isn't enough processing power for you, it also runs two Z80s (one to handle CP/M and other Bee programs, the other for disk DMA) and takes an 8086 card in one of its three expansion slots.

Standard memory is 256 Kbytes, with room on the motherboard for 3.5 Mbytes. The design allows for a whopping seven megabytes of main memory.

It has excellent graphics on board, with up to four separate planes. Resolution is 720 by 350 on high-frequency monitors. You can choose a palette of 16 out of 4096 available colours, with the ability to use a different palette on every line of the display. The screen provides 90 characters by 27 lines, which gives a standard 80 by 24 page with room to spare for window borders and the other niceties of the graphics interface environment.

Paged memory management is provided, and used in the proprietary operating system; naturally, it can also be taken advantage of for Unix.

Low-Cost Networking

Networking capability is built in to the Gamma machine. Serial communication is provided by a Zilog SCC, which supports a low-cost 1 Mbit/second network on twisted-pair cable. This network will be available on the 'ordinary' Bee as well, and Microbee Systems sees a big future for the Gamma (and a real use for its reserves of ▶

Above: *Five of the Microbee Systems development team. From left to right: Gerard Hill, Matthew Starr, John Wilmshurst (also a director of the company), Paul Wilmshurst and Timothy Morris-Yates.* **Previous page:** *Microbee's Macintosh/Amiga/Atari challenger, code-named Gamma.*

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power) as the server in school networks.

There are three expansion card slots on the main board, which will be used for add-ons like the 8086 card, disk controllers, and high-speed networking options.

Initially the Gamma will be launched as a floppy-drive machine, although an internal hard disk is expected to be available soon after the release. The floppies will be 800 Kbyte 9 cm units, a decision made as late as January. Originally it was planned to run 1.5 Mbyte 13 cm drives, but the tooling for the case was kept intentionally flexible while the company watched market trends.

The system box was designed with large drive openings which are filled by insert panels — so only the panel design had to be changed to switch to the small drives. Two drives will be standard.

The design follows current 'standards' with a separate system unit, keyboard and monitor. However, the system box is smaller than the typical IBM PC size, and the keyboard slides into a slot in the system unit when not in use. It can be slid out and left attached or separated completely.

Users of the old Bee will drool over the high-quality keyboard, which packs a full set of keys including function keys, numeric keypad and 'mouse keys' into a compact, professional-looking design.

The mouse keys — one marked Mouse and two with symbols indicating mouse buttons — allow you to use the keypad in place of the little rodent if desired.

The Gamma was conceived and specified more than two years ago, and work started on its design in late 1984. Running prototypes have been under test and development since the middle of last year — we saw prototype number 10 in action in the research offices.

It gave an impressive graphics display. Fast-moving high-resolution colour seemed to be a breeze for the 68000. At one stage I saw one of the project's software wizards pick up a graphics window with the mouse and whip it around the screen. Do that on a Macintosh and only the window outline moves (the graphics are redrawn when you release the window) — on the Bee the whole display remained intact, spinning around the screen at an amazing rate.

I can hardly wait to get my hands on a release version of the Gamma to see if it is as successfully revolutionary as it appears!

Old Faithful Gets Some Sting

Old faithful, the Alpha-series Microbee, has had a complete board redesign to provide extensive new features.

The company says this machine is the answer to all the complaints, suggestions and 'wish lists' from Bee users around Australia — and it has had samples in schools for the past six months in an effort to confirm the success of the redesign.

Volume shipments started in December, again to schools — it will be available at the retail level from February.

The new 'basic Bee' has real, built-in colour in place of the tacked-on optional extra of its predecessor, and comes with 16 Kbytes of PCG graphics as standard — eight times the maximum provided on the old model. The graphics capacity can be doubled again, to 32 Kbytes, if needed.

There is now no screen flickering, minimal wait states, and colour changes are available on a character-by-character basis. There is a selection of 16 foreground and 16 background colours.

If you're wondering just how good the graphics can look, zip down to the local Bee shop and see if you can get a demo of some of the Macintosh emulations Microbee's programmers have been playing with ...

Those surviving the old keyboard will be pleased to hear the new Bee gets cursor control keys — and if the keyboard still isn't up to your standards you can plug in the new unit from the Gamma and Delta machines.

The Bee still uses CMOS logic, so it will accept the standard core-boards from the previous model. It still has battery backup for the main memory. A real-time clock is optional.

Internal Competition

The Alpha-plus series will continue with a model lineup matching the previous version's, although we're unsure how the high-end models will survive in the face of the internal competition provided by the Gamma.

Microbee is aiming for a launch price for the Gamma of under $3000 — quite a way under, according to some reports — and at that level its ability to duplicate a standard Bee as just one of its tasks has to be attractive.

We know which machine we want ... for now, until we see more of the Delta perhaps? We have our old staff Bees lined up in our office waiting for release date — good old Mr Bee is continuing his 'every customer can upgrade' policy through to the new models, believe it or not ... □

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WHEN OWEN HILL STOOD STILL

Owen Hill, founder and now managing director of Microbee Systems, has always been a hard man to pin down. Matt Whelan and Natalie Filatoff cornered him one afternoon at the company's new offices in North Ryde, whipped out the tape recorder and captured a jumble of his philosophies and ideas.

Owen Hill carries the biggest briefcase you've ever seen — triple-decker-type. We have a theory that it's packed with Microbee power supplies (because they're the heaviest small component around), and that Owen actually uses it as a kind of drag net, to slow him down to the normal frenetic pace of the people he deals with. It would be too convenient to say he buzzes around. No, his mind just seems to operate at something like 100 MHz, which one can see is sometimes distressing for the rest of him to try to keep up with. As an output device, his voice would probably do better with a bigger buffer; the way it is, it generally has to defer finishing the thought it just started, to make way for the other seven ideas the man wants to express right away. Thank goodness (or, more likely, people like Owen Hill) for tape-recorders and cut-and-paste word processing.

Unscrambling all the juicy bits still wasn't easy. Nevertheless, it eventually emerged that Owen Hill's circuitry kept returning to certain logical paths: his belief in a policy of upgradability of machines; his concern with positioning the company's new releases; his pride in the fact that his all-Australian firm is successful in so many ways; and his determination to keep all of the company's approximately 164 feet firmly on the ground, and not succumb to "worshipping the machine".

Not getting carried away with what Hill describes as "silicon sandcastles" is an important part of the Microbee Systems philosophy. It means not losing touch with what the customer wants, and it means hanging back a little from the leading edge technology until you can package it cost-effectively.

Owen Hill himself uses a Computer-in-a-Book, currently the company's most popular product. "The problem," he says, "is once people get a Porsche, they never drive their VWs. So I sat with a cassette-based machine on my desk for a long while and did what many of our customers were doing. Now I'm using the Computer-in-a-Book and it's fantastic — I can do everything I want to. Everyone in this company, even when they've got PCs and Olivettis, still uses Microbees."

The Gamma machine described on the previous pages was conceived two years ago, but, says Hill, "We were holding it off the market because it would have been no good releasing it before it was ready. Why go to the real leading edge, and spend $50 million on releasing a product. We'd rather wait politely a little way behind. The pricing of machines in Australia is probably the biggest thing. Around one million dollars has gone into developing the Gamma, and that's all paid for and written off. We don't have to say, 'Because we spent so much money the first ones will cost $10,000 each'.

"I don't think we should go too far up in computer technology," he continued (thanks to cut and paste), "because we're now looking at applying the power. Things will happen throughout the year. The Gamma will run a 6810, but you're going to see things like the 6820 and the 32032. I don't ▶

think we should worship those advances. We should apply ourselves to knowing what the customers want and delivering it".

Plain Vanilla — With the Extras

According to Owen Hill, what the customer wants is a "plain vanilla" machine with the lot, which you can bite into right away without getting egg on your face, and which you never have to throw out — a kind of self-saucing, dripless, bottomless vanilla sundae.

"Customers aren't so silly anymore," says Hill. "There is a fundamental need to use computer power. We're selling information. Our product isn't a product, it's technology transfer. What we're doing is making the technology available to people. That doesn't necessarily come in the form of the keyboard, or just the diskettes, it's a combination of a lot of things."

"Otherwise," he asks, "why do people, say from Sweden (around 20 per cent of computers installed in Swedish schools are Microbees), fly over Korea, Hong Kong, Singapore and Japan to Australia to buy computers? The price they pay is a lot more than they'd pay in those countries. It appears people want more, and that's what Microbee somehow represents.

"You have to try to make a thing valuable. Customers will no longer tolerate getting a computer home to find it doesn't have all the bits you need. What we've tended to do with Microbee is put a fair bit there when you turn the machine on — that's Osborne's strategy."

Learning from the Opposition

Hill spends much of his thought-processing time analysing other computer companies and their products. He doesn't seem to be driven so much by a desire to *beat* them, as to learn from their strengths and mistakes, and thereby be one of those that wind up on top in the long run. It seems a good strategy for a small company to take.

How does he rate the Gamma against the Amiga and the Atari?

"I think we've got an excellent chance against them. The Amiga has better graphics use because it has dedicated chips, at this point in time, but we've got more flexibility. The Atari has a few brilliant techniques; for example, I love the metallic finish on graphics, giving you a three-dimensional look, and a few things like that which we've got the technology to do. I'm very pleased with our position in relation to both these machines. They will build the market for us. They both put a lot of work into that marketing."

"So the predicament is bringing out new computers — you must make sure they're at an increment to previous models, and the customer who bought one of the older ones yesterday feels like he or she is still an intelligent person. That customer is more important to us than the new person we might attract with a new machine."

And Hill does enjoy winning against IBM on small but significant fronts. Take the self-saucing factor, for instance. Hill recently bought an IBM JX: I think we've done things with the Computer-in-a-Book that are a long way ahead of that, especially in terms of its usability. To back up a disk you hit a couple of buttons and it formats, copies, reads, verifies, reads, verifies and so on — all automatically. My little JX has a beautifully written manual, but to back up a disk you have to go right through MS-DOS, blow by blow, by blow. Why not have had someone spend an hour writing a shell, a collection of routines which do all that?"

Then there's BMW. Long an IBM customer, BMW Australia is using Microbees to link the parts divisions of its car and motorcycle dealer networks to the head office computer for interactive order entry.

Owen Hill is justifiably proud. He says, "It would have cost them $3000 to $4000 for the IBM solution, and even though BMW uses IBM gear worldwide, they looked at the IBM PC and said, 'If we're going to need 160 of them, we just can't do it.' So at $1000 a throw, they're putting in Microbees. Now Yamaha, Jaguar, Alpha and Volvo are putting them in, and BMW Spain is saying, 'Well, how about Microbees in Spain?' And that's a plain vanilla machine. Not only is it going into dealers' offices, the dealers are saying, 'These things seem okay, BMW thinks they're okay, I'll get another one for the wife and kids.' We're probably getting as many dollars as IBM would have got out of this sale because the customer decided to drop its allegiance to that supplier's range."

An Upgradable Queen Bee Deserves Loyalty

It's on a slightly different level, but you probably wouldn't drop your allegiance to Microbee Systems if you'd started out with Applied Technology. Hill and his design team are determined to maintain the Bee as a bottomless sundae — you'll never have to throw it out because the nuts and cherries and extra flavouring of new models will always fit on top.

Hill compares his company's development of machines with Commodore strategy: "If you traced the Commodore, you would have bought a VIC-20 in those days, and you would have thrown it out and bought a 64, and you might have thrown that out to buy a 128, and now you'd be looking sadly at the Amiga. So that's a 100 per cent write-off, each year, over four years. Now, if people feel a computer's got a longer-term value than that...

"Our policy adds value to the machines. The government, for example, doesn't have to depreciate the Microbees it has in schools. We upgrade the machines. If the schools followed Commodore, their first machines would be almost useless, but we just give them the latest model as an upgrade throughout the state and the machines are worth it again. A company that does that maintains the value of the product in the owner's hands, even if he or she doesn't elect to upgrade."

So, the joke (the yoke?) isn't on the customer every time Microbee Systems brings out a more advanced computer. "One of our strongest points," says Hill, "is that we control our distribution. We're not exactly the heroes of the distribution channels, but it's meant we've been able to watch the trends. On my way here today I checked out retail sales for last week; they were on target at $100,000 — and that's with the plain vanilla Microbee. So the predicament is bringing out new computers — you must make sure they're at an increment to previous models, and the custom-

er who bought one of the older ones yesterday feels like he or she is still an intelligent person. That customer is more important to us than the new person we might attract with a new machine.

"All the ordinary Microbee software will still run on the Gamma, it's totally compatible with the existing machine, so people can take all their software across, and it will run in a Macintosh-like world.

"In positioning a new product we have to make sure it will be an enhancement, an opportunity for you, our old customer. You should be able to say 'Look what I can get now', not feel silly for buying a machine that's outdated. And you should be able to upgrade at a reasonable price."

With around 60,000 Microbees currently in the hands of users, we wondered out loud how the company would manage upgrading them all, and what it would do with the trade-ins.

Rentabee

"Microbee Rentals," said Hill, laughingly. But he wasn't having us on: "Seriously, we're going to set up an entire rental company to rent to schools and other things. We believe, under the restricted trade practices act and other things, that we can actually take the entire number of machines coming back and make commercial decisions with them."

"No-one has done it right across the range, but with the need the schools have for plain computing horsepower ... It's not offered to them as new; it'll be totally factory refurbished, guaranteed, warranteed, covered. We can take a large number of trade-in machines from our customers, at quite reasonable commercial prices for them and for us, giving them newer technology, and immediately giving us the market share we want in the schools. The customers have a good feeling in their tummies that they're with the right crowd. And then going to schools and others with quite a ... Have you looked at just trying to buy a Viatel terminal? Sony or something like that? ... Yet we can issue anyone ... One of the funniest things was ..." (cut and paste is momentarily overwhelmed).

While Hill is setting up a trade in refurbished Bees, other countries want to build their own from scratch. It's not quite a return to the old 'kit' Bee days — the request came from Singapore, for 20,000 Microbees in "knocked-down" form. Hill laughs at the idea and says, "I don't know how long the thing would last if we got into a contract like that. Our approach and philosophy is to make them in Australia. All the Microbees are made here — we're showing that Australia is doing it.

"My goal in three or four years is to become a nett exporter of technology. So we'll be bringing in disk drives, power supplies and those sorts of things, but we'll be exporting so much that the nett value of our exports exceeds that of the original components we brought in."

"My goal in three or four years," he continues, "is to become a nett exporter of technology. So we'll be bringing in disk drives, power supplies and those sorts of things, but we'll be exporting so much that the nett value of our exports exceeds that of the original components we brought in."

Untangling another corner of the conversation, we found "If companies in Australia only make computers in small volumes, they never get out of the critical mass, so if we can ramp up successfully to make, say, 5000 computers a month, then we're really getting up to US production rates (proportionally). And if we do that profitably ... well, our big thing is we're survivors — we can take a loss of half that market and adapt.

With an average annual compound growth rate in sales of 122 per cent, and no slackening in the number of plain vanilla Bees going out the door, even on the eve of several new releases, Microbee Systems' goals don't look as though they'll end up melting on the pavement.

To Bee or Not to Bee? There was no Question!

Would-bee investors were obviously of the same opinion when the company went public late last year. Says Hill. "When we were going to the float, Microbee was so popular that our advisors and the stock brokers came to us and said 'We're going to raise the price of issue', which means we got an extra $600,000. They were sold on the computer and the company.

"What we've also found," he adds, "is there is an overseas interest in Australian technology which looks like it can succeed. We have investors from Germany, New York, London and Hong Kong. If we're seen as more successful than the other companies in Australia, then we will get more investment. The shareholders are getting out of it what they want, and it gives us the money to grow, and also the advice and the ability to grow into those countries. It won't be long before there's a Microbee UK, because the UK is where I'd like to start. We're always ready to expand, if we're careful about it."

Right now, Hill is being especially cautious. Although he enjoys the looks on bank tellers' faces when he comes in to deposit million-dollar cheques, he says: "It's very easy, once you go public, from having no money in the bank to plenty of money there, to just lash out and end up bearing the brunt of that. So we've been particularly careful in our use of funds, to try to position ourselves first, and then we'll turn on the fire power when we need to."

Hill believes the success of the Gamma machine will depend largely on the software development it inspires in users, and is targeting early machines towards the people he think can help: "Our real problem is to position this product just right. We need the help of the refined hacker. The product won't take off with a company pushing hardware down someone's throat. We have to foster the 'friends of Microbee' cult we had originally among hackers, in a more refined way. The idea is to create user groups: take good management, users and the people we think are top programmers, open the door, almost examine them and get rid of the riff-raff, give them good discounts, major support and, later, marketing resources — almost like a record company. Maybe we'll give them an advance, and market the programs on a royalties basis on their behalf."

"There are some very clever people in Australia. The refinement of the hackers you run into is amazing. Our success so far has been attributable to a little bit of their help, your help, the readers' (YC and *Online*) help. Honestly, the letters, the comments, the refinements. It's not just a one-way street, it's been an incredible input. That's the phenomenon. It doesn't belong to any one company, as such. □

Streetwise CP/M

CP/M is dead, long live MS-DOS ... We thought that would get you going. Not only is IBM PC or compatible not the only choice for business, but there are a multitude of situations where a CP/M machine would more than do the job, and more cost-effectively. Ewart Stronach (would you buy a computer recommended by a car salesman?) has some strong opinions in this area, and took on the task of evaluating likely CP/M business prospects. Here he tells what you can expect of AWA's Amstrad, Microbee Systems' Computer-in-a-Book, and the Bondwell, Epson and Kaypro machines.

TO EXAMINE the potential use of a small computer on a small business, we must first define 'small' in both contexts. It has been said that one of the quickest ways to get into small business in Australia is to buy a big business and make the wrong computer decision. Pretty soon, you'll have the small business you always wanted.

I define a small business that qualifies the purchase of some form of computer as one which:

- Types more than 20 invoices a day.
- Carries more than 100 fairly fast-moving items of stock.
- Types repetitive letters and maintains a mailing list or client list.
- Has a bookkeeping function which consumes more time than seems necessary.
- Is involved in manufacturing and subsequent parts inventory.

There are obviously many exceptions to these basic requirements, but with the cost of small computers now no more than the cost of a good electric typewriter five years ago, some sort of electronic assistance is justifiable. With the right choice of computer and program, you need never become a computer expert, just a competent computer-user. Today's programs should be written well enough for you to be able to master their usage within days, and you should expect no trouble expanding them as your needs grow. Try not to become involved with experts who are anxious to sell a particular style of operating system or one who can only offer one brand of machine.

Keep Your Pants On

I define a small computer as one which stands alone on an office desk, needs no special environment and looks like it won't scare the pants off your staff.

The first step is to evaluate your needs.

How much office time is spent typing repetitive letters? How much time is spent typing invoices? How much time is spent manually entering a bookkeeping system and updating stock records? These are functions which almost any modern small system will do for you. The size of the system will obviously depend on the volume of work and record storage required. Most modern systems can be upgraded in memory and disk storage, and a machine's ability to be upgraded must be a deciding factor in your purchase.

There's no industry in the world today so full of 'buzzwords' as the computer business. Try not to be confused by them and, if dealing with a salesperson who uses these words perpetually, say they mean nothing to you and simply ask for a demonstration of what the machine will do. Better yet, ask for the name of an existing customer whose needs are similar to yours. The fact that one salesperson's machine has 32 gigabytes on board and formats its disks up to 1.4 meg each is only of interest if he or she can assure you these features are relevant to the application you have in mind.

Using a computer in your business will be a compromise. You will either have to modify your business methods or modify an existing program to suit your methods. I have yet to see a business program which fits both your procedure and existing stationery. With any machine worth its salt today, expect to be supplied with a package of programs. At minimum, you should get a word processor, a spreadsheet calculator and a filing system. The difference between a good purchase and a bad one is often the usability of these supplied programs.

What is CP/M?

CP/M is simply a program which controls a computer. It's one form of operating system, has been around for a long time (by computer standards), and is presently under threat from more sophisticated and newer systems. Its strength lies in its portability from machine to machine — it's interesting to see manufacturers are building new machines with new operating systems and retaining CP/M capability.

CP/M does nothing by itself and requires programs such as word processors and spreadsheets, accounting packages and games to make it work for you or entertain you. A tremendous amount of programming has been done in CP/M, and much of it is now in the public domain. This means there is no longer any copyright on such programs, and they may be purchased for the cost of the disk plus marketing costs, or copied from other users with a clear conscience.

How does this help a first-time user? First, CP/M machines are generally cheaper than those with more modern operating systems. For the same price as a current IBM PC, you can expect to get a computer, printer, monitor, modem and whatever you need in the way of supplies to establish a complete electronic office.

It all sounds too good to be true. Even our politicians now recognise the fact that there's no free lunch. What, then, are the drawbacks? CP/M is generally slower than later systems and usually won't accept so much memory in the actual computer. Most CP/M programs are woefully short of graphics and colour. But this is not the end of the world: in a small-business environment, all a computer has to do is compute, which CP/M does well.

Which computer then? The brand doesn't matter if it will do your job and you are sure there will be someone about to support you if it doesn't. Compatibility is important. It makes good sense to have a machine which is compatible with the one in your accountant's office. It's easier to send him a couple of disks which his com-

puter can read than a truckload of books which he has to wade through. (You may have noticed accountants still charge by the hour.) Portability may be a factor. Many small-business owners take a certain amount of work home, and the ability to take FRED (a buzzword which translates as Flaming Ridiculous Electronic Device) home could be useful. The bonus here is that computing might become a hobby, and there is no doubt that the ability to write or modify your own programs will save you heaps in the long run.

Amstrad PCW8256

My initial reaction to the Amstrad was "What a big cardboard box you've got, Grandma". Unlike most systems, which come in upward of five little separate packages, the Amstrad arrives in one large unit. Short of the portables, which, by their very nature, are all in one piece, this would be the easiest system I have ever assembled. It consists of a keyboard, a monitor and a printer. "Where's the computer?" I hear you cry. Well, the cunning little men at Amstrad have buried it in the monitor case! That's not all they've buried in there. The electronics for the printer are similarly hidden, leaving a very small printer with the power of many twice its size. And there's more to come. Even the disk drive is hidden in there, with the door just to the right of the screen. Ah, the marvels of modern miniaturisation. If the boys at Amstrad get any better at it, they'll be forced to find smaller premises.

Plugging in the necessary cables is foolproof and obvious, even to a beginner. The keyboard is smaller than the current IBM style, and lacks adjustable legs. The angle is satisfactory and the keys feel good and are well marked. The monitor is steady and, when used for word processing, has an unusual format of 90 columns by 32 lines, instead of the normal 80 by 25. The power switch on the monitor brings the whole system to life and reads the disk in the drive.

As the Amstrad is configured to be first and foremost a word processor, this was the application I tried first. The disk boots on power up and the first screen appears. To a first-time user, this screen would be confusing. Even to someone accustomed to word processing, it would still look like a Rpakapoo ticket, but a few moments reading the most comprehensive instruction booklet and it all becomes clear. It's obvious that the strength of this machine lies in this program. Now is not the time to draw long comparisons between word processing packages, but I've looked at a lot recently and find this program easy to be comfortable with.

The features I liked best were the range of printer options, the auto-loading of single-sheet paper and the quality of the print in near-letter-quality mode. In this mode, the printer makes two passes and is quite slow, but the result is better than many old typewriters. Those who would sell you a printer are very glib about print speed, but generally neglect to tell you that at high speed the result looks like a damp telegram. The printer includes a clip-on tractor feed for pin-edge paper, but is at its best with standard A4 office paper.

On the software side, it's nearly impossible to lose a document. When you kill a file from the disk, it relegates it to the back of the disk, which it calls Limbo, and only overwrites it when the disk becomes full. The program is clearly prompted from menus which pop up on screen, on demand, and disappear without disrupting your text. To those of you familiar with word processing, this might seem like old hat, but to a novice it's a very convenient way to become proficient quickly.

The system also runs CP/M, which comes as part of the package. I have a list of available software, and there's more to come. A spreadsheet is available for $104, a full stock control, invoicing package and sales-ledger package for $312, and purchase and nominal ledgers for $104 each. A major English software house, New Star, is supporting the Amstrad and making a full range of CP/M software available.

The only limiting factor I can see with this system is the choice of a non-standard disk size. The disks aren't readily available and the interchange of software between users will be difficult.

To sum up, the Amstrad PCW8256 is a superb word processing package with *no more to spend*. It's a CP/M machine limited at the moment by the lack of available software and its single disk drive. A second drive can be fitted, and there appears to be space on the main board for a substantial memory upgrade. The Amstrad is ergonomically good, pleasing to look at, and has a very small space requirement. The system is well documented in large spiral-bound volumes, which are well indexed and easy to read.

Microbee Computer-in-a-Book

I must be getting old — I remember when a Microbee came in a small box which rattled. If you were very clever with a soldering iron and had about a hundred hours to spare, you could wind up with a massive 16 Kbyte cassette-based home computer for which you couldn't buy software. We all knew what the 'B' stood for then. My, how

things have changed. Microbee Systems has persevered in the face of imported opposition and come up with a system that ranks with the world's best in terms of design and flexibility.

The keyboard unit houses most of the electronics, but is smaller than many empty keyboards. It's not what I would call professional quality, and lacks many of the dedicated function keys found on more sophisticated systems, however, it's quite comfortable to use, and a competent typist would have no trouble mastering it. The keyboard connects to an amber video screen of excellent quality and resolution, and another cable goes to a unit about the size of a big book. Hence the name, 'Computer-in-a-Book'. This 'book' contains a 9 cm disk drive. Software supplied with the unit includes BASIC, CP/M, a word processor and a disk cataloguing utility.

Also optional with the software is a communication program. With the addition of a modem (a device to connect to your telephone) for about $190, you can communicate with other computers. Go on, tell me that's all you ever wanted to do. Talk to another computer, indeed. There is a benefit and it is particularly related to CP/M. Out there in electronic land there lurks a group of people which runs bulletin boards. These serve as clearing houses for the interchange of information and programs. People who have written clever little programs leave them on these bulletin boards, and others who are smart enough can get a copy of them for almost nothing, by simply ringing up and connecting the Microbee. Now does it seem worthwhile?

This modem and communication package also allows you to get in touch with an organisation called Viatel. For want of a better description, Viatel is a commercial bulletin board. Major information providers leave information on a range of topics, for your perusal and use. You can access stock exchange information, news and weather, as well as leave messages for others who use the system.

A full range of software is available for the Microbee at a very reasonable cost. A major benefit of an Australian-designed and developed system is that the programs reflect our needs and require less modification than many of the imported products.

The Microbee is small enough to take home, and the sophisticated level of available programs makes it an excellent education tool. It's in use in a huge number of our schools, and many school leavers are already quite familiar with its operation.

Software

There is a choice of four software suites offered with the package:

1. A home office package of a database and a business-graphics program.
2. A games package of arcade-style games and family games such as chess, concentration, draughts or Australian economy. When you've learned the last game, you can teach the Government.
3. A primary education package, which includes spelling and maths exercises.
4. A secondary education package of scientific experiments, geography and history lessons.

All these packages can be purchased at the time of original purchase of your Bee for an additional $133.

In a sentence: it's tidy, compact, locally serviceable and has plenty of software available for it. Microbee is committed to making each new machine upwardly compatible; if you buy a new model the day before another is released, you can be confident of upgrading your existing one without too much expense.

The Bondwell 14

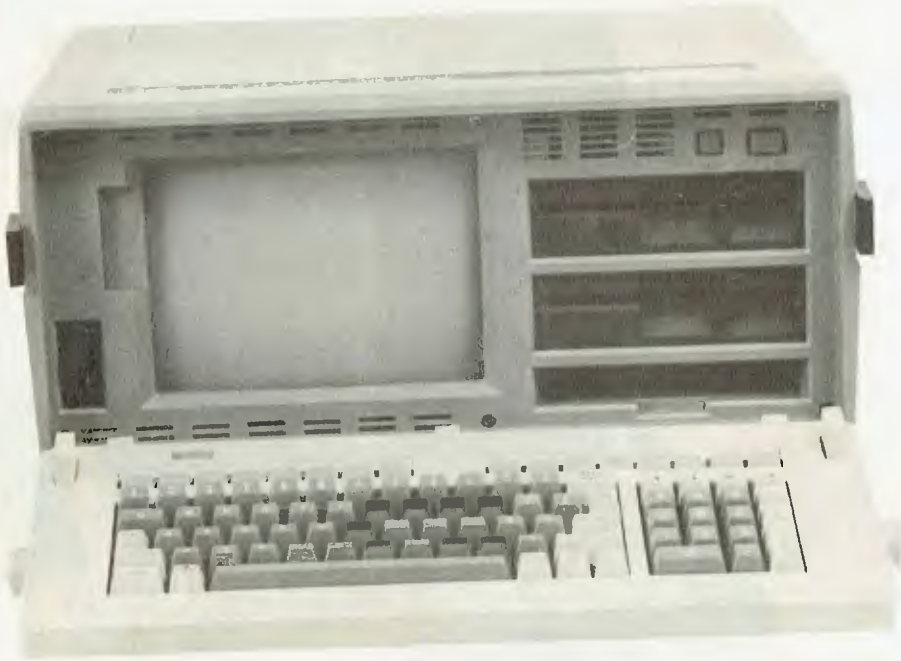
If portability is important to your needs, the Bondwell deserves serious consideration. It's a straightforward CP/M machine, sold nationally and backed by Dick Smith Electronics. About the size and weight of a portable sewing machine, the Bondwell is strongly constructed and looks like it could be thrown in the car, along with the briefcase and the day's takings. Even if you don't really need to, you should take it home for a few nights, to show the neighbours you have a computer.

The machine comes with a pile of books, which give detailed coverage of the programs supplied with the Bondwell.

Let's look through them briefly.

Wordstar

The manual supplied with Wordstar is comprehensive. It opens with a very basic description of the program and a step-by-step instruction for getting it up and running for the first time. Word processing programs are geared to communicate with almost any style of printer, but the first time you use it you must tell the program what type of printer you have. This can be confusing at first, but I had no trouble following the instructions. The manual then goes on to explain all the keys and their functions in great detail, and finishes ▶



with a series of lessons, with clear pictures of what your screen should look like at each stage of the lesson. The lessons are graded and, if followed, should result in expert use of the program in a very short time.

The supplied version of Wordstar comes complete with another program called Mailmerge. This add-on is indispensable to anyone who wishes to build a mailing list and then send repetitive letters to all or selected clients, with the correct name and address automatically inserted in each letter and a mailing label created at the same time. Wordspell is optional, and allows you to check text files for spelling mistakes.

Wordstar is not my favourite word processor, but there's no doubt that it's widely used and is often the program taught at business colleges, and therefore most likely to be familiar to staff.

Datastar

Datastar is described in the first page of the manual as a comprehensive key to data entry, control and retrieval. Great, but what the hell does it do?

Basically, it's an electronic filing system. You have the ability to design a form with headings and areas for data (such as names, addresses, customer numbers and any details you would normally write on paper), generate the forms, fill them in on the screen and file them on a disk. The ability to search through them rapidly and alter any information at will can have many applications. You can create invoices, order forms, inventory lists, catalogues, delivery schedules and rude letters to your bank manager with ease. Once the form is designed and the data entered on it, you can add data, delete data, retrieve a single item from the file and modify it, print one or more records or scan the files on the screen.

Calcstar

Calcstar is a spreadsheet. You don't have to be a painter to use one of these. In the simplest terms, a spreadsheet is a giant sheet of ruled paper in which you can enter labels, figures or formulae. Any segment of the paper can be relative to another. If you called the top left square PRODUCT and the next square COST PRICE, the next one MARKUP and the next one TAX and the next one RETAIL, you could instruct the spreadsheet to automatically add the correct percentages of markup and tax to your cost price and calculate the retail price. Spreadsheets have a very real application in accountancy for playing 'what if?'. You can enter a year's trading figures and, by changing the formula for one item, see instantly what the effect would be on a year's trading. The more I use a spreadsheet, the more I find I can do with it.

Reportstar

Reportstar is a database. (There I go, using those funny words again, but there's no other word for a database.) The program interacts with Datastar, and allows you to generate reports from data already filed by Datastar or by itself. I'm not completely familiar with the program, and time doesn't permit me to bury myself in it now. There are two books on Reportstar, and suffice it to say that if you read them carefully and are able to finally make sense of the hexadecimal equivalents for logical expressions in appendix E, you have done very well.

BASIC

The BASIC computer language supplied with the Bondwell is called Nevada BASIC. For those of you who have had experience with computers, it's close to Microsoft BASIC. The manual doesn't try to be a tutorial, but it does list several books more suitable for the beginner in an appendix. The need for knowledge of BASIC depends on whether you're going to try to write your own programs.

Finally, you get a CP/M User's Guide. This volume is pretty heavy reading, but essential for efficient use of your new toy. It carries full details on the housekeeping you're going to need to do, including backing up important files, copying files from one disk to another and controlling other devices, such as printers or modems.

I seem to have spent more time on the software than the machine, but that's really the most important part of the Bondwell. It's not a fancy machine and has no special quality, apart from its portability. It's a solidly-built computer with two disk drives, attractively cased and with an acceptable keyboard. One annoying feature is the screen: while the size is acceptable for a portable and its display is amber (which I find easier on the optics), it has a habit of suddenly swelling the image size momentarily — giving a sort of bulging effect on the screen. At first, I put it down to interference from other devices in my computer room (and, believe me, there are a few at the moment). Later, I tried it on another power supply which I know to be rock-steady, and it still did it. I've been informed that the addition of a full-size monitor cures the problem, and while this might be okay in a permanent setting, it rather destroys the value as a portable.

Morrow MD 16

They say there's no such thing as a free lunch, but I feel as though I've just been given a free supper at least. Since my early days of cassette-based data-storage systems, I've heard of the wonders of a hard disk.

There are three basic ways to store programs externally. The first is the cassette, an ordinary audio cassette in an ordinary cassette player, which stores your programs or the data they generate and can be played

back into your computer when you need it. The method is cheap and is the basis of bottom-line home computers. It doesn't lend itself to business applications, because a tape can only be searched end-to-end, and if the data you need is at the south end and your cassette is wound to the north end, you can have a short snooze while you wait for it to be found.

The second and most popular storage medium among small business users is the floppy disk. Generally 13 cm in diameter, floppies are made of a magnetic substance like thick tape, and are housed in a semi-rigid cover. They typically hold as much as 850,000 pieces of information (850 Kbytes). They're capable of finding and transferring this information to your computer rapidly and accurately.

Next come the big guns: the hard disks. From the front, the unit looks just like a floppy disk drive with no door. It's capable of storing hundreds of megabytes of information (the most common on PCs is 10 to 20 megabytes). You can load up the hard disk with every program you're likely to want and just call them up, without having to search through piles of badly labelled floppies.

The Morrow Microdecision MD16 comes complete with one floppy drive and one 16 Mbyte hard disk. The total unit consists of a monitor on a tilt-and-swivel base, a main computer box which also houses the disk drives, and a separate keyboard. The keyboard is light, but solidly built, with a full row of function keys and a number pad. It has quite a soft feel to it, and its adjustable legs allow you to achieve a comfortable typing position. The tilt-and-swivel capability of the monitor is an excellent idea; it allows you to adjust the monitor to a comfortable position and re-adjust to cut out those annoying reflections. The rest of this machine is just a box with black openings for the disk drives. Connection of the components is no problem, and the machine lights up waiting for the first disk.

Now comes the magic. You get 13 disks with your purchase, and the Morrow takes you through set-up procedures when you put the first disk in the drive. Set-up procedures are what usually scare the wits out of first-time users; they include backing up master disks, formatting disks for working on and telling the machine what kind of printer you're using — it's all not so terribly frightening, just very foreign to novices.

The first use of a hard disk is an especially cumbersome and time-consuming job for a beginner. In fact, I would be loath to try it without someone holding my hand. The Morrow held my hand. All the formatting of the hard disk is automatic, and the Morrow prompts you to insert each disk in sequence. The entire software suite is transcribed on to the hard disk and you can lock away your floppies against the unlikely prospect of having to re-construct your hard disk later. At the end of the procedure (which will take you about an hour and a quarter), the screen displays a menu of all the programs on the hard disk, and you select your choice by typing in a number. You can exit to the CP/M mode and load any other programs you like from other floppies.

The software suite included with the Morrow can only be described as comprehensive. First, there is a word processor called Newword. A quick run through this program convinced me it is the equal of any CP/M-based word processor I've tried. The help menu, which can be kept at the top of your work screen while you're learning the ropes, is unambiguous and easy to master. A full range of editing commands is available, and Newword bears enough similarity to Wordstar for anyone familiar with that program to make an easy transition. As with all the software, Newword comes with a comprehensive user's guide. In fact, in the 11 books supplied with the Morrow, there is a comprehensive guide for just about everything. Other programs supplied include a spelling checker to kleen up those little errors in your letters or documents, Supercalc (a spreadsheet), Pilot (a simple programming language), Personal Pearl and a full bookkeeping suite.

Personal Pearl is a database which enables you to design forms or reports, write information to your forms and file all for later retrieval.

The bookkeeping system seems comprehensive; it covers accounts receivable, cash book, general ledger and complete general-ledger reporting, with balance sheet and income statements.

Each and every program has a complete tutorial stored on the disk, to lead you through setting it up and applying it. There's even a two-stage tutorial on the use of CP/M for those of you who care to write your own programs.

In summary, while the Morrow is the most expensive machine I looked at, it has the potential to carry much more informa- ▶

tion in a readily usable form. Its degree of user-friendliness is better than any I've seen, and its tutorials are clear and easy to follow. The range of software supplied with the system is superb and many users would never need to buy any other programs.

The full range of Microdecision models, from floppy-only systems to the hard disk versions, comes with the user-friendly interface and bundled software.

Epson QX 16.

The Epson QX 16 is supplied with twin floppy disks, a separate keyboard and an excellent amber monitor. The keyboard is large, adjustable in working angle and has a soft touch and response. Being used to cheaper keyboards, I found it strange at first, but soon warmed to it. I'm reliably informed by professional typists that this is the style of keyboard they favour. Assembly of the unit is straightforward, with each component arriving in its own package, and all the instructions you'll need in a separate book called *Setting Up and Getting Started*. The main unit houses the computer and twin disk drives and the monitor can sit comfortably on top of this. The keyboard may be placed up to a metre away from the unit, connected by a coiled lead. The only switch settings on the back of the computer are to tell the unit what type of monitor you're using. On the test model it was already configured to the supplied amber screen and would only need changing if you wanted to use a colour monitor.

The only problem I encountered on power-up was of my own doing. Cocky, because this was the fourth computer I had set up in as many days, I didn't read the instructions fully and just booted the first disk. I then looked for a directory on the second disk by issuing the normal command B:. The colon was not where the keyboard suggested it should be, and it took me some time to find it. In doing so, I discovered one of the features of the Epson: its operating system is multi-lingual. When supplied in Australia, the keyboard is configured to the British standard and the operating system is configured to American standard. A simple run through a configuration program put all the keys back where I expected to find them and all was well. Lesson: read the instructions.

The Best of Both Worlds

The greatest advantage the Epson has is its ability to run dual operating systems — this gives you the best of both worlds. The CP/M it offers is also configurable to different language use, but I see little practical application for this in a normal office environment. However, the ability to run MS-DOS opens a whole new world of software. Under most circumstances, the Epson will emulate an IBM, although not all programs are compatible. Nevertheless, I switched to MS-DOS mode and threw in some disks generated by my Challenger, and it read them without complaint. This gives you the ability to exchange data with many other users.

Programs supplied with the Epson include MFBASIC, Nevada BASIC and MS-DOS, as well as CP/M. No application programs are supplied with the package, but I believe the program choice from Epson is very wide.

Electric Desk ($265 excluding tax) is a suite of software from Epson, and incorporates a word processor, spreadsheet and database. Full accounting packages and other application software is available and the machine's ability to read MS-DOS means you aren't limited to Epson-supplied programs.

The documentation is well presented in spiral-bound volumes. There is a separate volume for each operating system and a user's guide for MS-DOS.

To Sum Up

The Epson QX 16 is a truly professional unit, supported by one of the most respected names in the business, with the huge benefit of the dual operating system. The machine is superbly built and a joy to use, but at the price I feel a basic set of application programs should be included.

Kaypro 2X and 10

Surprise, surprise! Two boxes from Kaypro. One turned out to be a twin-disk machine and the other a hard-disk version. Kaypro has been about for quite a while and there are many happy users out there. Memo Mr Kaypro: It doesn't matter what colour you paint a Land Rover, it still looks like a Land Rover. Also, the attachment of a handle to a Rolls-Royce doesn't make it portable. That's probably a bit unfair, but the Kaypro design is angular and dated, and by today's standards the machine is heavy and cumbersome. Portable it is, but I would rather walk a metre than a mile with it. With that harsh criticism off my mind, let's see how the thing computes.

Running standard CP/M and with a wealth of software available, the Kaypro is also sturdy and reliable. The green screen — built-in, of course — is clear and shake-free. It's a larger screen than most portables, and the removable keyboard sits below it when you prop the machine up on its stand. The keyboard is metal-cased and set at a usable angle. There are no defined function keys — it's a standard typewriter keyboard, with a numeric pad off to the right and a set of arrow keys along the top. Sockets on the rear of the unit allow for connection of the keyboard, a printer and a modem. A reset button is also at the back, where it would be almost impossible to flick it by accident. From the pile of books supplied with the system, one clearly

marked 'READ ME FIRST' gives easy directions for setting up your new toy.

I started by setting up the hard disk model. It came to me already loaded, so it was just a matter of plugging her in and letting her rip. When I hit the power switch there was a noise like a 1948 Austin in first gear, as the hard disk came up to operating speed. It settled down, but the spinning disk unit is really quite loud in a home environment. The screen cleared and displayed a very well-organised menu. On the left, in reverse video, was a list of the main programs headed by a file called 'Instructions'. One of the headings is highlighted on the screen, and the arrow keys move the highlight to your choice. Having selected your choice, the Enter key moves the highlight across the screen and a description of your choice appears. If you select Instruction, a moderately comprehensive course in CP/M operations appears on your screen. At the end of the lesson you're automatically returned to the main menu. There is nothing in the lesson which isn't covered in more detail in the manuals, but it's more fun this way.

The other menu selections reflect the huge variety of software supplied with the Model 10.

First there's CP/M and a suite of utility programs, including one which will allow the reading of disks generated by other computers.

Then there's Microsoft BASIC, with a selection of games.

Wordstar is also resident, along with Word Plus, a spelling checker. Wordstar is also interactive with Mailmerge, which allows you to print repetitive letters, using names and addresses from your customer files, and print corresponding mailing labels.

Infostar, a database management system which includes a report generator and a data entry and retrieval system, is followed by Calcstar, a spreadsheet, and dBase II, a database management system.

There is also a program called Superterm, which makes your Kaypro into a communications terminal for connection to your telephone via a modem.

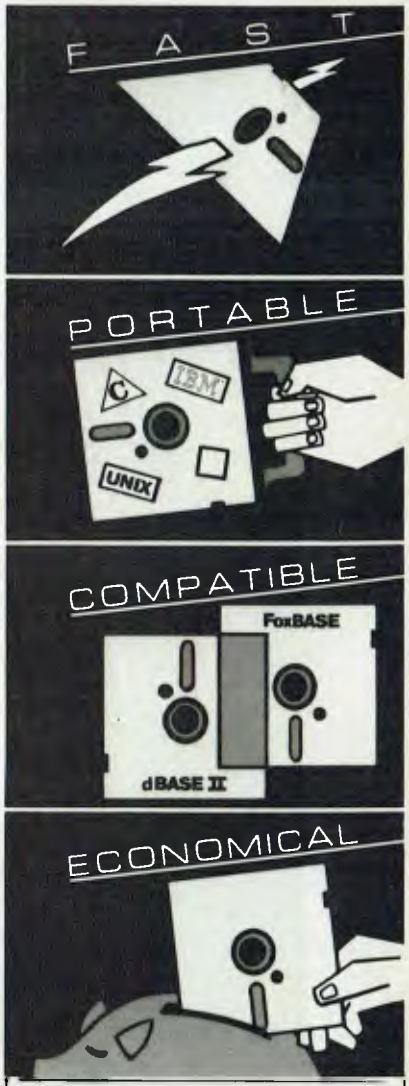
Then there is another spreadsheet called Microplan, and two programs which will compile programs you write in BASIC to make them run faster.

Kaypro gives the retail value of this software bundle as $3280, and since the whole box and dice costs $3695, it makes the computer seem cheap.

There are two lesser Kaypro models available: the Kaypro 2X and the Kaypro 2. The only difference between the 2 and the 2X is the capacity of the disk drives, the 2X having twice the capacity. The software package with the 2X is nearly as good as that supplied with the Model 10, and the total cost is only $1995. Kaypro seems to share my viewpoint that an accounting package must be tailored to suit your business, or at least that the package closest to your needs must be sought, and has therefore not included such a program. I'm assured a wide range of such application programs is available.

Kaypro also assured me of its continued support of the CP/M operating system, and enclosed a copy of an American magazine called *Profiles*, which is dedicated to Kaypro users throughout the world. The remainder of the included documentation would take a large part of your bookshelf; there are 17 books to wade through and many of them become heavy going if you're not regularly using the program they refer to, but they would be indispensable for a business user.

The Kaypro is a heavy-duty machine, designed to be transported with a minimum ▶



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of protection. It's old-fashioned in appearance, but very functional. The program package and the ability to start small and upgrade make it well worth considering.

A Worthwhile Bunch

Looking back over the machines I tried, there isn't one I'd suggest is not value for money. Sure, there's a wide variety in price structures, but each machine is capable of carrying out its maker's claims. All would be suitable for running CP/M programs in a small business, and some would fill the needs of quite large firms.

At the bottom end of the price scale sits the Microbee. This computer is totally capable of performing a valuable role in a small business. The range of available programs makes it a valuable tool, and its suitability as a home computer would endear it to many who have such a dual need. Exciting things are happening at Microbee Systems, and the company's policy of maintaining an upgrade path between its machines is reassuring.

At the other end of the price scale is the Morrow MD16, a very powerful unit designed with the serious user in mind. It is undoubtedly the best-documented and most user-friendly machine of the bunch; the package of programs included with the system makes the higher price seem well worthwhile, since once you add the cost of an accounting/bookkeeping program to some of the others, it closes the price gap significantly. Morrow offers a range of computers, and the same basic unit without the hard disk could well suit users with lesser requirements.

I should mention that there were to be two other computers included in this rundown. The Osborne Vixen, a portable CP/M machine with specifications very close to the Bondwell, never appeared. It seems Osborne doesn't share my opinion that the CP/M operating system has much future, and advised us that it was no longer interested in CP/M machines. I hope those who already own such machines can be assured of support in the future.

The other unit conspicuous by its absence is the recently released Commodore 128. I haven't even seen one performing yet, but Commodore assures us that, as there is already a new machine (the 128-D) due any moment, the company would rather wait and let us test it on arrival.

I have made no endeavour to decide which is the 'best' machine. Obviously, the more you pay, the more you get. If you're not certain how much machine you need for your particular application, seek the advice of any of the manufacturers and try to get them to refer you to some satisfied users.

To enable salespeople to give you any sort of constructive advice, you should be in a position to tell them exactly what you expect the computer to do for you. Don't get carried away — none of them will do the dishes for you. Be armed with details of how many stock items you wish to control, how many customers you have, how many invoices you generate and how far you would like to take your bookkeeping function. If the budget allows, buy bigger than your existing needs, unless you're certain of the ability to upgrade your choice. A computer is first and foremost a productivity tool in a small business, and a successful productivity tool will generate more work for itself, or free you to spend more time generating it. □

Make	Cost	Hardware	Software
Microbee Computer In a Book	$995	Computer 9 cm disk amber monitor	CP/M, BASIC, word processor, disk catalogue, plus optional package.
Bondwell 14	$1695	Computer 2 x 13 cm disks, built in amber screen	CP/M, BASIC, Wordstar, Datastar, Calcstar, Reportstar.
Amstrad PCW8256	$1495	Computer monitor 1 x 8 cm disk printer	CP/M, BASIC, word processor, Logo
Epson QX 16	$3865	Computer 2 x 13 cm disks, amber screen	CP/M, MS-DOS, BASIC
Morrow MD16	$5338	Computer 1 x 13 cm 1 x hard disk amber screen.	CP/M, Newword, Supercalc, database, spelling checker, Pilot, bookkeeping system, hard disk utility programs.
Kaypro Model 10	$3695	Computer hard disk 1 x 13 cm green screen	CP/M, SBASIC, Microplan, CBASIC, Microsoft BASIC, Word Plus, Wordstar, Mailmerge, Supterm, Infostar, Calcstar dBase II.

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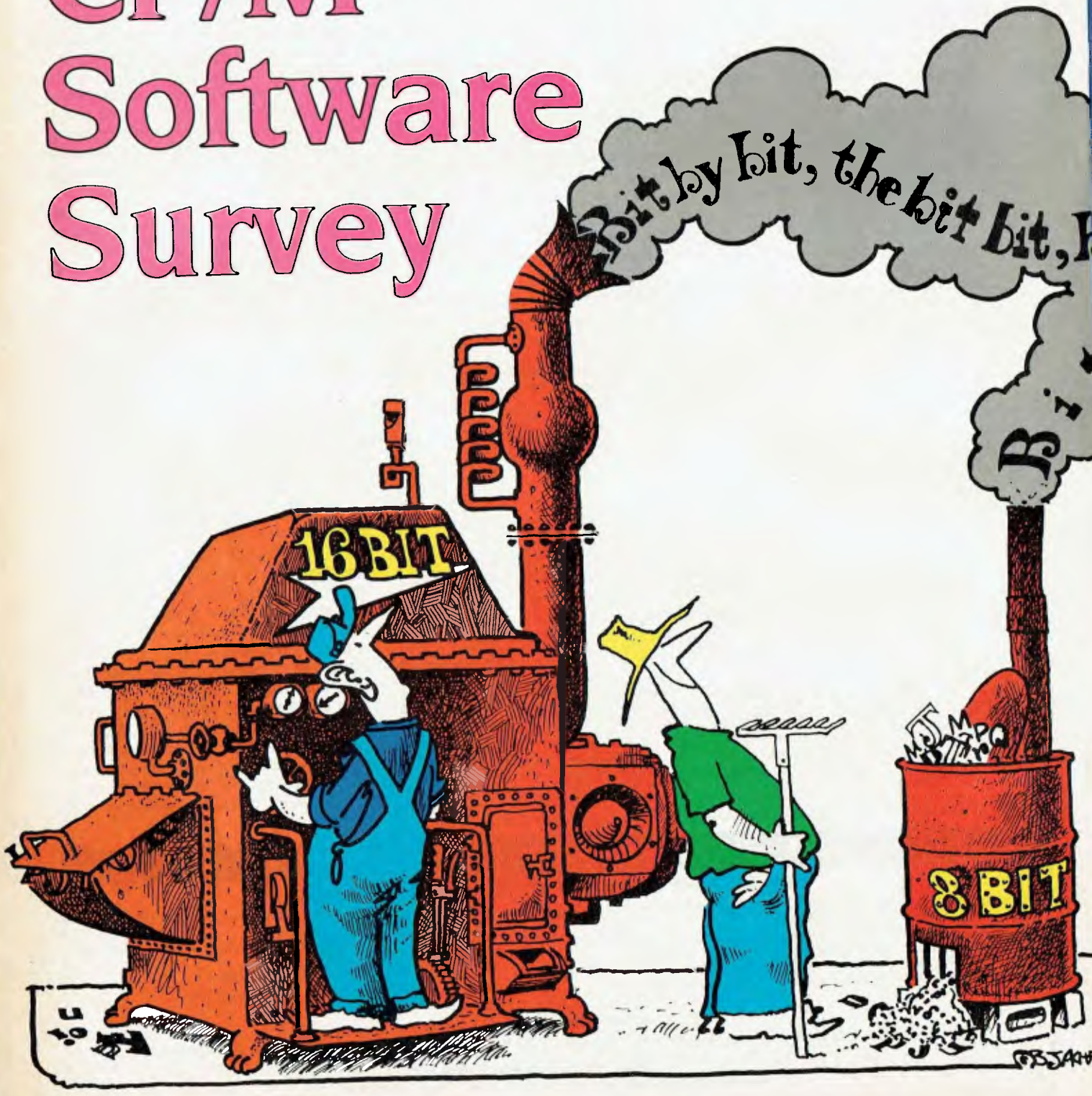
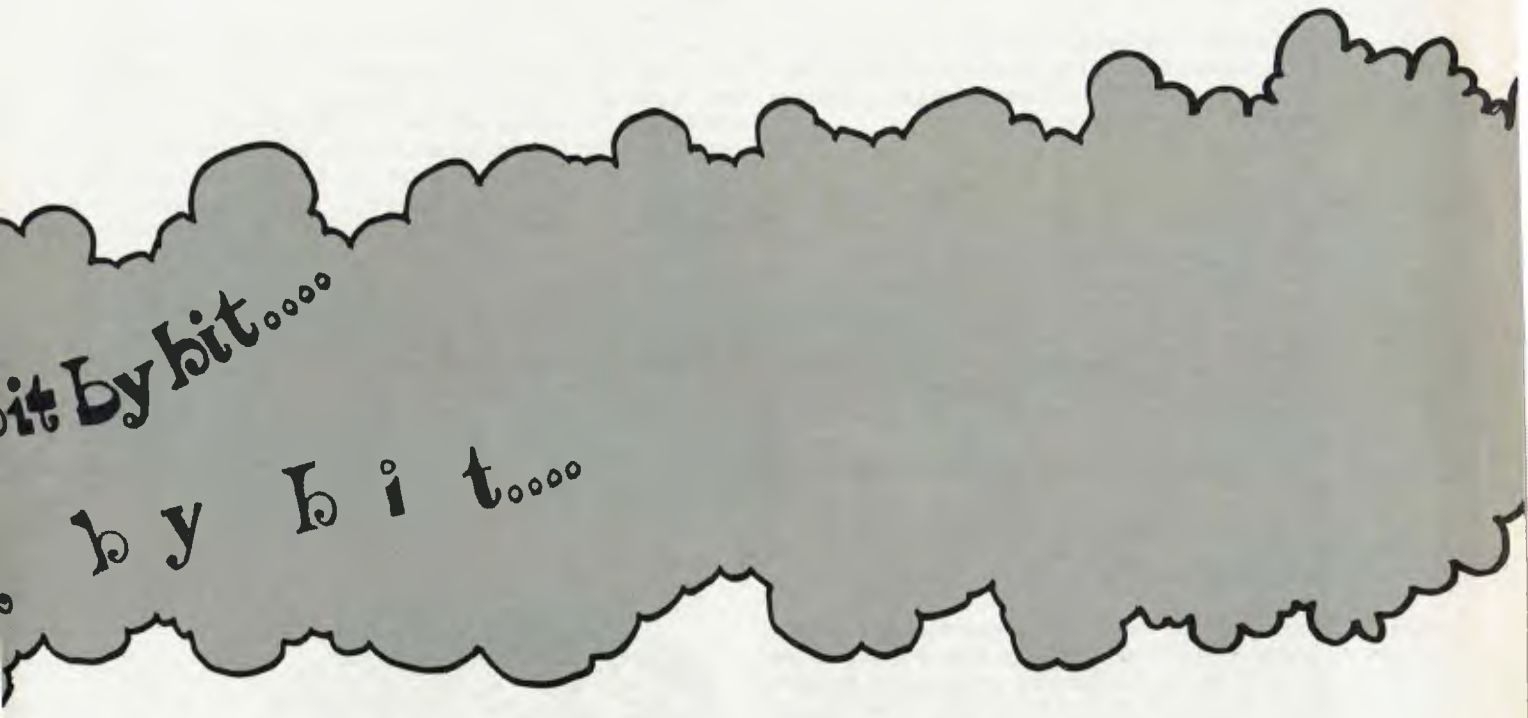
Remote computer must run 56K CP/M system disk (not supplied). 8 Kerry Ct, BEACON HILL. E&OE

CP/M Software Survey





There's a lot more to CP/M software than the old standbys like Wordstar, dBase, Multiplan, and the thousands of public domain programs — the only problem is discovering what exists and where to get it. Maria Lengas (you remember her — the one with four hands) chased all the distributors she could find to bring you a rundown on the lesser-known or less widely distributed packages. She discovered a wealth of software is available to those prepared to look a little further than the corner computer store.

Tmaker Integrated
Supplier: The Computer Factory
Price: $749 retail
Features: Combines a word processor with mailmerge, a spreadsheet, list processing and bar graphing, a relational database, and an integrated dictionary and supplement dictionary. Claimed to be the only fully integrated package to run on both 8- and 16-bit systems. Also runs under MP/M, MS-DOS and CP/M-86 and has probably the simplest learning curve of any integrated package.
Requirements: 64K CP/M

Basic Management System
Supplier: The Computer Factory
Price: $995 retail
Features: Handles debtors, creditors, stock control and general ledger. A fully integrated management system.
Requirements: 64K CP/M and a 300 Kbyte drive

TCF General Accounting (Standard Version)
Supplier: The Computer Factory
Price: $695 retail
Features: This package follows standard accounting procedures as taught by the Institute of Accountancy. It handles standard general ledger, and has skeleton debtors, creditors and payroll capabilities. TCF also provides facilities for cash-register recording and produces all books of accounts, a full balance sheet and all required reports. The program makes maximum use of default prompts for simplicity of entries.
Requirements: 64K CP/M and two 170 Kbyte disks ▶

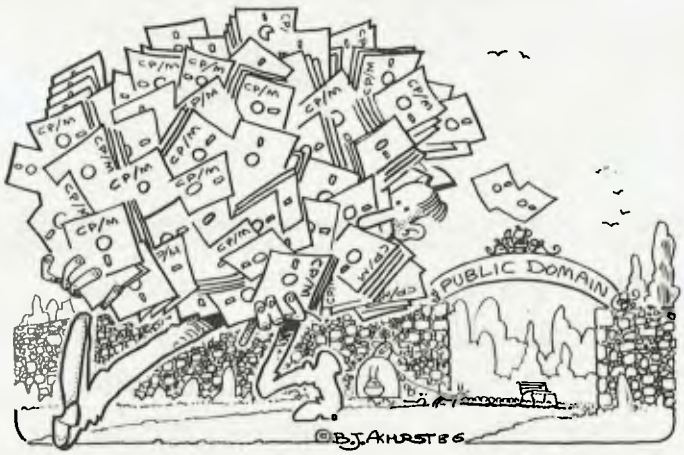
TCF General Accounting (Accountants' Version)
Supplier: The Computer Factory
Price: $895 retail
Features: This package has all the capabilities of the standard version, and can also handle statutory reporting for corporate affairs, or a truncated set of reports where restricted information need not be shown, as well as all directors reports.
Requirements: As above

Typequick
Supplier: Typequick Pty Ltd
Price: Single-user license — $77; college license — $1500; school license — $795; corporate training kit — $1000.
Features: This touch-typing tutor received a Special Commendation in the 1985 *Your Computer* PC of the Year Awards. Typequick monitors every keystroke for speed and accuracy and alters the course according to your results. A structured 10-lesson course, Typequick is suitable for beginners and those who need to improve their touch-typing skills.
Requirements: 64K CP/M, one disk drive and an 80-character by 25-line screen.

Business Manager
Supplier: AMS Computer Services Pty Ltd
Price: $350 per module
Features: Business Manager lets you track your sales, do all your accounting, and keep your inventory up-to-date. It also provides historical data and reports for planning analysis. The program automatically handles the transfer of related data, updating your receivables with sales information, updating inventory and keeping you informed of stock levels, and automatically updating the general ledger for all activities that effect it. A customer information system helps answer customer inquiries and allows quick access to credit and collection information. The user can quickly create customer mailings, complete with mailing labels, for promoting new products or pursuing collections. Business Manager is menu driven; you only need to press one key to select each function. The package is sold in six modules: sales order entry, accounts receivable, inventory control, general ledger, accounts payable, and purchase order management.
Requirements: CP/M-80, 64K RAM (CP/M-86 also available)

Income (Integrated Company Management)
Supplier: AMS Computer Services Pty Ltd
Price: Available on application.
Features: The AMS Income system is an integrated accounting package designed for use by most private-sector businesses, such as retailers, wholesalers, manufacturers, and service providers. Its modular design allows you to select only those programs from the Income system which are needed, and it is adaptable to a wide variety of hardware configurations. The package is organised into the following six modules: General Ledger, Accounts Receivable, Accounts Payable, Inventory Control, Purchasing and Order Entry. Said to be virtually crashproof, the system checks files for damage caused by power fluctuations or hardware problems. AMS Income offers true multi-user performance and full installation support is available.
Requirements: CP/M-80, 64K (52K TPA); or CP/M- 86 256K; or CCP/M multi-user with 96 Kbytes per user, plus one additional 80 Kbyte partition. A 132-column printer and a minimum of 640 Kbytes of floppy disk storage (hard disk recommended) are also required.

Inmass (Integrated Manufacturers Software Series)
Supplier: AMS Computer Services Pty Ltd
Price: Available on application.
Features: The AMS Integrated Manufacturing Software Series (INmass) is a tool to aid in the management of manufacturing facilities. It provides the means for managing inventory, purchasing, order entry, job costing and material requirements planning. All programs within Inmass require that you use the Inventory program. The other Inmass programs can be purchased and used separately, or combined as needed to create a comprehensive management system. In addition, Inmass can be used in conjunction with the AMS Accounts Receivable, Accounts Payable and General Ledger programs from the Income system. Inmass is organised into six modules: Inventory Control, Bill of Materials, Job Cost/Work in Progress, Purchasing, Material Requirements Planning and Order Entry. It offers true multi-user performance and full installation support is available.
Requirements: CP/M-80, 64K (52K TPA); CP/M-86, 256K; CCP/M multi-user with 96 Kbytes per user and one additional 80 Kbyte partition. A 132-column printer and a minimum of 640 Kbytes of floppy disk storage (hard disk recommended) are also required.



Poor Person's Write-Hand-Man
Supplier: Glyphic Software
Price: $49.
Features: Poor Person's Write-Hand-Man is very similar to the Borland International product, Sidekick, but doesn't run on the IBM PC nor under CP/M 3.0 — it's for CP/M 2.2 or ZCPR based computers (for example, Kaypros, Osbornes, Apple II CP/M, all disk-based Microbees and the Dreamdisk system) and for use in conjunction with RAM disks and keyboard extenders such as Smartkey II.
Requirements: 56K CP/M 2.2, or 64K ZCPR 1.6

Poor Person's Spooler
Supplier: Glyphic Software
Price: $40
Features: Poor Person's Spooler allows the user to print at the same time as running another program. The Spooler doesn't interfere with running programs, and console input doesn't interfere with

printing. When the Spooler is accessing the disk there is a minor delay to console response. Even printer output initiated by the Control/P command can be captured by the Spooler for subsequent printing. The Spooler operates by opening spooling files and capturing all printer output.
Requirements: 56K or greater CP/M 2.2

Poor Person's Spreadsheet
Supplier: Glyphic Software
Price: $40
Features: The Poor Person's Spreadsheet contains a flexible screen design system which allows placement of the information needed exactly where you want it to appear. It also has an on-line help feature and an easy-to-understand 28- page manual with a 'teach-yourself' tutorial, to get you up and running without delay.
Requirements: CP/M 2.2 (56K or greater). Also requires a 24-line by 80-character cursor-addressable terminal.

Poor Person's Mailing Label Processor
Supplier: Glyphic Software
Price: $40
Features: Two menu-driven programs are provided, allowing the selective printing of mailing or other labels in a variety of formats and fonts. Mailpick selects labels based on keywords appearing on special label comment lines, while Maillist prints labels in the user's choice of format. The size of labels and the number of labels to be printed across the page can be chosen to suit. Test patterns can be printed to check printer alignment and label size.
Requirements: Requires CP/M 2.2 (56K or greater). Requires a 24-line by 80-character cursor-addressable terminal. Epson-compatible dot matrix (or similar) printers are supported.

Poor Person's Spelling Checker
Supplier: Glyphic Software
Price: $26
Features: The Poor Person's Spelling Checker is easily used and suits many applications. Any CP/M text file, for example word processing files, program source files, or files created as a result of a student spelling or typing test session, can be checked against the supplied, and/or other user-built dictionaries. The supplied dictionary contains 33,000 words and is in compacted form so checking is rapid.
Requirements: CP/M 2.2 (56K or greater).

MicroShell
Supplier: Oxford Systematics
Price: $199
Features: MicroShell offers the smoothest facilities of a Unix environment to permit effective use of CP/M- 80. Shell programming allows complete customisation of the user interface, and full keyboard trapping. Shell files simplify the command system, and the automatic search through user numbers and disks enables WordStar and other programs to run with overlays on different disks, thus permitting smaller systems to operate smoothly.
Requirements: 48K Z80 CP/M.

Hochstrasser Modula-2
Supplier: Oxford Systematics
Price: $999
Features: A four-pass, optimising compiler system developed to provide high-performance, embedded-code development-system support and portable code transfers between Modula-2 systems on different machines. It is a fast, ROMable, re-entrant Z80 native-

SO YOU WANT TO PROGRAMME YOUR IBM PC.* NOW WHAT?

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THE COMPLETE PC TUTORIAL comes complete with manual and fills two diskettes. It requires an IBM PC or work-alike running PC-DOS or MS-DOS with 128k RAM and at least one disk drive. THE COMPLETE PC TUTORIAL is unprotected and is available from most software outlets at a recommended retail price of $69.95. If unavailable, you may purchase directly from Intouch Australia, 1 Kent St., Bicton, Western Australia, 6157. Nearly any method of payment is accepted. Postage and packaging is free.

THE COMPLETE PC TUTORIAL — AN INTOUCH PRODUCT

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*IBM [illegible] International Business Machines Corp

CP/M SOFTWARE

Have you had this problem? You probably walked into your friendly local IBM *software dealer. There's stacks of* CP/M *software around — our listing will give you some clues on where to find it.*

code system, with an auto-search mechanism for both linker and compiler. Designed for professional library building and development.
Requirements: 56K Z80 with two 360 Kbyte drives.

Dolphin Screen Handler
Supplier: Oxford Systematics
Price: Z80 — $400; 8088 — $550
Features: Dolphin is a library of Prospero Pascal Procedures designed to make extendable screens, with full input checking and formatting, and linked automatic calculations between fields. It includes data storage and retrieval facilities. Designed to be used with the Shark system.
Requirements: 48 Kbytes for Z80; 128 Kbytes for 8086

CP/M-80 Mac
Supplier: Oxford Systematics
Price: $275
Features: A full Z80 CP/M-80 emulation which can be run under the filer on the Mac, producing compiled Z80/8080 applications which appear as standard Icons on the Mac disc.
Requirements: 128 Kbyte Mac for 8080 emulation; 512 Kbyte Mac for full Z80 emulation.

Nucleus Maintenance Control and Call System
Supplier: Nucleus Computer Services
Price: From $1950
Features: This system provides management, service and accounts information on the status and history of contracts and service calls logged. A database of both contracts and calls logged is held in the system, which is easily accessed on the screen. The system provides extensive reports, automatically producing contract invoices and 'call' log invoices. Suitable for both the service and rental industries.
Requirements: Two 360 Kbyte drives

Smartpak
Supplier: FBN Software
Price: $50 plus $4 for shipping.
Features: Smartpak is a package of programs designed to extend the usefulness of CP/M-80 (V2.2) by providing utilities which are not otherwise available in the system. Utilities provided include SPOOL and UNSPOOL, a quick SUBMIT utility, RESTORE for recovering accidentally erased files, and EXTEND for fully utilising the USER command.
Requirements: Requires only 4.25 Kbytes of memory and works on systems operating under CP/M-80.

Smartprint
Supplier: FBN Software
Price: $30 by itself, $13 when purchased with Smartkey II.
Features: A powerful add-on to Smartkey II, Smartprint is a versatile writing tool designed to give you full access to all of your printer's features. It lets you send control characters to your printer and produce italics, foreign characters and other built-in features of your printer.
Requirements: Any CP/M-80 operating system running Smartkey.

Smartkey II
Supplier: FBN Software
Price: $77 plus $4 shipping.
Features: Smartkey is a program which lets you redefine each key on your keyboard to become whatever you want, whenever you want it. Produce your own macros within your applications programs and save them for use whenever you have to do boring repetitive keying tasks. It is compatible with major applications such as Wordstar, dBase II, Perfect Writer and Multimate.
Requirements: Smartkey II uses only 4.25K of memory and works on CP/M-80 systems.

CP/M SOFTWARE

dToolkit
Supplier: The Computer Trader
Price: $99
Features: dToolkit comprises a number of modules which enhance the performance of dBase II. The modules are dLibrary, a set of machine language routines; dFix, which fixes corrupted data files; dCrypt, an enciphering routine; dBASIC, which allows programs written in CBASIC to process dBase II files; and dMenu, which provides password security and a menu-building facility.
Requirements: As for dBase II.

Dataflex
Supplier: Intelligence Australia
Price: Single-user — $1000; multi-user — $1420; single-user (16-bit) — $1420; multi-user (16-bit) — $1880.
Features: Dataflex is a high-level command language with powerful relational database management functions for handling the storage, maintenance and retrieval of data.
Requirements: 52 Kbyte TPA, 256K (16 bit); CRT with cursor addressing; 600 Kbytes disk storage.

Pertmaster
Supplier: Intelligence Australia
Price: 1000 Activities — $1600; 2000 Activities — $2000.
Features: Pertmaster is a program developed to assist project planners. The speed of operation gives better control over time and deadlines, and makes it easy to check — and modify if necessary — critical path activities. Make the best possible use of all available resources, or simply ask the computer "What if?" or "What next?". It provides daily, up-to-the-minute reports readily available on any part of the project.
Requirements: 64 Kbytes of memory.

Flashprint
Supplier: JRT Software
Price: $58 CP/M-80; $88 MS-DOS.
Features: Flashprint is a program that allows Wordstar to print anything of which your dot-matrix printer is capable. 'Anything' comprises double width, compressed and italic text, superscripts, elite font, underlines, coloured text (with colour printers) and graphics.
Requirements: Wordstar.

Carpe Wine & Spirit System
Supplier: Carpe Office Systems
Price: $2950
Features: A fully integrated accounting system for wine and spirit merchants or restaurants to cover all aspects of liquor control. It allows analysis by creditor and debtor litreage and value of wine, beer and spirits and produces government reports.
Requirements: 64 Kbytes

Carpe Spare-Parts System
Supplier: Carpe Office Systems
Price: $2950
Features: A fully integrated accounting system for motor spares (up to 10,000 products). It includes facilities for van sales when salespeople sell from their vans. Allowance is made for product code, 20-digit part number, and 25-character description; tax is calculated on the lowest wholesale price, and automatic updating of five selling prices from last cost is provided.
Requirements: 64 Kbytes.

SO YOU'RE A FRUSTRATED HACKER WITH AN IBM PC.* NOW WHAT?

Is it difficult to find concise information?
Are you finding the manuals hard to understand?

We know how you feel, so we developed a self help Tutorial system for the Hacker. You can now take total control of your PC without have to spend weeks or months deciphering the various manuals. Topics such as machine code programming on the 8088 CPU chip, screen display, graphics control, interrupts, calls, functions, speaker control and keyboard control plus many, many more are covered.

THE COMPLETE PC TUTORIAL probably uses the most powerful and effective software teaching method currently available. If you want to be a real IBM PC hacker, THE COMPLETE PC TUTORIAL is just what you have been looking for!

THE COMPLETE PC TUTORIAL comes complete with manual and fills two diskettes. It requires an IBM PC or work-alike running PC-DOS or MS-DOS with 128k RAM and at least one disk drive. THE COMPLETE PC TUTORIAL is unprotected and is available from most software outlets at a recommended retail price of $69.95. If unavailable, you may purchase directly from Intouch Australia, 1 Kent St., Bicton, Western Australia, 6157. Nearly any method of payment is accepted. Postage and packaging is free.

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General Interest

We are the Borland distributor, stocking:

Turbo Pascal, Tutor, Editor Toolbox; Database Toolbox; Gameworks;

Turbo Lightning; Reflex, etc.

We are also the distributor for the Respond range of products providing PC integrated communications software, eg, emulation of TTY, VT 52/100/102, 3270, 3278/79 terminals, coax file transfer under TSO, UM CMS, CICS plus many others.

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Files — Inspect the disk — change contents of files — every PC should have one —

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Carpe Baker's System
Supplier: Carpe Office Systems
Price: $2950
Features: An accounting, costing and production system for bakers where margins are critical to success. Advises the 'chef' on quantities of mixes to produce and the store on raw materials to issue. It provides integration from invoicing to stock control; full costing with percentage for wastage; allowance for long- and short-term products; and complete management control.
Requirements: 64 Kbytes.

Carpe Parcel Delivery System
Supplier: Carpe Office Systems
Price: $2950
Features: A parcel delivery system with up to 10 zones by 10 rates per zone for each contract. An exception report for non deliveries is included. Pricing is provided for each debtor according to contract, and profitability is shown per client and per carton.
Requirements: 64 Kbytes.

The Carpe Carpet System
Supplier: Carpe Office Systems
Price: $2500
Features: A fully integrated system for carpet wholesalers and retailers, providing facilities from invoicing to general ledger. Designed by carpet specialists with simplicity and speed in mind, it provides dye and roll numbers for complete control; profitability by client, salesperson and branch; and invoicing with costing.
Requirements: 64 Kbytes.

Carpe Payroll
Supplier: Carpe Office Systems
Price: $450
Features: A payroll designed for the small to medium business where basic control is required. All headings are changeable by the operator for employees and divisions. It provides pay advice slips, group certificates, coinage analysis and divisional analysis by hours and value for each month and year-to-date.
Requirements: 64 Kbytes.

Carpe Real Estate System
Supplier: Carpe Office Systems
Price: $2950
Features: A property-management system covering every area of property requirements, from receipt writing to full reporting. It can produce an owner's account at any time, maintain tenants' ledger always on balance and handles disbursements with all options.
Requirements: 64 Kbytes

Carpe Courier System
Supplier: Carpe Office Systems
Price: $1750
Features: A system for small to medium sized courier companies using owner drivers. It sorts dockets in date order for invoice/statement; calculates drivers' wages; allows variable periods for clients and drivers; and provides full reporting.
Requirements: 64 Kbytes

Carpe General Accounting Package
Supplier: Carpe Office Systems
Price: $1680
Features: A general accounting package suitable for the small to

SO YOU'VE JUST SOLD YOUR CUSTOMER AN IBM PC.*

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Are your salespeople becoming Computer Tutors?
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We know how you feel, so we developed a complete self help Tutorial system for PC user. You cannot afford to have sales people tied up answering simple questions for the new computer user. Their job is to sell. Our job is to teach. THE COMPLETE PC TUTORIAL covers the complete spectrum of computing, from simple DOS commands to the depths of machine code. It is suitable for ANY computer user/programmer. If your customer leaves your premises with a copy of THE COMPLETE PC TUTORIAL, they will most probably return with a cheque book rather than note pad.

THE COMPLETE PC TUTORIAL comes complete with manual and fills two diskettes. It requires an IBM PC or work-alike running PC-DOS or MS-DOS with 128k RAM and at least one disk drive. THE COMPLETE PC TUTORIAL is unprotected and is available from most software outlets at a recommended retail price of $69.95. If unavailable, you may purchase directly from Intouch Australia, 1 Kent St., Bicton, Western Australia, 6157. Nearly any method of payment is accepted. Postage and packaging is free.

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- ☑ Optional 8087 maths co-processor

Stocks are limited so call now to avoid disappointment.

SLE Board and software $550.00

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We are now able to offer unmatched low pricing on hard disk versions of the APC-III. Plus a new high speed 20 Meg hard disk. All hard disks are manufactured by NEC. They offer superior speed and reliability. Do not compare them with brands being fitted on other PCs!

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512K memory card $695.00

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The Novell Netware/O system is now available for the APC-III.

- ☑ Up to 16 APC-IIIs can be networked together, with one machine acting as a file server and print sharer for all machines.
- ☑ A high speed common bus allows sharing of files and peripherals.
- ☑ Printers may be connected to workstations or accessed via the file server. Two printers may be connected to the file sharer. Sophisticated print queuing is provided.
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NEC APC III

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medium size business. It can be tailored to meet specific requirements and retains six months of transactions on the hard-disk version. Modules — which include invoicing, debtors, creditors and general ledger — can be used separately or they may be integrated. Versions are available for different businesses.
Requirements: 64 Kbytes

Superfile
Supplier: Sunshine State Scientific Systems
Price: Single user — $475; multi-user — $925; 16-bit single user — $725; 16-bit multi-user — $1425.
Features: Database primitives for use with a higher-level language. That is, instructions which can be embedded in a higher-level language program, such as BASIC, Pascal or FORTRAN, and which perform all database filing, indexing and searching functions. Also included are the available interfaces to higher-level languages (ask for the current Ilst), and the LOOK utility, for quick peeks at the database.

Superforms
Supplier: Sunshine State Scientific Systems
Price: $285.
Features: A program for single-record screen display and/or entry. Display the same record in many different ways using different Forms. 'Paint the screen' to resemble a paper form, with headings and data slots, and then filter out bad data with comprehensive validation checks.

Supertab and Sort
Supplier: Sunshine State Scientific Systems
Price: $285.
Features: A tabulating program for producing printed tabular reports, with comprehensive facilities for arithmetic, headings, subtotals and totals. The SORT utility can sort data on up to 36 criteria, and output can be sent to disk in fixed record, SYLK or Mailmerge format.

Multi-Master Debtors System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Multi-Master Series Debtors System is a sophisticated suite of modules and the most frequently used in the General Accounting Suite. Apart from performing the necessary functions of producing or displaying Debtors Statements and details, Aged Trial Balance reports and Transactions reports, it provides a very flexible input to the General Accounting Suite.

Multi-Master Creditors System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Multi-Master Series Creditors System provides a business with precise, up-to-the-minute details of accounts payable, giving management effective control over cash and cash flow. It provides accurate details of your company's obligation to its suppliers. Remittance advices can be printed or displayed whenever necessary. Aged trial-balance amounts payable can be rapidly produced. Comprehensive details of all transactions including debit notes, credit notes, invoices and receipts are readily available as displays or printouts.

Multi-Master General Ledger System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Multi-Master General Ledger system provides a business with a source of vital management information generating the Profit and Loss reports, Balance Sheet and Budget reports all with a selected range of comparatives. The system has been designed to operate as a standalone package, although dissection totals, receipts and payment figures within the Debtors and Creditors system can be automatically transferred to the General Ledger.

Multi-Master Inventory System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Computer Master Systems suite of stock control modules was designed to be an effective management tool in the control of stock. Details of minimum stock, maximum stock, stock in hand, stock on backorder and other essential details are held on the stock files and are immediately accessible. Bin locations help locate stock while a wide range of price structures are used to produce price lists. Stock reports are drawn from the stock files and are quick and accurate. Sales-tax summaries are produced by the system providing a breakdown of sales by tax level.

Multi-Master Job Costing System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Job Costing Package has a complete, integrated stock control system. Cost centres containing up to 30 raw components can be set up and maintained. Job masters consisting of up to 80 cost centres are also set up, and job files containing any number of items can be created.

Multi-Master Service Modules
Supplier: Computer Master Systems
Price: Price on application.
Features: Wherever the suite of Multi-Master Service Modules is used it provides accurate charging of services, accurate stock control and account postings, and meaningful reports on technician labour units.

Multi-Master Payroll System
Supplier: Computer Master Systems
Price: Price on application.
Features: The Multi-Master Payroll package is an easy-to-use menu-driven system. All options and sub-options are accessed with single key strokes, making it easy to understand and operate, even for the most inexperienced operators. The package was developed to complement other packages in the Multi-Master software range and is a complete multi-user suite of modules. The system provides for rapid production of payslips and coinage breakdowns in order to simplify the whole payday workload.

Rental Management Package
Supplier: Computer Master Systems
Price: Price on application.
Features: The Rental Management Package is a reliable and easy-to-use system. One or more operators can simply take rent from a tenant as calculated by the system. A receipt will be printed if required, and all affected files (tenant ledger, owner's ledger, daily ledger, bank deposit details) are updated almost instantly. Trust ▶

accounts cannot be overdrawn and concise details of all rents collected and disbursements made are reproduced in the owner's statements and in the transaction reports.

Poor Person's Crossword Game
Supplier: Glyphic Software
Price: $26
Features: Designed as an educational game for children, this game can also be challenging entertainment for adults. Crossword puzzles can be created on the screen and several can be saved to one file. When puzzles are displayed for the player to solve, the word meanings are listed. Words are entered as the program is unravelled and 'hard' words can be skipped till more letters have been found. The package includes three multi-puzzle files with words selected from a child's dictionary.
Requirements: CP/M 2.2 (56K or greater). You'll also need a a 24-line by 80-character cursor-addressable terminal.

Poor Person's Window System
Supplier: Glyphic Software
Price: $35
Features: The Window System augments the capabilities of CP/M. Applications may define windows on the screen and switch output to any of the defined windows, and background tasks may have separate windows. No knowledge of the size of the windows or the technique of supporting the window needs to be known by the application; each window appears as a separate terminal. This package provides three BDOS functions to control the windows, which may be defined and switched under application or from the keyboard. The current window and its description may be retrieved by the application. Does not provide for concurrent execution of programs.
Requirements: CP/M 2.2 (56K or greater).

Poor Person's Keyed Sequential Files
Supplier: Glyphic Software
Price: $38
Features: This is a recently announced Poor Person's Software product for CP/M 2.2. It provides a CP/M resident extension that supports keyed and sequential access to CP/M files. Keyed files may be written, updated or read either by key or through a series of eleven new BDOS calls: CREATE, OPEN, CLOSE, and DELETE file; GET, PUT and WRITE by Key; READ by Key; REWRITE by Key; DELETE by Key; and RETURN Version Number.
Requirements: CP/M 2.2 (56K or greater).

Poor Person's Menus
Supplier: Glyphic Software
Price: $38
Features: This package includes an interactive menu design and editing program, a 'C' language runtime library, a terminal configuration program and an interactive Mail List Manager program.
Requirements: CP/M 2.2 (56K or greater) and a 24-line by 80-character cursor-addressable terminal.

Systat for CP/M-80
Supplier: Oxford Systematics
Price: $999
Features: Systat is an extensive statistical package, maintained in identical FORTRAN source code on CP/M-80, MS-DOS, Mac, HP9000 and many other systems. The data transformations, sorting, data entry and tabulation facilities, and the fact that you don't need a hard disk to run it, make Systat a highly usable heavy duty statistics system.
Requirements: Z80 and 64K CP/M-80

Swordfish Screen and Retrieval System
Supplier: Oxford Systematics
Price: $450
Features: Swordfish is a screen-based system designed to create screens, and enter, edit, retrieve and store data. Described as an integrated data system combining two programs called Shark and Dolphin, this veritable 'marineland' allows multiple displays, can export and import data selectively, uses Wordstar format editing for screen design, and performs calculations between fields on input formulae.
Requirements: Z80 and 48 Kbytes for CP/M-80; 8088 and 128 Kbytes for CP/M-86.

SoftZ80: CP/M-80 under CP/M-86
Supplier: Oxford Systematics
Price: $250
Features: This system is a complete CP/M 2.2 under CP/M-86. The Z80 emulation extends to the 'unimplemented' or 'undocumented' instructions in almost all cases, and the overall performance is said to be excellent. The program runs as a 2 MHz Z80 on a 5 MHz 8086, and can be supplied in conjunction with Independent CP/M-86 under any MS-DOS.
Requirements: 128 Kbytes

Softdesign: Complete and Configurable CP/M-80+Z80
Supplier: Oxford Systematics
Price: $499
Features: This program is a complete Z80 emulator, used to implement the whole CP/M-80 CCP and BDOS in Z80 code for the 68000. It offers customisable links to map 68000 addresses to Z80 ports and supports multiple operating systems.
Requirements: 256 Kbyte 68000 systems running CP/M 68K and other operating systems.

Shark Multi-Key ISAM Library
Supplier: Oxford Systematics
Price: Z80 CP/M-80, CDOS, TurboDOS — $400 for single-user and $800 for multi-user; 8088 CP/M-86, MS-DOS, TurboDOS — $650 for single-user and $1000 for multi-user.
Features: Shark is described by its manufacturers as "An elegant and well-tested package using a variant of indexed sequential retrieval, with key indexing and pointer updating to avoid the need to reformat data on disk." Its security options include 'careful update' of files, which protects against soft or hardware incidents. Recovery procedures are said to be particularly well covered.

Prospero Pascal
Supplier: Oxford Systematics
Price: $695
Features: The first microcomputer Pascal compiler to gain the highest independent certification of accuracy and quality — the ISO 7185 Validation Suite. Prospero is said to generate extremely compact code, with special emphasis on accuracy of floating point. ▶

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Lotus 1-2-3™ has become the de facto industry standard spreadsheet for the IBM PC and compatible computers. The only thing wrong with it is the price. Well here's The Twin™. A spreadsheet so similar to 1-2-3 you'll hardly be able to tell you're not using 1-2-3. But the price is just $249. Yes, for less than 1/3 the price you can have a spreadsheet with the power of 1-2-3.

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Glover & Assoc. 6125

Segmentation is easily used to build module libraries and to transfer from UCSD p-system Pascal.
Requirements: 48 Kbytes and Z80 for CP/M- 80/CDOS/TurboDos; 128 Kbytes for CP/M-86.

Prolog-1
Supplier: Oxford Systematics
Price: CP/M-80 — $695; CP/M-86, MS-DOS — $950.
Features: A strict DEC-10 syntax interpreter of considerable speed. Used by TekKnowledge of Palo Alto as the basis for its $12000 US M1 pilot expert system building tool. Sparing in its use of memory space, Prolog-1 runs efficiently on small machines down to Z80s, with a slight edge in speed over MicroProlog 3.1.
Requirements: 48 Kbytes and Z80 under CP/M-80; 128 Kbytes under CP/M-86.

Prospero Fortran
Supplier: Oxford Systematics
Price: $695
Features: A complete and very reliable Fortran IV which compiles to very compact code. Complex arithmetic support in all versions. Linkable with Prospero Pascal and Assembler. The Z80 version has been consistently rated as the best available by user groups and other reviewers. The source codes accepted by the Z80 and 8086 versions are fully compatible, excepting only the operating-system-dependent extensions.
Requirements: 48 Kbytes and Z80 for CP/M-80; 128 Kbytes for CP/M-86.

MicroProlog 3.1
Supplier: Oxford Systematics
Price: Z80/6502 — $275; 8088/86/286 — $475
Features: This is perhaps the world's most widely used educational Prolog, with five years of school usage, and extensive University support and use. Ideal for a first introduction to Prolog, and with a migration path to Professional and Mac Prologs. Both DEC-10 and the LPA Micro and Simple syntaxes are supported. The special MITSI syntax for school and educational use (suitable down to primary level) is also provided; it is compatible with all MicroProlog versions. The code is also compatible with the LPA Professional Prolog, which accesses the entire address space available under MS-DOS and CP/M-86. A built-in clause editor is provided, and the interpreter is compatible with almost any ASCII word processor. Assembler interfaces are fully documented.
Requirements: 48 Kbytes and Z80 under CP/M-80; 128 Kbytes under CP/M-86.

MicroExpert
Supplier: Oxford Systematics
Price: $695
Features: A backward chaining, plausible reasoning Prospector-style shell, widely used in education as a host shell for initial IKBS forays in the construction industry and elsewhere. It is in use in a number of construction industry research centres applying expert systems techniques. The rule structures are readily upgraded into input for the forward- and backward-chaining SAVOIR systems for production use on a wide-area basis.
Requirements: 48 Kbytes for CP/M-80; 128 Kbytes for CP/M-86.

Microtools
Supplier: Oxford Systematics
Price: $199
Features: MicroTools was written by Don Graft, one of the original Unix architects. He added the horizontal cutting and pasting, sorting and chunking facilities required to make CP/M-80 a usable text-handling environment with pipes, filters and I/O redirection. These tools were written to combine with MicroShell to provide a smooth and very powerful shell and tools environment for CP/M users.
Requirements: 48K CP/M-80 □

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BASIC FORTH

Are you a likely Forth Fanatic? If you'd like to try this fascinating language-for-enthusiasts, but don't want to go to the trouble or expense of purchasing it, here is your answer. Tim Hartnell has written a Forth simulator in BASIC, to give you the chance to 'taste-test' the language and, at the same time, learn how it works.

You probably know how to program in BASIC. Although often maligned by enthusiasts of other programming languages, BASIC is a very flexible tool.

All languages have their advocates, but few devotees are as impassioned as those who support Forth. Forth is incredibly flexible, fast (20 to 30 times faster than BASIC), and very compact (a complete Forth can occupy less than 8 Kbytes). So I thought it would be good idea to write a Forth Emulator, which will enable you to experiment in Forth on your own computer, without having to buy the language.

The following program should run, more or less without modification, on any computer. It's just over 9 Kbytes long, which will make typing it in a bit of a chore, but when you consider you will actually end up with a new language for your computer for free (even if it runs very slowly), the effort is worthwhile.

I've written the program to run on any computer which supports a BASIC with standard string handling (MIDS$, LEFT$ and RIGHT$). The lines are less than 80 characters long, so you can get them into a Commodore 64 (you'll need to leave off some of the REM statements at the end of the longer lines), and the Emulator avoids use of IF/THEN/ELSE, which isn't supplied on Commodores. If your computer doesn't have the LINE INPUT displayed in line 590, change it to INPUT. If you have standard string handling on your machine and more than 9 Kbytes of RAM, you should be able to enter and run the program easily.

Forth was developed by Charles Henry Moore, who found he couldn't use languages such as FORTRAN and ALGOL to write programs to control radio telescopes.

Moore first developed a primitive version of his language in the early '70s, and finally managed to get an integrated version of it running on an IBM 1130, the most powerful computer he had at his disposal.

The language was called Forth because Moore was working with 'third-generation' computers, and he considered his language suitable for 'fourth-generation' machines. The 1130 only allowed filenames of five characters, so 'fourth' had to be shortened to 'Forth'.

Forth differs from 'fixed' languages such as BASIC because it comes with a standard set of words which the user can use to develop his or her own commands. These new commands can then be used to construct further commands, which makes Forth fast, powerful and flexible.

However, as the authors of the book 'Forth' (Salman, Tisserand and Toulout; Macmillan, 1984) point out, this flexibility has a rather bizarre result: "Forth can be almost completely written in Forth." My Forth Emulator won't allow you to do that, although you can create up to 500 new words of your own, which the system will execute as though they were programming words provided with the raw version of the language.

Reverse Polish

One of the more unusual features of Forth is its arithmetic. When you want to add two numbers, such as 50 and 9 in BASIC, you would enter the following:

```
PRINT 50 + 9
```

In Forth you'd need to enter:

```
50 9 +
```

You enter the first number (50), then a space (spaces are very important in Forth, as you'll see in due course), then a second number (9), another space, the operation you wish to perform (+), followed by a dot (.) which causes the program to print out the answer. If you omit the dot, Forth will still work out the problem, but won't tell you the answer. This kind of arithmetic, working from left to right, with the operator after the values to be operated on, is known as 'Reverse Polish Arithmetic'.

The Stack

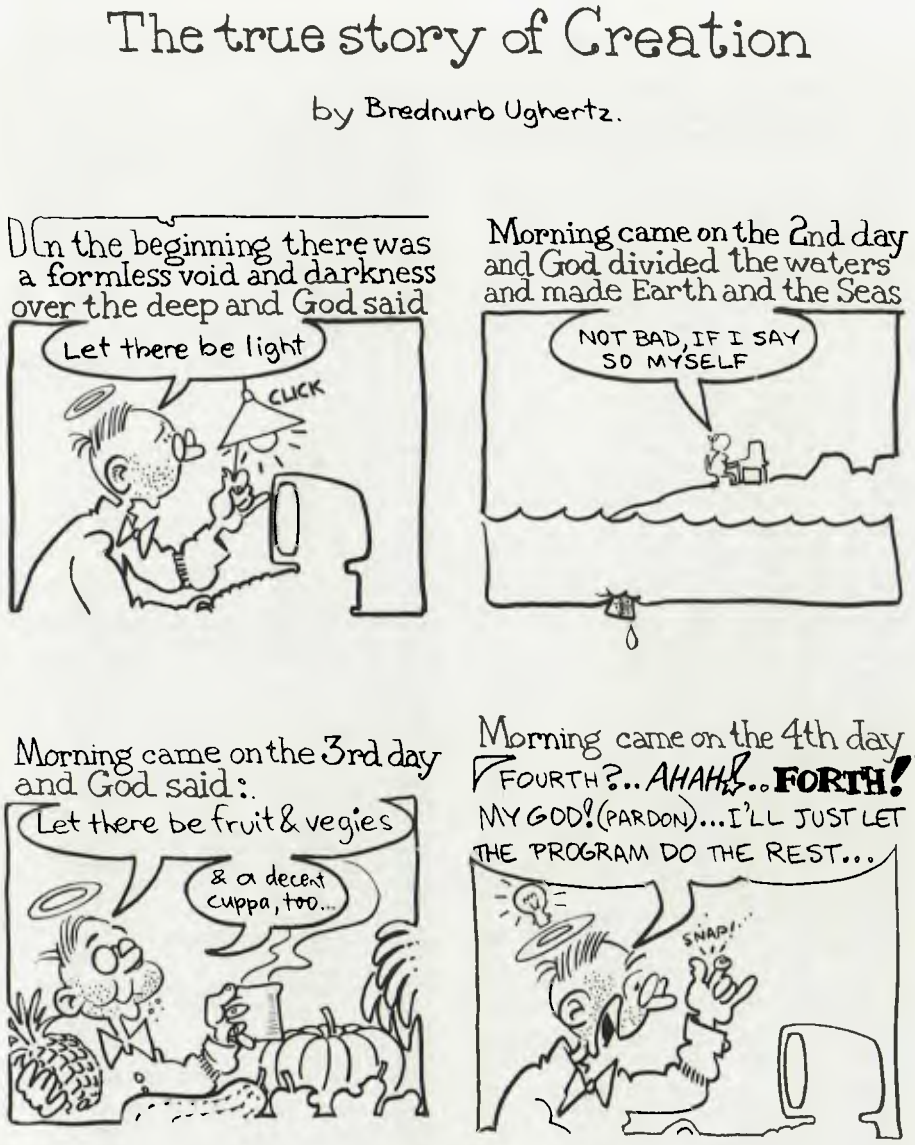
The stack is one of the fundamental concepts of Forth, so it's worth taking the trouble to try and understand what it is.

The stack is like a tall mound of paper. You can only add or remove pieces from the top of the pile, and the last sheet you put on the pile must be the first one you remove.

When you enter 50 followed by a space, a computer running Forth effectively writes this number on a sheet of paper and places it on top of the stack of paper. It then writes the 9 on another sheet and places it on top of the 50, so the 50 is now the second piece of paper from the top of the stack.

The computer then comes to the instruction '+', which is a word in the computer's 'dictionary' of instructions. '+' tells the computer to 'take the two numbers from the top of the stack, add them together, then place the result of that addition on top of the stack'. This is what the '50 9 +' program does. Finally, working along the line of input, the Forth computer comes to the word '.', which it uses as a signal to take the value from the top of the stack and print it out.

As I pointed out earlier, if you don't include the '.' command the computer will



still work out the problem, but will leave the answer on the top of the stack.

The Visible Stack

The stack provided with our program can be up to 20 sheets of paper deep. The sheets of paper only store numbers, and as we saw before, a number is written on the top sheet, then the next sheet of paper with a number on it is put on top of the preceding one, and so on. The Emulator program has a 'visible stack', so you can easily see what's happening.

When you first run the program it will ask "Do you want the stack printed out (Y/N)?". Press the 'Y' key the first time you run this, and you'll see the top four positions on the stack printed out:

```
Stack:
      1  |  --
      2  |  --
      3  |  --
      4  |  --
-----------------

>> OK
```

The double hyphen (—) indicates that the stack is empty at that point (or the sheet of paper is blank). You can prove this by entering a dot (.) after the 'OK' appears. This, you'll recall, is to print out the top element on the stack. When the stack is empty, as in this case, you'll get the message 'Stack empty'. Let's try out our complex sum, and see how it appears on the visible stack.

When your computer comes up with the 'OK', it means it's waiting for your input. Type in the following sum, making sure you

```
10 REM         The FORTH Emulator
20 REM
30 REM      (c) Tim Hartnall, 1985
40 REM    Interface Publications (Aust.)
50 REM
60 REM  Engage CAPS LOCK before running
70 REM
80 C$="":E$="":NC=0
90 DIM A(21),B(21),C(21),N$(500),M$(500)

100 REM N$ = Name of new words
110 REM M$ = Meaning of new words
120 FOR J=1 TO 21:A(J)=1E-10:B(J)=A(J):N
EXT
130 CLS
140 IF INKEY$<>"" THEN 140
150 GOTO 530
160 REM **********************
170 REM Print out stack
180 IF SFLAG=0 THEN RETURN
190 PRINT TAB(5);C$
200 PRINT TAB(17);E$
210 PRINT:PRINT TAB(5);"Stack:"
220 FOR Q=1 TO 4
230 IF A(Q)<>1E-10 THEN PRINT TAB(8);Q;"
| ";A(Q)
240 IF A(Q)=1E-10 THEN PRINT TAB(8);Q;"|
 --"
250 NEXT Q
260 PRINT TAB(3);"-----------------":PR
INT
270 RETURN
280 REM **********************
290 REM Pop Stack
300 E=A(1)
310 FOR J=2 TO 21:A(J-1)=A(J):NEXT J
320 GOSUB 170
330 A(21)=1E-10
340 RETURN
350 REM **********************
360 REM Push Stack
370 FOR J=1 TO 20:B(J+1)=A(J):NEXT J
380 FOR J=2 TO 21:A(J)=B(J):NEXT J
390 A(1)=E
400 A(21)=1E-10
410 GOSUB 170
420 RETURN
430 REM ************************
440 REM Strip Excess Spaces
450 Q=LEN(C$)
460 J=0
470 J=J+1
480 IF MID$(C$,J,1)<>" " THEN 500
490 IF MID$(C$,J+1,1)=" " THEN C$=LEFT$(
C$,J)+MID$(C$,J+2):Q=Q-1:GOTO 490
500 IF J<Q THEN 470
510 RETURN
520 REM **********************
530 PRINT:PRINT:PRINT "Do you want the s
teck printed out (Y/N)?"
540 W$=INKEY$:IF W$="" THEN 540
550 SFLAG=0:IF W$="y" OR W$="Y" THEN SFL
AG=1
560 CLS:GOSUB 170
570 REM **********************
580 REM Input Routine
590 DF=0:PRINT " >> OK ":LINE INPUT C$
600 IF C$="" THEN END
610 C$=C$+" "
620 GOSUB 440:REM STRIP EXCESS SPACES
630 REM **********************
640 REM Scan Input
650 J=0
660 J=J+1
670 IF LEN(C$)=0 AND DF=1 THEN RETURN
680 IF LEN(C$)=0 THEN 590
690 IF MID$(C$,J,1)<>" " THEN 660
700 E$=LEFT$(C$,J-1)
710 C$=MID$(C$,J+1)
720 REM ******************
730 REM Action
740 REM The first four words are not
  FORTH words but are used to make
  operation of the FORTH Tutor simpler
750 IF E$="ABORT" THEN 580:REM Not used
 as in FORTH, but to terminate an input
 when a particular condition is reached
760 IF E$="CR" THEN PRINT:GOTO 650:REM
 Used to emulate a CARRIAGE RETURN for
 formatting output
770 IF E$="LLIST" THEN FOR U=NC TO 1 STE
P -1:LPRINT N$(U),M$(U):NEXT:GOTO 650:RE
M Used to get current definitions to
  printer
780 IF E$="STACK" THEN SFLAG=-SFLAG+1:GO
TO 650:REM Turn stack print off and on
790 REM ******************
800 REM Now the FORTH words
810 KW=0
820 IF E$=":" THEN KW=-99:GOSUB 1280:REM
 DEFINE NEW WORDS
830 IF E$="+" THEN KW=1
840 IF E$="-" AND MID$(C$,3,2)<>"IF" THE
N KW=2
850 IF E$="*" THEN KW=3
860 IF E$="/" THEN KW=4
870 IF E$="MOD" THEN KW=5
880 IF E$="/MOD" THEN KW=6
890 IF E$="**" THEN KW=7
900 IF E$="SWAP" THEN KW=8
910 IF E$="*/" THEN KW=9
920 IF E$="*/MOD" THEN KW=10
930 IF E$="NEGATE" OR E$="MINUS" THEN KW
=11
940 IF E$="ABS" THEN KW=12
950 IF E$="MAX" THEN KW=13
960 IF E$="MIN" THEN KW=14
970 IF E$="DUP" OR E$="?DUP" THEN KW=15
980 IF E$="OVER" THEN KW=16
990 IF E$="PICK" THEN KW=17
1000 IF E$="DROP" THEN KW=18
1010 IF E$="ROT" THEN KW=19
1020 IF E$="ROLL" THEN KW=20
1030 IF E$="." THEN KW=21
1040 IF E$="." THEN KW=22
1050 IF E$="EMIT" THEN KW=23
1060 IF E$="VLIST" THEN KW=24
1070 IF E$="FORGET" THEN KW=25
1080 IF LEFT$(E$,1)="'" THEN KW=26
1090 IF E$="KEY" THEN KW=27
1100 IF E$="RAND" THEN KW=28:REM Not a
     FORTH word, but useful for games
1110 IF E$="DO" THEN KW=29
1120 IF E$="SPACES" THEN KW=30
1130 IF E$="1+" OR E$="1-" OR E$="2+" OR
 E$="2-" THEN KW=32
1140 IF E$="2*" OR E$="2/" THEN KW=32
1150 IF E$="=" OR E$="<" OR E$=">" OR E$
="0=" OR E$="0<" OR E$="0>" THEN KW=31
1160 IF (E$="-" AND KW=0) OR E$="NOT" TH
EN KW=31
1170 IF KW>0 AND KW<9 THEN GOSUB 1550:GO
TO 650
1180 IF KW>8 AND KW<17 THEN ON KW-8 GOSU
B 1860,1910,1980,2010,1550,1550,2040,208
0
1190 IF KW>16 AND KW<23 THEN ON KW-16 GO
SUB 2130,2200,2230,2130,2280,2380
1200 IF KW>22 AND KW<28 THEN ON KW-22 GO
SUB 2430,2480,2590,2750,2820,2860
1210 IF KW>28 THEN ON KW-28 GOSUB 2900,3
060,3090,3450
1220 REM Next lines push numbers on
          steck
1230 CF=0:IF KW=0 AND LEN(E$)>0 THEN CF=
1
1240 IF CF=1 THEN IF ASC(E$)>44 AND ASC(
E$)<58 THEN E=VAL(E$):GOSUB 360
1250 IF CF=1 THEN IF ASC(E$)>57 THEN GOS
UB 1460:GOTO 610:REM Change defined
                     words into definition
1260 GOTO 650
1270 REM ******************
1280 REM Define new words
1290 REM Note word name must not begin
          with a number
1300 IF NC<500 THEN NC=NC+1:REM Allows
          up to 500 new words
1310 X=0
1320 X=X+1
1330 IF MID$(C$,X,1)=";" THEN R$=LEFT$(C
$,X-1):C$=MID$(C$,X+1):GOTO 1360
1340 IF X<LEN(C$) THEN 1320
1350 PRINT TAB(25);"Missing ';' in defin
ition":C$="":RETURN
1360 REM Now get name of new word
1370 J=0
1380 J=J+1
1390 IF MID$(R$,J,1)=" " THEN 1420
1400 IF J<LEN(R$) THEN 1380
1410 PRINT TAB(25);"Error in input for d
efinition routine":C$="":RETURN
1420 N$(NC)=LEFT$(R$,J-1)
1430 M$(NC)=MID$(R$,J+1)
1440 RETURN
1450 REM ******************
1460 REM CHANGE DEFINED WORDS INTO
          DEFINITION
1470 J=NC+1
1480 J=J-1
1490 IF E$=N$(J) THEN 1520
1500 IF J>0 THEN 1480
1510 PRINT TAB(25);"Word not defined":KW
=-99:RETURN
1520 C$=M$(J)+C$
1530 RETURN
1540 REM ******************
1550 REM Two Number Operations
1560 T1=0:T2=0:T3=0:T4=0:K$=""
1570 GOSUB 290:T1=E
1580 GOSUB 290:T2=E
1590 IF E$="MAX" OR E$="MIN" THEN 1610
1600 IF E$="+" THEN T3=T2+T1
1610 IF E$="-" THEN T3=T2-T1
1620 IF E$="*" THEN T3=T2*T1
1630 IF (E$<>"/" AND E$<>"/MOD" AND E$<>
"MOD") THEN 1650
1640 IF T1=0 THEN PRINT TAB(25);"Divisio
n by zero is illegal":C$="":RETURN
1650 IF E$="/" OR E$="/MOD" THEN T3=INT(
T2/T1)
1660 IF E$="MOD" THEN T3=T1*(T2/T1-INT(T
2/T1))
1670 IF E$="**" THEN T3=T2^T1
1680 IF E$="/MOD" THEN 1720
1690 IF E$="SWAP" THEN 1770
1700 E=INT(T3+.5):GOSUB 360:RETURN
1710 REM *************
1720 REM /MOD
1730 T4=T1*(T2/T1-INT(T2/T1))
1740 E=INT(T4+.5):GOSUB 360
1750 E=INT(T3+.5):GOSUB 360:RETURN
1760 REM *************
1770 REM SWAP
1780 E=T1:GOSUB 360
1790 E=T2:GOSUB 360:RETURN
1800 REM *************
1810 REM MAX and MIN
1820 A=T1:B=T2:IF T1>T2 THEN A=T2:B=T1
1830 E=A:IF E$="MAX" THEN E=B
1840 GOSUB 360:RETURN
1850 REM *************
1860 REM KW=9 */
1870 GOSUB 290:P3=E:GOSUB 290:P2=E:GOSUB
 290:P1=E
1880 E=INT(P1*P2/P3):GOSUB 360
1890 RETURN
1900 REM *************
1910 REM KW=10 */MOD
1920 GOSUB 290:CQ=E:GOSUB 290:BQ=E:GOSUB
 290:AQ=E
1930 DQ=AQ*BQ/CQ
1940 E=INT(CQ*((DQ)-INT(DQ))):GOSUB 360
1950 E=INT(DQ):GOSUB 360
1960 RETURN
1970 REM *************
1980 REM KW=11 NEGATE/MINUS
1990 GOSUB 290:E=-E:GOSUB 360:RETURN
2000 REM *************
2010 REM KW=12 ABS
2020 GOSUB 290:E=ABS(E):GOSUB 360:RETURN

2030 REM *************
2040 REM KW=15 DUP  ?DUP/-DUP
2050 GOSUB 290:IF E=0 AND (E$="?DUP" OR
E$="-DUP") THEN GOSUB 360:RETURN
2060 GOSUB 360:GOSUB 360:RETURN
2070 REM *************
2080 REM KW=16 OVER
2090 GOSUB 290:XW=E:GOSUB 290:YW=E
2100 E=YW:GOSUB 360:E=XW:GOSUB 360:E=YW:
GOSUB 360
2110 RETURN
2120 REM *************
```

```
213D REM KW=17 PICK/KW=2D RDLL
214D GOSUB 28D:FR=E-1
215D FOR T=1 TO FR:GOSUB 29D:C(T)=E:NEXT
 T
216D GOSUB 29D:XR=E:IF KW=17 THEN GOSUB
360
217D FOR T=FR TO 1 STEP -1:E=C(T):GOSUB
360:NEXT T
218D E=XR:GOSUB 36D:RETURN
219D REM ************
220D REM KW=18 DROP
221D GOSUB 29D:RETURN
222D REM ************
223D REM KW=19 ROT
224D GOSUB 28D:G3=E:GOSUB 29D:G2=E:GOSUB
 29D:G1=E
225D E=G2:GOSUB 36D:E=G3:GOSUB 36D:E=G1:
GOSUB 36D
226D RETURN
227D REM ************
228D REM KW=21 .'
229D X=0
23DD X=X+1
231D IF MID$(C$,X,1)="'" THEN 234D
232D IF X<LEN(C$) THEN 23DD
233D PRINT TAB(25);"No closing ' in your
 input":RETURN
234D PRINT LEFT$(C$,X-1);
235D C$=MID$(C$,X+1)
236D RETURN
237D REM ************
238D REM KW=22 .
239D GOSUB 29D
24DD IF E<>1E-1D THEN PRINT E;' ";:RETUR
N
241D PRINT "Stack empty":PRINT:E=1E-1D:G
OSUB 35D:RETURN
242D REM ************
243D REM KW=23 EMIT
244D GOSUB 29D:PRINT CHR$(E);:RETURN
245D REM ************
246D REM KW=24 VLIST
247D PRINT:IF NC=D THEN 25DD
248D FOR J=NC TO 1 STEP -1:IF N$(J)<>""
THEN PRINT N$(J),
249D NEXT
25DD PRINT "+","-","*","/","MOD","/MOD",
"**","SWAP","*/","*/MOD",
251D PRINT "NEGATE","MINUS","ABS","MAX"
"MIN","OVER","PICK","DROP",
252D PRINT "ROT","ROLL",".'","'",".",";"
,";","EMIT","VLIST","FORGET",
253D PRINT "KEY","DO","LOOP","SPACES","I
F","THEN",
254D PRINT "DUP","?DUP","-DUP","=","<",
">","0=","D<","D>",
255D PRINT "NOT","1+","1-","2+","2-","2*
","2/"
256D PRINT:PRINT " -> System also suppor
ts STACK ABORT LLIST RAND CR <-"
257D PRINT:RETURN
258D REM ********************
259D REM KW=25 FORGET
26DD J=D
261D J=J+1
262D IF J>LEN(C$) THEN PRINT TAB(25);"FO
RGET error":KW=-99:RETURN
263D IF MID$(C$,J,1)=" " THEN 265D
264D GOTO 261D
265D F$=LEFT$(C$,J-1):C$=MID$(C$,J+1):FL
AG=D
266D FOR J=NC+1 TO 1 STEP -1
267D IF N$(J)=F$ THEN N$(J)="":M$(J)="":
FLAG=1:DROP=J
268D NEXT J
269D IF FLAG=D THEN PRINT TAB(25);"Word
 '";F$;"' not recognised":C$=MID$(C$,LEN(
F$)+1):KW=-99:RETURN
27DD ZN=NC:FOR J=NC TO DROP STEP-1
271D N$(J)="":M$(J)="":ZN=ZN-1
272D NEXT J:NC=ZN
273D RETURN
274D REM ********************
275D REM KW=2G ' [tick]
276D PRINT:E$=MID$(E$,2):FL=D
277D FOR J=1 TO NC:IF N$(J)=E$ THEN FL=J
278D NEXT J:IF FL=D THEN PRINT TAB(25);"
Error - ";E$;" not known":RETURN
279D PRINT TAB(1D);"> ";E$;" < OK":PRINT
:PRINT TAB(12);M$(FL)
28DD RETURN
2811 REM ********************
282D REM KW=27 KEY
283D W$=INKEY$:IF W$="" THEN 283D
284D E=ASC(W$):GOSUB 38D:RETURN
285D REM ********************
286D REM KW=28 RAND (Note this is not a
 standerd FORTH word)
287D GOSUB 29D:Y1=E:GOSUB 29D:Y2=E
288D E=INT(RND*Y2+Y1):GOSUB 36D:RETURN
289D REM ********************
29DD REM KW=29  DO loops
291D REM Find the end of the loop
292D JH=D
293D JH=JH+1
294D IF MID$(C$,JH,1)=" " THEN IF MID$(C
$,JH+1,4)="LOOP" THEN 297D
295D IF JH<LEN(C$) THEN 293D
296D PRINT TAB(25);"DO LOOP error":RETUR
N
297D DF=1
298D D$=LEFT$(C$,JH):I$=MID$(C$,JH+6)
299D GOSUB 29D:L2=E:GOSUB 29D:L1=E
3DDD 6T=1:IF L2>=L1 THEN ST=-1:L1=L1+2
3D1D FOR D=L2 TO L1-1 STEP ST:REM Letter
 D, not zero
3D2D C$=D$:GOSUB 31D
3D3D NEXT D:REM Letter D, not zero
3D4D C$=I$:DF=D:RETURN
3D5D REM ********************
3D6D REM KW=3D SPACES
3D7D GOSUB 29D:FOR J=1 TO E:PRINT " ";:N
EXT J:RETURN
3D8D REM ********************
3D9D REM KW=31 IF...THEN
31DD IF LEFT$(C$,2)="IF" THEN C$=MID$(C$
,4):REM Strip off the word IF
311D IF LEFT$(C$,6)="NOT IF" THEN C$=MID
$(C$,8):GOSUB 335D:REM 'NOT'
312D REM Now look for the THEN
313D BJ=D
314D BJ=BJ+1
315D IF MID$(C$,BJ,4)="THEN" THEN 318D
316D IF BJ<LEN(C$) THEN 314D
317D PRINT TAB(25);"No THEN to match IF"
:RETURN
318D U$=LEFT$(C$,BJ-1):C$=MID$(C$,BJ+5)
319D REM Now check condition
32DD GOSUB 29D:K2=E
321D IF LEFT$(E$,1)<>"D" THEN GOSUB 28D:
K1=E
322D TRUE=D
323D IF E$="=" AND K2=K1 THEN TRUE=1
324D IF (E$="<>" OR E$="-") AND K2<>K1 T
HEN TRUE=1:REM <> only via NOT
325D IF E$="<" AND K1<K2 THEN TRUE=1
326D IF E$=">" AND K1>K2 THEN TRUE=1
327D IF E$="D=" AND K2=D THEN TRUE=1
328D IF E$="D<>" AND K2<>D THEN TRUE=1:R
EM D<> only via NOT
329D IF E$="D<" AND K2<D THEN TRUE=1
33DD IF E$="D>" AND K2>D THEN TRUE=1
331D IF TRUE=D THEN RETURN
332D C$=U$+C$
333D RETURN
334D REM ********************
335D REM NOT - reverse condition
336D IF E$="=" THEN E$="<>":RETURN
337D IF E$="-" THEN E$="=":RETURN
338D IF E$="<" THEN E$=">":RETURN
339D IF E$=">" THEN E$="<":RETURN
34DD IF E$="D=" THEN E$="D<>":RETURN
341D IF E$="D<" THEN E$="D>":RETURN
342D IF E$="D>" THEN E$="D<":RETURN
343D PRINT TAB(25);"Error - NOT needs a
 condition to act on":RETURN
344D REM ********************
345D REM 1+  1-  2+  2-  2*  2/
346D GOSUB 29D
347D IF E$="1+" THEN E=E+1
348D IF E$="1-" THEN E=E-1
349D IF E$="2+" THEN E=E+2
35DD IF E$="2-" THEN E=E-2
351D IF E$="2*" THEN E=E*2
352D IF E$="2/" THEN E=INT(E/2)
3536 GOSUB 36D:RETURN
```

leave spaces between each element of your input:

```
50 9 +
```

The process will begin when you press your RETURN key.

The 50 will be taken from the input, and placed on top of the stack:

```
9 + .
                    50
Stack:
      1  |   50
      2  |   --
      3  |   --
      4  |   --
 ------------------
```

You can see 50 on the stack, in the position marked '1'. The rest of the line still to be processed is shown as (9 + .), and the 50 is shown to the right. With a normal Forth compiler, of course, you wouldn't see these things, but I included them in order to make it easy to understand what is going on (you can turn them off at any stage).

Follow the process as the 9 is placed on top of the stack, causing the 50 to be pushed down to the second position. The computer then comes to the '+' and knows it needs two numbers to add together, so it takes (we use the word 'pops') the top two numbers from the stack, adds them, then 'pushes' the result (59) back onto the stack. Finally, the computer comes to the '.' which tells it to pop the top value off the stack and print it out.

```
.
                    +
Stack:
      1  |   59
      2  |   --
      3  |   --
      4  |   --
 ------------------
```

Now try it with these other simple bits of Reverse Polish Arithmetic, until you have a pretty good idea of what's going on:

```
 >> OK
3 2 + .
 5    >> OK
-3 -2 + .
-5    >> OK
3 2 - .
```

```
 1     >> OK
-3 -2 - .
-1     >> OK
3 2 * .
 6     >> OK
7 4 / .
 1     >> OK
```

All Forth operations more or less come down to pushing values on and popping them from the stack (in 'real Forth' there's another stack, but it would be confusing to try to emulate that in our program, so we'll ignore it).

Defining Your Own Words

The most exciting thing about Forth is the ease with which new words can be defined, and we'll look at that next.

You'll recall from the arithmetic examples you've tried that the dot (.) is used to pop the top value off the stack and print it out. There may be times when you want to print out the value, but still want the value on the stack afterwards. Dot, as you have seen, is destructive — you lose the top number by popping it off.

The word DUP (for 'duplicate') gets around this by duplicating the top number on the stack and pushing a copy of it on top of the first one (so positions one and two on the stack now have the same value). You can then pop the number off to print it out, but leave a copy of it on top of the stack.

We can invent a word of our own, PRINTOUT, to duplicate the top number on the stack, then pop off the top value and print it out. You create words with an input as follows:

```
: PRINTOUT DUP . ;
```

You start defining a word with a colon (:) and follow it with a space, then put the words (in this case DUP and .) you want in your definition, followed by a semi-colon to indicate that the word has been defined.

From that point onwards you can simply use PRINTOUT in your Forth programs, and your computer will automatically perform the DUP . for you. The program given here will allow you to define up to 500 new words, which should be more than enough for your needs.

If you want to define a word which will square the number on top of the stack, make a copy of the result and print out the answer. You could define the word as follows:

```
: SQUARE DUP * DUP . ;
```

In this word (or colon definition, as such user-defined words are often called), the name of the word you are defining is 'SQUARE'. DUP duplicates the top number on the stack, then uses '*' to multiply it by itself. The answer is on top of the stack, and DUP . copies the answer and prints it out, leaving a copy on the stack. Note you can call a word anything you like in our version of Forth, so long as it begins with a letter or symbol (such as $, #, %, or @), and not with an operator (+, —, * or /) or a number.

This brings us to an even more exciting part of Forth. You can see that the last part

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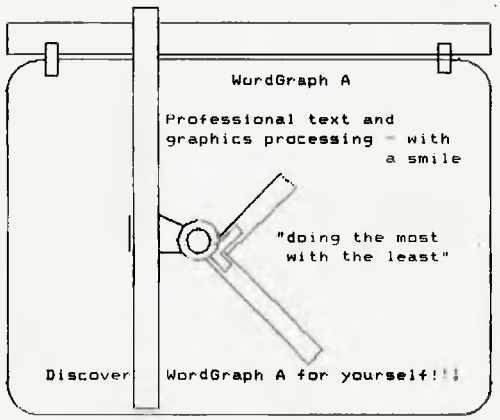

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of our definition of SQUARE (DUP .) is the same as the definition of PRINTOUT. Why don't we use PRINTOUT in our SQUARE definition? You can, by adding this word to the dictionary:

```
:SQUARE DUP * PRINTOUT ;
```

Forth always uses the most recently defined version of a word, searching its dictionary from the newest word to the oldest, so you can safely redefine a word and know it will use the latest version.

You can see a hint of the real magic of Forth in this inclusion of PRINTOUT within SQUARE — you can keep adding more and more words to your dictionary. If you modify my program to save the contents of the N$() and M$() arrays and load them when you next run the program, you can build up a permanent dictionary of your own words.

To wipe a word from the dictionary, type 'FORGET', followed by the word you want to delete. However, be warned that when you do this Forth will also forget all the words defined after the word you told it to FORGET.

Forth In Action

Forth works more or less in the following way:

- The user types something into the computer after the OK prompt
- Forth looks through its dictionary of words to see if any of them match the word which has been entered
- If it finds a match, either within the dictionary provided with the program, or within the dictionary of words the user has defined, it executes the word, then goes to the next element in the input stream
- If it doesn't find a match, it assumes the word is a number

You'll find our Forth program is well furnished with error messages, which (along with the visible stack) should make it pretty easy to keep aware of what is going on in the program.

The usefulness of being able to define words is illustrated by the following example. Suppose you want a word called CIRCLE, which would take a number off the stack and treat it as the diameter of the circle, printing out the circumference of the circle; you'd only need to enter something like 23 CIRCLE to get your computer to print out the circumference of a circle with a diameter of 23 units.

The word CIRCLE could be defined as follows (where 355/113 is used as an integer approximation to PI, since most Forths work in integers, rather than supporting floating point numbers):

```
: CIRCLE 355 113 */ . ." IS THE
CIRCUMFERENCE" ;
```

If you did this, you'd only have to enter a number (or allow the computer to take one off the stack) for the diameter, and the computer would do the rest. You'll find you should have a lot of fun defining words and using them with this program.

The Built-in Vocabulary

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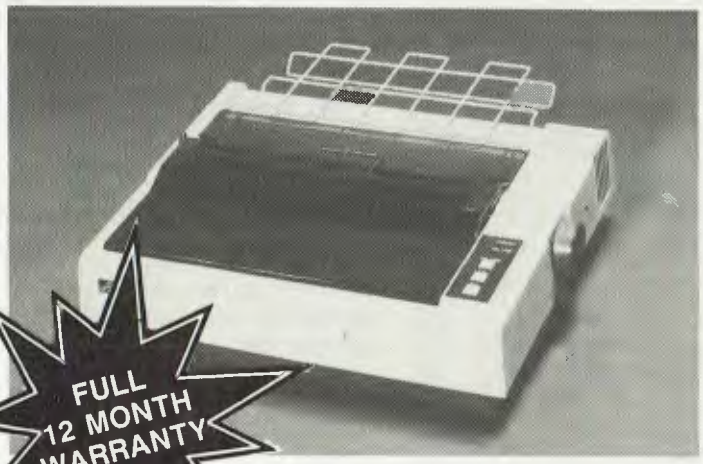

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sions of Forth, fig-Forth (from the Forth Interest Group) and Forth-79. The program provided adheres to the Forth-79 standard, but allows the use of fig-Forth equivalents in some cases (so the fig-Forth word MINUS can be used interchangeably with Forth-79's NEGATE).

The vocabulary supplied with our program is extensive, as a glance at the following words which it supports will show.

We've already seen the arithmetic operators, +, —, * and /, which take the top two numbers from the stack, add or subtract the first one from the second, multiply them together or divide the second number by the top one. In all cases, the result is pushed to the top of the stack.

Both / and MOD divide, but where / puts the quotient on the stack, MOD puts the remainder onto it. /MOD divides again, but puts the quotient and remainder on the stack, with the quotient on top. */ multiplies then divides, leaving the quotient, and requires three numbers from the stack. */MOD is similar to */, returning the quotient and remainder, with the quotient on top.

** takes two numbers from the stack and raises the second number to the power of the first one on the stack, returning the result to the stack. NEGATE is the Forth-79 word which multiplies the number on the top of the stack by minus one, thus changing its sign. The fig-Forth equivalent, MINUS, can also be used. ABS performs in the same way as ABS in BASIC, returning the absolute value of the number to the top of the stack.

MAX and MIN compare the top two numbers on the stack, leaving only the largest (MAX) or smallest (MIN) behind. We've met DUP before — it duplicates the top value on the stack. ?DUP works like DUP, but only if the value is not zero (the fig-Forth equivalent is —DUP, so this is also recognised). OVER takes the second number on the stack, copies it, and puts a copy of that on top of the stack, which means if the top number was A and the second one was B, an OVER would make the stack read B A B from top to bottom.

PICK must be preceded by a number. This command selects the numbered element on the stack (so if the number which preceded it was 6, PICK would select the sixth element, counting down) and copies it onto the top of the stack. DROP deletes the top number on the stack, and SWAP causes the two numbers on the stack to change places. ROT (for ROTate) brings the third element on the stack up to the top, moving the former items one and two down a position each.

ROLL, like PICK, must be preceded by a number. It brings this numbered element to the top, deleting it from its original position and moving all other elements down one position. VLIST lists every word the program understands, with user-defined words first, from the newest one to the oldest.

FORGET must be followed by the name of the word you've defined, and should be treated with caution.

KEY works like INKEY$ or GET$: it waits until you touch a key, then puts the ASCII code of the character on top of the stack. The command 'dot' (.) pops the top element off the stack and prints it out, while 'dot-quote' (.') is used to preface text output, and must be followed by a space. Forth regards as text all material which follows dot-quote up to the next quote ('), which can follow the text without a space preceding it. (Most Forths use ." rather than ', but the inclusion of double-quotes within a string plays havoc with some BASICs, so I've changed it to a single quote in our program.)

Forth usually includes the word 'tick', which is a single quote mark (') and is followed by the name of a word. If that word is in the dictionary the computer will print out 'name OK' to indicate the word does exist. In my Forth, tick also prints out the complete definition of the word, so if you've forgotten what meaning you assigned to a word ' name will print it out on the screen.

EMIT is the 'opposite' of KEY: it prints out the character whose ASCII code precedes it, so 42 EMIT would print out an asterisk.

SPACES can be used to format output, since it takes the top number from the stack, and prints out that number of spaces. Forth allows for a 'carriage return' (which is not the same as pressing the ENTER key), which we've imitated by allowing you to include the non-Forth

```
: GAME THINKNUM 11 1 DO GETGUESS TEST LOOP END ;

: THINKNUM 9D 1D RAND ;

: GETGUESS CR .' ENTER GUESS ' KEY 48 - KEY 48 - .' THANK YOU ' SWAP 10 * + ;

: TEST SAME? BIGGER? SMALLER? DROP ;

: END .' SORRY, TIME IS UP' CR .' I WAS THINKING OF' . ;

: SPINNER DUP ROT DUP ROT ;

: SAME? SPINNER = IF .' YOU DID IT!!' ABORT THEN ;

: BIGGER? SPINNER > IF .' TOO BIG ' THEN ;

: SMALLER? SPINNER SWAP < IF .' TOO SMALL ' THEN SWAP ;
```

Figure 1. *The Forth listing of the 'Guess My Number' game.*

```
SMALLER?    BIGGER?     SAME?       SPINNER     END
TEST        GETGUESS    THINKNUM    GAME        +
-           *           /           MOD         /MOD
**          SWAP        */          */MOD       NEGATE
MINUS       ABS         MAX         MIN         OVER
PICK        DROP        ROT         ROLL        .'
'           .           :           ;           EMIT
VLIST       FORGET      KEY         DO          LOOP
SPACES      IF          THEN        DUP         ?DUP
-DUP        =           <           >           0=
0<          0>          NOT         1+          1-
2+          2-          2*          2/

 -> System also supports STACK ABORT LLIST RAND CR <-

 >> OK
```

Figure 2. *Executing a* VLIST *after the 'Guess My Number' words have been defined produces this result; all the words the program now supports are listed, with the newest word shown first.*

word **CR**, which simply moves print output to the start of the next line. This is also helpful in formatting output.

A **DO LOOP** is similar to a FOR/NEXT loop in BASIC. It repeats everything which comes between the words DO and LOOP. The number of repetitions is the difference between the top two numbers on the stack. If the second number on the stack were 11 and the top number were 1, the loop would be run through ten times.

You're bound to be familiar with **IF** and **THEN** from BASIC, and although they perform much the same function in Forth, the order in which they are placed in a statement may seem strange. The condition being tested comes before the word IF, and if the condition is evaluated as true, all the words between IF and THEN are carried out. If it's evaluated as false, action moves along the input stream beyond the THEN. IF/THEN in Forth can test =, < >, <,>, as well as check to see if the number on top of the stack is equal to, not equal to, less than or greater than zero.

The word **NOT** causes IF/THEN to look for the opposite condition.

Finally, in our standard vocabulary, there are special arithmetic words to add one to the number on top of the stack (1+), or subtract one (1—) along with 2+, 2—, 2* and 2/.

In the non-standard vocabulary, our Forth is supplied with **ABORT** to cancel action (usually in conjunction with an IF/THEN); **LLIST** to get a hard copy printout of all the words you've defined and their meanings; and **STACK** to turn the printing of the visible stack off and on.

Finally, to show real programs can be written in our Forth, I've knocked up a 'Guess My Number' game, in which the computer thinks of a number between 10 and 100, and you have 10 guesses in order to work out what the number is. Feedback from the computer is in the form of the message TOO BIG or TOO SMALL. The 'program listing' for this game is given as Figure 1. Forth programs consist of a series of definitions; there are no line numbers. The game itself is 'held' in the word GAME as:

```
: GAME THINKNUM 11 1 DO GETGUESS
TEST LOOP END ;
```

To trigger the game simply enter GAME. The program goes to the word THINKNUM to get its number; starts a DO LOOP from 11 to 1 and within this loop gets a guess from the player with GETGUESS; tests this against its own number with TEST; and finally, if the LOOP is traversed 10 times, goes to the routine called END, where the computer tells you your guesses are over and reveals which number it is thinking of.

The program may look pretty complex, and it probably won't make much sense right now, but once you've played with Forth for a while and watched the stack in action, you'll be well on the way to mastering it.

I'd be very interested to see any programs you write to run under this Forth, and to hear about any developments you come up with. □

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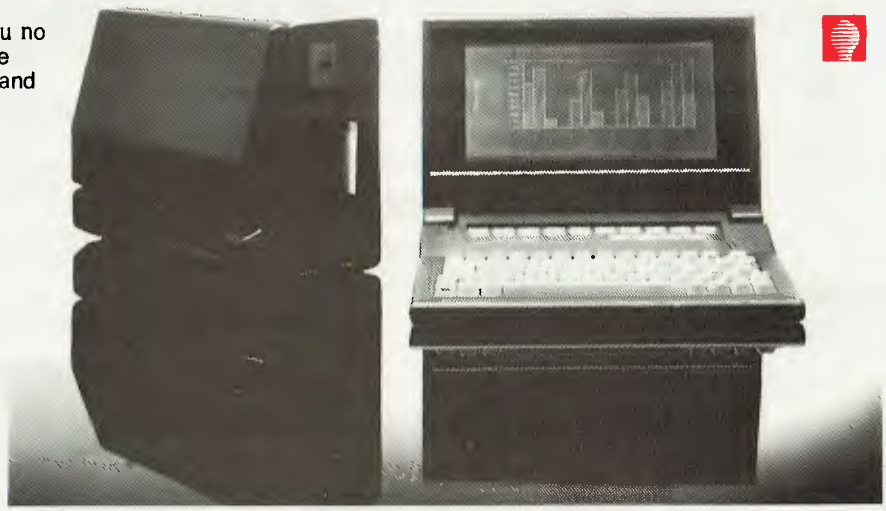

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THE $200 MAC MODEM!

Bob Pulsford, with a little help from his friends Tim Docker and Ken Humphries, shows you how to construct a device to enable the Apple Macintosh to use a Beemodem for low-cost communications.

INSPIRED by *Your Computer*'s article 'Beemodem Gets a PC of the Action' (February, 1985), I made a simple device which enables an Apple Macintosh to use a Beemodem (retail price $185) for communication via the telephone system with other computers, bulletin boards and so on. The parts cost a mere $22.

You will need:

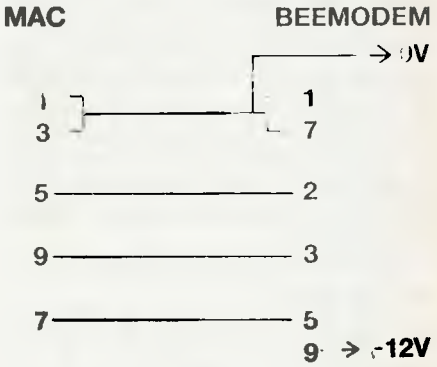
- One Jiffy box, approximately 130 by 67 by 40 mm
- One 25-pin 'D' type connector socket (female)
- One 9-pin 'D' type connector plug (male)
- One backshell for 9-pin plug
- One small transformer 240 to 13.6 volts (I used a DSE 2851)
- One 7812 voltage regulator
- Four IN4002 diodes
- One 2500 microfarad electrolytic capacitor
- One 0.22 microfarad capacitor
- A piece of vero board 60 by 30 mm
- Four connectors (I used speaker wire)

Install a small power supply in the Jiffy box — I followed the instructions provided on page 138 of the 1985/86 Dick Smith catalogue, using the 7812 regulator to deliver 12 volts dc to power the Beemodem (which usually draws its power from the Microbee).

Socket to the Slot

Cut a slot and install the 25-pin 'D' socket at one end of the box, and drill two holes at the other end (one for entry of the 240-volt lead and the other for the entry of the four connectors). On each side of the box drill two small holes 5 mm apart and in line with the holes on the end of the box. Thread some nylon fishing line through these holes to anchor the 240-volt and outgoing wires to the side of the box. Make sure you connect the green mains earth to the frame of the transformer, as well as to the metal cover of the box.

The connections are made using the following method:



One problem remains: the backshell of the 9-pin plug won't allow the plug into the Macintosh socket and the offending lugs have to be sandpapered almost away.

Plug the Beemodem into the box and the 9-pin into the correct socket in the Macintosh and, with the appropriate software, you're in business. □

GENERATING RANDOM NUMBERS

Random numbers were invented by the Chinese sage Li Ran Dum in 1347, and his heirs still receive a royalty for every random number generated in the world. Tim Hartnell looks into the situation.

Your computer probably comes with an inbuilt function to generate random numbers. Actually, the numbers are not really random; they're the result of a decision or decisions made by the computer in line with an inbuilt program. This program dictates specific actions in response to specific situations, so if you knew the computer's inner program and what it was responding to, you'd be able to predict exactly which 'random' number it would select next.

Fortunately, although the computer chooses each number from a list which it repeats when it gets to the end, the list is so long you'd have a pretty difficult time trying to work out where it began again. For example, when you fully wind up the BBC Micro it can produce a random number every 1.5 milliseconds. If you let it continue to generate these numbers (and paid royalties to Li Ran Dum's family), it would take 150 days before the sequence began to repeat itself.

How does your computer create its random numbers?

There are many existing 'random-number' algorithms. An early one was developed by one of the grandfathers of computers (and I don't mean Les Bell — this was even before his time). John von Neumann worked out a method of generating random numbers based on taking a four-figure number (such as 8931), then squaring it (in this case to produce 79,762,761), and from that selecting the middle four digits (7627). These were used as the first random number, then they were squared (58,171,129) to create the next number in the sequence (1711), and so on.

Here's a program to create von Neumann numbers on your computer. When it starts, enter any four-digit number. It will run for a while, then stop, expecting a new input. You can stop the program at any time by entering a number which is less than 1000. If you have a Sinclair computer (ZX81, Spectrum or QL), substitute the material given after the REM in line 80 for line 70. Non-Sinclair owners should simply ignore line 80:

```
10 REM Von Neumann Numbers
20 REM Enter number below 1000 to end
30 CLS
40 PRINT:INPUT "Enter number ";A
50 IF A<999 THEN END
60 B$=STR$(A*A)
70 A=VAL(MID$(B$,4,4))
80 REM Sinclair computers:
      LET A=VAL(B$(3 TO 6))
90 PRINT A;
100 IF A>999 THEN 60
110 GOTO 40
```

As you'll soon discover, this doesn't produce the world's most satisfactory random numbers. In many cases, the numbers start to repeat fairly quickly.

Now most random number generators inside microcomputers use a formula along the lines of:

SEED = (ANUMBER * SEE + ANOTHER-NUMBER) MOD YETANOTHERNUMBER

SEE is then fed back into the formula for the next run through. As you probably know, modular division returns the remainder of a division (so 10 MOD 3 is 1), and not all computers include MOD in their vocabulary. However, it's a pretty simple operation to simulate. Here's a simple program to generate random numbers, which uses an approach similar to the one which probably occurs deep in your computer's electronic gizzards:

```
10 REM Modular Seeds
20 CLS
30 INPUT "First big number ";A
40 INPUT "Second big one ";B
50 INPUT "Now a little number ";C
60 INPUT "And now the seed ";SEED
70 SEED=((A*SEED+B)/C)-INT((A*SEED+B)/C)
80 PRINT SEED
90 GOTO 70
```

The first two numbers (A and B) should be pretty big, and the next two (C and SEED) should be relatively small. For a run which continues for a long, long time without repeating, try 1,478,392 for A, 5,228,791 for B, 778 for C and 459 for SEED.

How random are the numbers produced by your computer's generator?

It's pretty easy to find out how random the numbers are by writing a program which not only generates the numbers, but also works out their distribution. You'll notice in the next program, which does this, that line 30 is RANDOMIZE. This works differently on various computers, but is designed to ensure the random number generator starts its inner sequence of numbers at an unpredictable point. You may be asked to enter a 'seed' when you use RANDOMIZE — just glance at your watch, and enter the number of seconds past the minute currently showing.

Random Numbers

There may be times, say when creating computer simulations, when you want skewed random numbers (numbers which are biased in some way), rather than numbers which are evenly distributed across the range. This is fairly easy to do.

```
10 REM Distribution of Numbers
20 CLS
30 RANDOMIZE
40 DIM A(10)
50 FOR J=1 TO 1000
60 B=INT(RND(1)*10+1)
70 A(B)=A(B)+1
80 NEXT J
90 FOR J=1 TO 10
100 LPRINT J;" > ";A(J)/10;"%"
110 NEXT J
```

As you can see, this program stores the frequency with which the numbers are generated in an array, then lines 90 through to 110 print out the frequency as a percentage of the whole run. (My version uses LPRINT in line 100 to print out the results to the printer. By all means change this to PRINT if you only want the output on the screen.)

I ran the program 20 times, and took an average of the results. If the random number in my IBM PC was perfect, and I ran the program for an infinite time, each number from one to 10 in my sample would occur exactly 10 per cent of the time. As you can see, even with a relatively small sample, the output is pretty close to this ideal distribution:

```
1  >  10.08 %
2  >  10.035 %
3  >  10.245 %
4  >  10.12 %
5  >  9.845 %
6  >  9.805 %
7  >  9.97 %
8  >  9.859999 %
9  >  9.984999 %
10  >  10.055 %
```

Try it on your computer, and see how the results compare with mine.

Skew-Whiff

Now there may be times, say when creating computer simulations, when you want skewed random numbers (numbers which are biased in some way), rather than numbers which are evenly distributed across the range. This is fairly easy to do. If you want, for example, the lower numbers to appear more often than the higher ones, all you have to do is change line 60 of the above program to:

```
60 B=INT(RND(1)*RND(1)*10+1)
```

I did this, ran the program five times and again averaged the results. This is what I got:

```
1  >  33.1 %
2  >  18.68 %
3  >  14.68 %
4  >  10.06 %
5  >  7.26 %
6  >  6.04 %
7  >  4.7 %
8  >  3.1 %
9  >  1.6 %
10  >  .78 %
```

How does this work? Simply by the fact that RND(1) produces a number between zero and one, and multiplying any such number with another similar one produces numbers which tend to be lower.

I couldn't think of an elegant method for biasing them upwards (and I'd love to hear from you if you have any such method — write to me care of *Your Computer*), so I finally settled on:

```
55 D=RND(1)+RND(1):IF D>1 THEN 55
60 B=INT(D*10+1)
```

I ran five trials of this (again with 1000 numbers being generated each trial), with the following results:

```
1  >  1.08 %
2  >  3.22 %
3  >  4.88 %
4  >  6.96 %
5  >  8.58 %
6  >  10.52 %
7  >  12.56 %
8  >  15 %
9  >  18.14 %
10  >  19.06 %
```

This certainly seems to have skewed them the right way, although I think my way of doing it is a little brutal, and definitely disturbs the sequence of numbers produced by the random number generator, causing it to reject a number from time to time.

There are a few other interesting random number routines I'd like to share with you this month. If you need a set of random numbers, in which the same number doesn't recur, you can use a routine like

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this one, which produces the numbers one to 10 in a random order, with none of the numbers repeated:

```
10 REM Non-Repeating
20 RANDOMIZE
30 CLS
40 DIM A(10)
50 FOR C=1 TO 10
60 B=INT(RND(1)*10+1)
70 IF A(B)<>0 THEN 60
80 A(B)=B:PRINT C;">";B
90 NEXT C
```

The Monte Carlo Approach

John von Neumann, who invented the 'pick a four-figure number, then square it' method of generating random numbers, also developed a rather neat way of working out areas enclosed by an irregular border, based on random numbers. His method is called the 'Monte Carlo Method'. I'll try to explain how it works.

If you had a map of an area containing a single continent and you dropped darts on the map randomly, then counted how many darts fell within the continent on the map and how many fell outside it, the area of the continent would be proportional to the number of darts which fell within it compared to those which fell outside it. By knowing the area covered by the whole map, it would be simple to work out an approximation of the area of the continent.

We can use such a method to work out an approximation of PI. Imagine a square with a circle drawn inside it which just touches the sides. Divide the square and circle mentally into four and throw away three-quarters of the square, and keep the remaining quarter, which contains a quarter circle.

Now imagine dropping darts on the square in such a way that they have an equal chance of falling anywhere within it. Some would land within the quarter circle, and some would land outside it. If the darts were dropped in a perfectly random manner, the ratio between those which fell within the quarter circle to those which fell outside it would be PI divided by four. This program 'drops the darts' for you:

```
10 REM Monte Carlo PI
20 CLS
30 RANDOMIZE
40 A=0:B=0
50 GOSUB 120
60 B=B+D
70 A=A+1
80 P=4*B/A
90 PRINT A;ABS(3.141593-P);TAB(23);P
100 IF 500*(INT(A/500))=A THEN LPRINT A;
ABS(3.141593-P);TAB(23);P
110 GOTO 50
120 D=0
130 M=RND(1)
140 Z=RND(1)
150 IF M*M+Z*Z<1 THEN D=1
160 RETURN
```

You can see in line 90 that I've used 3.141593 as an approximation of PI, to check the accuracy of the value of PI produced by the program. If your computer has a PI value wired in, substitute it for my 3.141593. The program prints out the number of darts you've dropped (A), the difference between 3.141593 and the number you're calculating as an approximation of PI ()3.141593-P) and, finally, 'your' version of PI (P) in line 90.

After dropping 500 darts the first time I ran the program, I got a value of 3.088 for PI — an error of around .0536, which isn't too bad. However, I didn't think it was good enough, so I ran the program again, dropping 26,000 darts (patience required here), and the output from line 100 toward the end of that run was as follows:

```
22000   6.320238E-03    3.135273
22500   4.526377E-03    3.137067
23000   5.940914E-03    3.135652
23500   7.124901E-03    3.134468
24000   4.259587E-03    3.137334
24500   8.368492E-03    3.133225
25000   8.152962E-03    3.13344
25500   6.847859E-03    3.134745
26000   6.977558E-03    3.134616
```

It's very interesting to watch as the program homes in on the value of PI.

I modified line 100 so it would only print out after every 5000 darts, and left the computer to get on with the job. Five and a half hours (and one hot PC) later, I'd dropped half a million darts to get a value of 3.143612 for PI:

```
470000   2.160072E-03   3.143753
475000   2.768994E-03   3.144362
480000   2.840281E-03   3.144433
485000   3.033877E-03   3.144627
490000   2.309084E-03   3.143902
495000   2.390862E-03   3.143984
500000   2.310991E-03   3.143904
```

Earlier in the run, the value was even closer:

```
295000   4.720688E-05   3.141546
300000   1.664162E-04   3.141427
305000   2.946854E-04   3.141298
310000   1.606941E-04   3.141432
315000   7.05719E-05    3.141664
320000   8.058548E-05   3.141513
```

The Heat is On

I doubt dropping more than half a million darts would produce a better result. But, if you want to melt your computer to prove me wrong, please do so and send the results to me care of the magazine. I'd also be interested in any other discoveries you've made concerning random numbers.

And when you're generating all those numbers, don't forget the royalties to Li Ran Dum. □

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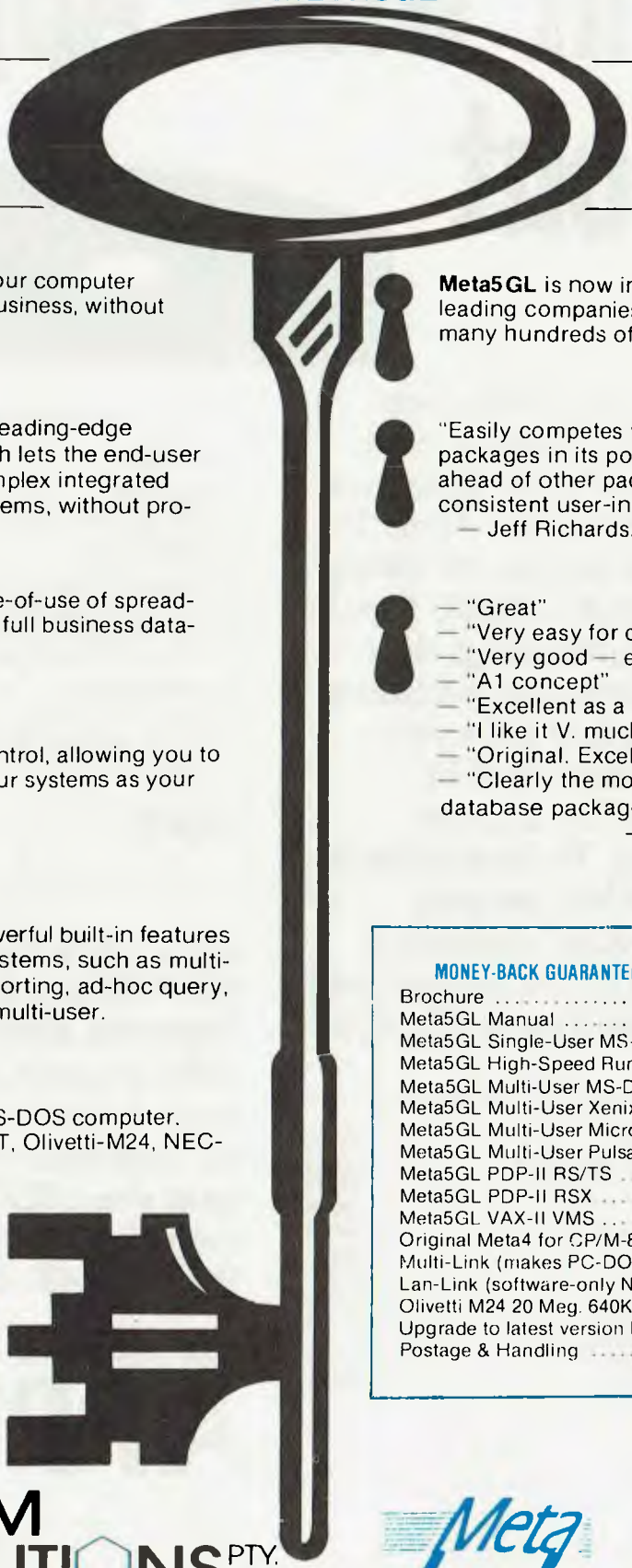

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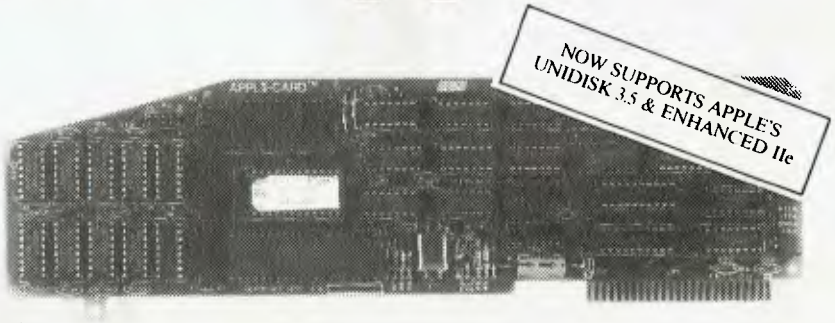

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C Programmers

M80SYM.C

This program extracts the symbol table from a Macro-80 assembler listing file, and converts it into a file for use by the Hi-Tech interactive symbolic debugger, DEBUG.

The Macro-80 listing file prints the symbol table in four columns of label and value at the end of the listing. DEBUG requires a symbol table that is a single column of value followed by label with no additional text.

DEBUG is supplied with the Hi-Tech C Compiler, and my program is written in Hi-Tech C. The only non-standard feature is the 'void' keyword, which tells the compiler which named functions do not return a value. Compilers without strict type-checking don't need this keyword and the line can be omitted.

Once the symbol table file is produced, all the facilities of the debugger are available for compiled Macro-80 programs except the stack backtrace. Note that upper and lower case are relevant for symbols and commands.

The logic of the program is as follows:

1. Scan the input file until the word 'Symbols:' is found. This marks the start of the Macro-80 symbol table.
2. Continue scanning until an ASCII character is found and start loading characters into temporary string storage until a TAB character is found.
3. If there are less than nine string ASCII characters up to the TAB, print the next four characters as the address, a space, then the string and, lastly, a new line.
4. If the string is nine characters or greater, assume the characters are text (heading or title line) and scan the file, ignoring all characters, until the next carriage-return.
5. Repeat from step 2.

This process has proved reliable, but it could be upset by a heading or title line that has a TAB character. Such headings and titles should be avoided.

```
/*************************************************************************/
/*                              m80sym.c                                 */
/*                                                                       */
/*            Program to convert MACRO-80 listing                        */
/*          files to HITECH DEBUG symbol table format.                   */
/*                                                                       */
/*   by Jeff Richards, 25 Bowline Street, Jamboree Heights, QLD 4074     */
/*                                                                       */
/*************************************************************************/

#include        <stdio.h>
#define VERSION "1.0"
#define VDATE   "7 Jan 85"
#define TAB     0x09
#define CR      0x0d
#define LF      0x0a
#define FF      0x0c
#define SPACE   0x20
#define CPM_EOF 0x1a            /* cp/m end of file mark                */
#define ERROR   -1
#define TRUE    1
#define FALSE   0
#define NULL    0
#define LINE    132             /* number of char in biggest line       */

static int inpfp, outfp;

main(argc,argv)
int argc; char *argv[];
{
        int c, nptr = 0, aptr = 0, sptr = 0, nameflag;
        char *str = "Symbols:", name[LINE];
        void putout(), usage(), help(), error();

        switch (argc)
        {
                case 1:
                        usage();
                        exit(0);
                case 2:
                        if ( (!strcmp(argv[1],"?")) ||
                             (cmdcmp(argv[1],"[HELP]")) ||
                             (cmdcmp(argv[1],"[help]")) )
                                help();
                        else
                        {
                            usage();
                            error("Not enough arguments on command line.");
                            exit(0);
                        }
                case 3:
                        break;
                default:
                        usage();
                        error("Too many arguments on command line.");
                        exit(0);
        }

        if (strcmp(argv[1],argv[2])==0)
        [
                printf("Input and output filenames must differ.");
```

C Programmers

The same job can be done for RMAC symbol table files, but in this case the program is trivial. Simply replace the working section of this program with a few lines to convert each TAB into a new line.

Jeff Richards,
Jamboree Heights, Qld

```
                printf("  Exiting...\007\n");
                exit(0);
        }

        if (!(inpfp= fopen(argv[1],"rb")))
        {
                printf("Can't open '%s' for input.\n",argv[1]);
                exit(0);
        }

        if (!(outfp=fopen(argv[2],"wb")))
        {
                printf("Can't open '%s' for output.\n",argv[2]);
                printf("(The disk directory is probably full.)\n");
                exit(0);
        }

/*************************************************************************/
/*                              main loop                                */
/*************************************************************************/

        printf("processing... ");
        while ((c=getc(inpfp))!=ERROR && c!=CPM_EOF && sptr!=8)
                {
                if (c == str[sptr]) sptr++;
                else sptr = 1;
                }
        nameflag = FALSE;
        while ((c=getc(inpfp))!=ERROR && c!=CPM_EOF)
        {
        if (nameflag == FALSE           /* search for 1st alpha   */
                && c != LF  && c != CR && c != FF
                && c != TAB && c != SPACE)
                nameflag = TRUE;
        if (nameflag)                   /* label extends to tab   */
                {
                if (c != TAB) name[nptr++] = c;
                else
                if (nptr < 9)           /* if label not too long  */
                        {
                        while ((c=getc(inpfp)) != ERROR
                                && c != CPM_EOF
                                && aptr++ != 4) putc(c,outfp);
                        name[nptr] = NULL;   /* terminate label */
                        putc(SPACE,outfp);   /* put a space     */
                        putout(name);        /* put the label   */
                        putc(CR,outfp);
                        putc(LF,outfp);      /* put CR/LF       */
                        nameflag = FALSE;
                        nptr = aptr = 0;
                        }
                else                    /* move to end of line  */
                        {
                        nameflag = FALSE;
                        nptr = aptr = 0;
                        while ((c=getc(inpfp)) != ERROR
                                && c != CPM_EOF && c != CR) ;
                        }
                }
        }
        putc(CPM_EOF,outfp);
```

C Programmers

```
        fclose(inpfp);
        fclose(outfp);
        printf("done.\n");
}

/*************************************************************************/
/*                      string output routine                            */
/*************************************************************************/
putout(s)
char *s;
{
        while (*s) putc(*s++,outfp);
}

/*************************************************************************/
/*                      short usage prompt routine                       */
/*************************************************************************/

usage()
{
        printf("m80sym version %s %s\n\n",VERSION,VDATE);
        printf("usage: m80sym M-80_print_file_name DEBUG_symbol_file_name\n");
        printf("e.g. m80sym prog.prn l.sym\n");
        printf(" or: m80sym (? | [help] | [HELP]) for help.\n");
        printf("Converts MACRO-80 listing files to ");
        printf("HITECH DEBUG symbol table format.\n");
}

/*************************************************************************/
/*                      error print routine                              */
/*************************************************************************/

error(s)
char *s;
{
```


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C Programmers

```
        printf("\007Error: %s\n",s);
}

/*************************************************************************/
/*                    on-line program help routine                       */
/*************************************************************************/

help()
{
printf("\nm80sym is a program to transform the assembler listing\n");
printf("file produced by the Microsoft MACRO-80 assembler into a\n");
printf("format suitable for use with the HITECH interactive symbolic\n")
printf("debugger DEBUG.COM.\n\n");
printf("The transformation consists of altering the four\n");
printf("columns of symbols at the end of the listing to the single\n");
printf("column required by DEBUG. This is done by reading the file\n");
printf("until the string \042Symbols:\042, and then extracting each\n");
printf("set of labels and references, reversing them, and writing\n");
printf("them out on one line.\n");
printf("The default filename for the M-80 listing file is\n");
printf("filename.PRN and for the DEBUG symbol file is L.SYM\n\n");
printf("usage:\tm80sym M-80_listing_file_name DEBUG_symbol_file_name\n");
```


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C Programmers

```
printf("e.g.\tm80sym prog.prn l.sym\n");
printf("\tm80sym ?          or\n");
printf("\tm80sym [help]     will produce this help message.\n");
exit(0);

}


/*************************************************************************/
/*                        test input commands                            */
/*************************************************************************/

cmdcmp(s,p)
char *s, *p;
[
        while(*p)
                if(*s++ != *p++) return(FALSE);
        return(TRUE);
}
```


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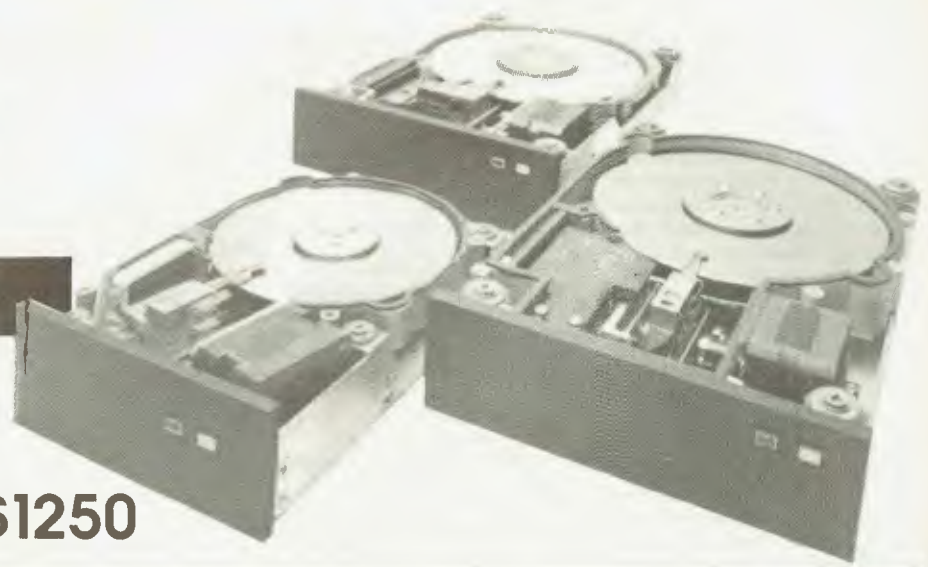

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Bondwell-14

PROGRAM PIXELS

Most Bondwell-14 owners probably don't think too highly of the machine's graphics capability. Certainly, 160 by 75 pixels isn't high resolution, but it's all we've got.

Presented here is a program written in Pascal (Turbo Version 2), which draws a simple mathematical curve. Its important features are the procedures 'pset' and 'preset', which turn individual pixels on and off. The function point returns a true or false value, indicating the state of individual pixels.

The Bondwell has 64 characters which make up every possible arrangement of pixels within a single character space. Each character space is made up of a two-by-three matrix and requires 2 ^ 6 (64) characters to cover all possible combinations.

Figure 1 shows how a character is assigned to display the required pixels. It's only necessary to add the 'xor BFh' step when the pixel in the bottom left is to be enabled. This step is required because the first 32 characters from '00h' to '1Fh' work well, while the second 32 characters (with the bottom left pixel on) are allocated the codes '80' to '9F', and are the reverse order to what you would expect.

The result provides a means of swapping the current screen character with another one to simulate individual control of each pixel. In a roughly timed test I found it possible to set about 350 pixels a second. I think machine code would be necessary to animate a picture requiring more than 50 pixels to be tested and changed. It wouldn't be hard to convert these routines to machine code.

Wilfred Kazoks,
Corinda, Qld

```
program pixels;

{This program draws a geometric picture on the screen of a bondwell-14.
 It contains procedures to set (turn on) and reset (turn off) pixels.
 It also contains a boolean function to test the status of a pixel.
 The function 'mask(x,y)' is a support function for the above procedures.
}

const
  screenaddr = $F800;       {Top left corner of screen RAM}
  columns = 80;
  rows = 25;
  hpixels = 2;              {Number of horizontal pixels in a char position}
  vpixels = 3;              {Number of vertical pixels in a char position}

var
  I,R :real;

function mask (x,y :byte) :byte;

{This function computes the mask required to add a pixel to the current
 screen character.
}

begin
  x := x xor 1;
  mask := 1 shl (x + y * hpixels);
end;

function point (x,y :byte) :boolean;

{ point(x,y) returns true if the pixel at (x,y) is on, and false otherwise.
  Pixel (0,0) is at the top left corner of the screen. Pixel (159,74) is the
  bottom right hand corner of the screen.
}
var
  charpos :integer;
  oldchar :byte;

begin {point}
  point := false;
  if (x >= 0) and (x <= 159) and (y >= 0) and (y <= 74) then
  begin {onscreen}
  charpos := screenaddr + (x div hpixels) + (y div vpixels) *columns;
  oldchar := mem[charpos];
  if (oldchar <= $1f) or ((oldchar >= $80) and (oldchar <= $9F)) then
    begin {graphics char}
    if oldchar >= $80 then
      oldchar := oldchar xor $BF;
    if oldchar and mask(x mod hpixels, y mod vpixels) <> 0 then
      point := true;
    end; {graphics char}
  end; {onscreen}
end; {point}

procedure pset (x,y :byte);

{ pset(x,) turns a pixel at co-ordinates (x,y) on.
  Pixel (0,0) is at the top left corner of the screen. Pixel (159,74) is the
  bottom right hand corner of the screen.
}
var
  charpos :integer;
  oldchar,newchar :byte;

begin {pset}
if (x >= 0) and (x <= 159) and (y >= 0) and (y <= 74) then
  begin {onscreen}
  charpos := screenaddr + (x div hpixels) + (y div vpixels) * columns;
  oldchar := mem[charpos];
```

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Con/ST/58

Bondwell-14

Continued from page 72.

```
  if (oldchar > $1F) and (oldchar < $80) or (oldchar > $9F) then
    oldchar := $0
  else if oldchar >= $80 then
    oldchar := oldchar xor $BF;
  newchar := oldchar or mask( x mod hpixels, y mod vpixels);
  if newchar > $1F then
    newchar := newchar xor $BF;
  mem[charpos] := newchar;
  end; {onscreen}
end; {pset}

procedure preset (x,y :byte);

{ preset(x,y) turns the pixel at (x,y) off.
  Pixel (0,0) is at the top left hand corner of the screen, pixel (159,74)
  is at the bottom right hand corner of the screen.
}
var
  charpos :integer;
  oldchar, newchar :byte;

begin {preset}
if (x >= 0) and (x <= 159) and (y >= 0) and (y <= 74) then
  begin {onscreen}
  charpos := screenaddr + (x div 2) + (y div 3) * columns;
  oldchar := mem[charpos];
  if (oldchar <= $1F) or (oldchar >= $80) and (oldchar <= $9F) then
    begin {graphics char}
    if oldchar >= $80 then
       oldchar := oldchar xor $BF;
    newchar := oldchar and (mask( x mod hpixels, y mod vpixels) xor $FF);
    if newchar > $1F then
      newchar := newchar xor $BF;
    mem[charpos] := newchar;
    end; {graphics char}
  end; {onscreen}
end; {preset}

begin
clrscr;
i := 0;
repeat
  i := i + 0.01;
  r := i*cos(i)*sin(i); {change this equation for different patterns}
  pset(round(80.0+7.0*r*cos(i)), round(35.0+3.0*r*sin(i)));
  until i>=70;
end.
```

```
+-------+                    '*' = on, '-' = off,
| 1 | 0 |
+---+---+       **
| 3 | 2 |       ..
+---+---+       *.    This character has a value given by
| 5 | 4 |             (2^0 + 2^1 + 2^5) xor BFh = 9Ch
+-------+
```

Figure 1

Reviews

The Latest Word in Mousing Around 76

Mouseword is, obviously, a word processor operating under rodent control. But it's not for the Mac. It's intended for use with Apple IIcs and IIes, and comes from France (feed only imported Brie), one of Apple's largest markets. A couple of functions (such as cursor control) may have lost a little in the translation, but, on the whole, Mike McCarthy found this a very useful mouseful.

CP/M in Your Lap 80

Here's one for the non-believers — a NEW CP/M machine. NEC's PC-8401 is a laptop, with a practical bundle of the soft stuff in ROM. Outstanding built-in communications capabilities make the baby NEC a desirable companion for anyone computing on the run.

Q-Pro-4 82

The database package which, according to its US advertising, blows dBase II away. Does it? Yes, our reviewer says, but warns that it can be hard to adjust to if you're a fan of the interactive command style of dBase. While this review didn't make it in time for last month's Great Database Search finale, the package did prove itself worthy of consideration in the judging.

Playing at Management 88

How do you manage? Are you just managing? Have you never managed anything in your life? Would you like to manage better? Try this little simulation ... You are Chief Executive Officer of a subsidiary of Divide & Devour, your products are Pet-Bots. Well, aren't you going to advertise them?

THE LATEST WORD IN MOUSING AROUND

Say cheese, because according to Mike McCarthy this is one mouse you'll be pleased to have around the house. Mouseword is a word processor which provides the IIc and IIe with versatility and ease of use in text handling.

IN APPLETALK, mouse is an operative word. Nowhere is that truer than with Mouseword. Dedicated to exploiting the inherently simple point-and-click technique conferred by the obliging mouse, this bold new word processor endows your IIc or upgraded IIe with Mac-like versatility and ease of handling.

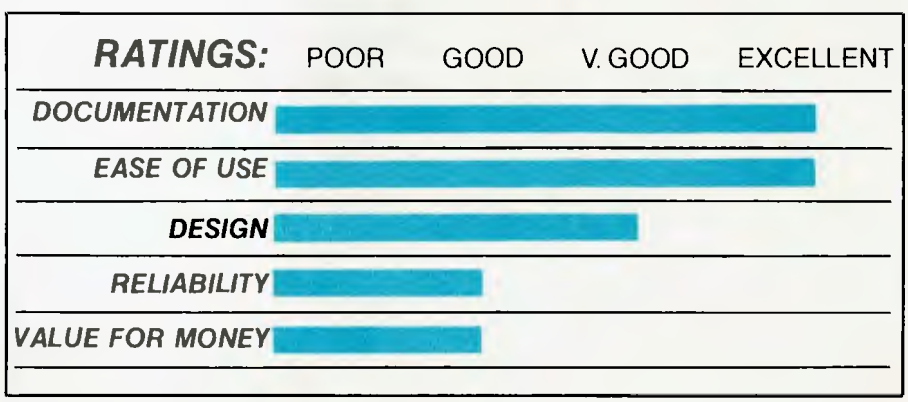
That's important, because while most conventional word processing programs get the word part reasonably right, many leave something to be desired in the processing department. They require you to key this or key that, usually with two or more strokes in concert, for editing, formatting or whatever. It follows that the more powerful a processing program, the more numerous and elaborate its commands. Thus a really comprehensive package can be almost too featured — that's the way with words when everything revolves around keyed commands.

The mouse changes all that, enabling the whole process to be tackled from other angles which, compared with keystroked conventions, are not only different, but also easier to learn and quicker to use.

The first thing you need in order to run Mouseword is a IIc (ideally with a second disk drive), or a IIe upgraded to 128 Kbytes and with a disk drive. The 128 Kbyte memory base is a must because Mouseword accounts for 81 Kbytes, leaving you with 47 Kbytes for any given file. If you're double-spacing your lines the available memory translates to a respectable 30 solid pages (15 single-spaced) before you spill an ongoing document to successive files.

You also need a mouse — either Apple's own or any other suitable species. The roller-balled rodent is what makes Mouseword tick.

With the program loaded you get seven heads across the top of the screen: ?, File, Edit, Format, Print, Display and Communications. Their contents are reached simply my moving the mouse so the related on-screen pointer finds your target; then just click the mouse and before you



can say cheese that particular menu will be displayed.

Ooh-la-la

The cryptic '?', for instance, tells you the prefix of the disk concerned, the name of the file you're working on and the number of characters used and remaining. Besides offering help, it credits Luc Barthalet and Richard Danais with authorship of Mouseword. It doesn't say (but you might be interested to know) the program was written in France, one of Apple's most fertile fields, before being translated in the United States for English speakers' consumption.

As its name implies, File contains your basic operational commands, including New, Open, Insert, Save, Delete and more. Here you begin to appreciate the ingenuity of this program. Ordinarily, commands are given by shifting the pointer to the appropriate instruction on the displayed menu, but with some commands you have the option of using either the mouse or particular keys. You can save, for instance, by 'pointing' to commands on the menu or by pressing 'open-Apple' and 'S' simultaneously. If you're already in the File menu, the mouse is most convenient, but if you want to save while in full flight, the keystrokes are the go.

The comprehensive Print menu holds no surprises. The command for normal printing can be keyed if you wish, but specifics such as multiple copies and the changing of printer options must be moused.

The Edit menu offers four blocks of commands, including 'Undo' which allows you to restore your document to its original form immediately after a cut-and-paste transposition that you found wasn't a good idea anyway. The subtle difference between Cut and Copy is the latter doesn't delete the selected text from its original position in the document. Either way, the selected text is transferred to an off-screen clipboard with a capacity for up to 12,000 characters. Selecting Paste brings a copy of the text to the current cursor (not pointer) position. All Edit's commands can be effected by either the mouse or appointed keys — again, the choice depends on which is easiest or quickest in the circumstances.

There's no choice in how to activate Format functions. Almost 40 commands covering a range of formatting requirements likely to be needed for normal documents are selectable by mouse alone. The lack of italics is a glaring omission. The only Format commands not under mouse control are for Superscript and Subscript, which must be keyed in. Standard formatting values relating to margins, spacing, single-sheet printing and the like are held in a default table which you can easily alter when necessary.

The comprehensive Print menu holds no surprises. The command for normal printing can be keyed if you wish, but commands for specifying things such as multiple copies and the changing of printer options must be moused. Similarly, in Display you can key Normal, but you must mouse either the from-page or from-cursor option.

Text is 'Displayed' as it will appear when printed, showing margins, paragraphs, indentations and such. It also shows underlined portions in inverse, but doesn't identify bold or otherwise different characters. ▶

THE COMPREHENSIVE PRINT MENU HOLDS NO SURPRISES...

PRODUCT DETAILS

Distributor:	International Solutions, 64 Shepherd Street, Chippendale 2007; (02) 319 1488.
Price:	$199 (plus tax)
Best points:	Ease of use.
Worst points:	Sometimes the cursor seems to have a mind of its own, darting up to the top of the page for no apparent reason.

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DEALER ENQUIRIES WELCOME

MOUSEWORD

MOUSEWORD ISN'T BLINDINGLY FAST...

As the text scrolls forward you can stop and go with the space bar as usual, and can return from Display mode to edit any point via the Escape key.

Many of Mouseword's features, such as the fact that the cursor can be moved anywhere around the text or screen with the mouse pointer, are self-explanatory, or become so with relatively little use. You can, for example, scroll back and forwards through long documents using the mouse pointer to run an elevator up or down the side of the screen.

To complement Mouseword's learn-as-you-go process, the manufacturer (Version Soft) provides an excellent 180-page, ring-bound manual. This documentation is not only nicely presented, but equally well organised and well written.

Though it executes most commands quite briskly, Mouseword isn't blindingly fast. It sometimes needs a moment or three to take action — for example, when you're scrolling back and forth. It also has the habit, disconcerting until familiar, of occasionally pausing when saving very long slabs of text.

Few Bugs

My efforts to review this program weren't entirely without incident. Twice in the first two weeks' use the program froze in mid-step for no discernible reason. Basically, this meant the lights were on, but there was nobody home. Normality could be restored only by reloading the program, which meant losing all text back to the last saving. That bug was eradicated by having the 1.0 program disk upgraded to the now standard 1.05 version, which has performed faultlessly for the several weeks since.

Even if the processes outlined above were all Mouseword is capable of, it would be an impressively handy and effective tool, and attractive value at below $300. But there's more. Mouseword goes far beyond being just a complete, easy-to-use word processor. Its icing includes an integrated communications system, which provides a no-hassle means of sending and receiving messages, documents or whatever via your phone line and a compatible modem. There's a terminal mode, too, which enables your screen displays to appear on receptive computers elsewhere, and vice versa. These two features alone distinguish Mouseword from its peers. For good measure it includes a calculator (not just for common garden arithmetic, but capable of complex mathematics as well), and a glossary system (for filing repetitive phrases and sentences, or commonly misspelt words).

Mouseword also allows mail merging, bringing together your standard letter or circular with name-and-address lists created in Mouseword or from outside ProDOS-based sources, such as the Appleworks database. Taken a step further, that facility also means Mouseword can be linked with databases such as Quickfile and spreadsheets such as Multiplan, once they've been converted from DOS 3.3 system to ProDOS.

While Mouseword is a stand-alone word processor, it can also fit right in with many other programs. Among these are Mouse Budget, Mousecalc and Mousedesk, three separate but interactive members of this remarkably versatile French family — all the more reason to have a mouse in the house and Mouseword in your Apple. □

DATABASE NETWORK
TELEPHONE: (03) 523 9399

NEC's PC-8401

CP/M In Your Lap

John Hepworth, known for being something of an MS-DOS fiend, declares NEC's new CP/M machine a winner.

WHO SAID CP/M is dead? Laptops running MS-DOS or their own operating systems have been available in droves, but at last a truly portable computer running CP/M 2.2 with a suite of useful programs in ROM has arrived, at a reasonable price. NEC's first laptop with LCD screen was the PC-8201; now the PC-8401, which features a hinged 16-line by 80-character screen, has been added to the company's range. Four programs are provided in ROM: Wordstar-To-Go, Calc-To-Go, Telcom (communications) and Personal Filer (a simple database). BASIC is not included.

CP/M 2.2 is also in ROM!, with all the standard CP/M functions — STAT, PIP, ERASE, FORMAT and so on — most of which can be called up from function keys or typed in at the CP/M prompt.

The Vital Statistics

The PC-8401 is roughly the size of an A4 desk diary. The screen adjusts to suit the viewing comfort of the user, and closes over the keys to protect both screen and keys while in transit. The contrast of the screen is typical of most large LCDs — adequate in good light, but weak in poor light.

The keyboard has a fairly standard layout, with five function keys across the top (which can be used with the shift key to give the effect of 10), and a cursor pad in the top right corner. Touch-typing is simple and easy.

The hatch for the batteries is at the top of the keyboard, next to the screen hinge. Four C cells are required. Conventional carbon zinc batteries can be used, but most users will find alkaline (Duracell or Energizer) batteries more economical. Rechargeable dry batteries can also be used, but can't be charged in the PC-8401 — an external charger is required.

Connectors for cassette, parallel printer, serial port and DC input socket, as well as a knockout for the modem, are on the rear panel. NEC had intended to release the PC-8401 in Australia with an internal 300-baud modem (the American version has one), but the company has to wait for Telecom approval before it can be included.

The on/off switch and the contrast control knob for the screen are on the right edge panel, while the expansion socket is on the left-hand panel behind a spring-loaded door. Either a RAM expansion unit or the disk drive/CRT adaptor can be plugged into this, allowing the PC-8401 to drive either mono or RGB monitors in 80-line by 25-character mode with VT100 or SOROC terminal emulation.

Disk Drive

A cable joins the adaptor to the optional 9 cm disk drive, a unit only slightly larger than the computer. The box has room for a second drive, which is very easy to install — you just clip off the front cover of the disk drive unit and slide the second drive into the pocket. A plug on the rear of the drive mates directly (and automatically) with the socket at the rear of the pocket, and two screws attach the drive — all in less than a minute!

The disk drives are almost whisper quiet — even in an empty room I had to check the disk access light to be sure they were operating. They're a little slow — copying a file from one disk to another took 14 times as long as a similar copy on an IBM PC.

Memory

Memory size is 90 Kbytes of ROM and 64 Kbytes of RAM. The RAM is divided into two 32 Kbyte banks. If the optional disk drive is *not* attached, one bank of 32 Kbytes is used as a RAM disk. Battery backup is provided to maintain the files while the main power is off. If the disk drive is attached, all 64 Kbytes can be used by the machine for processing.

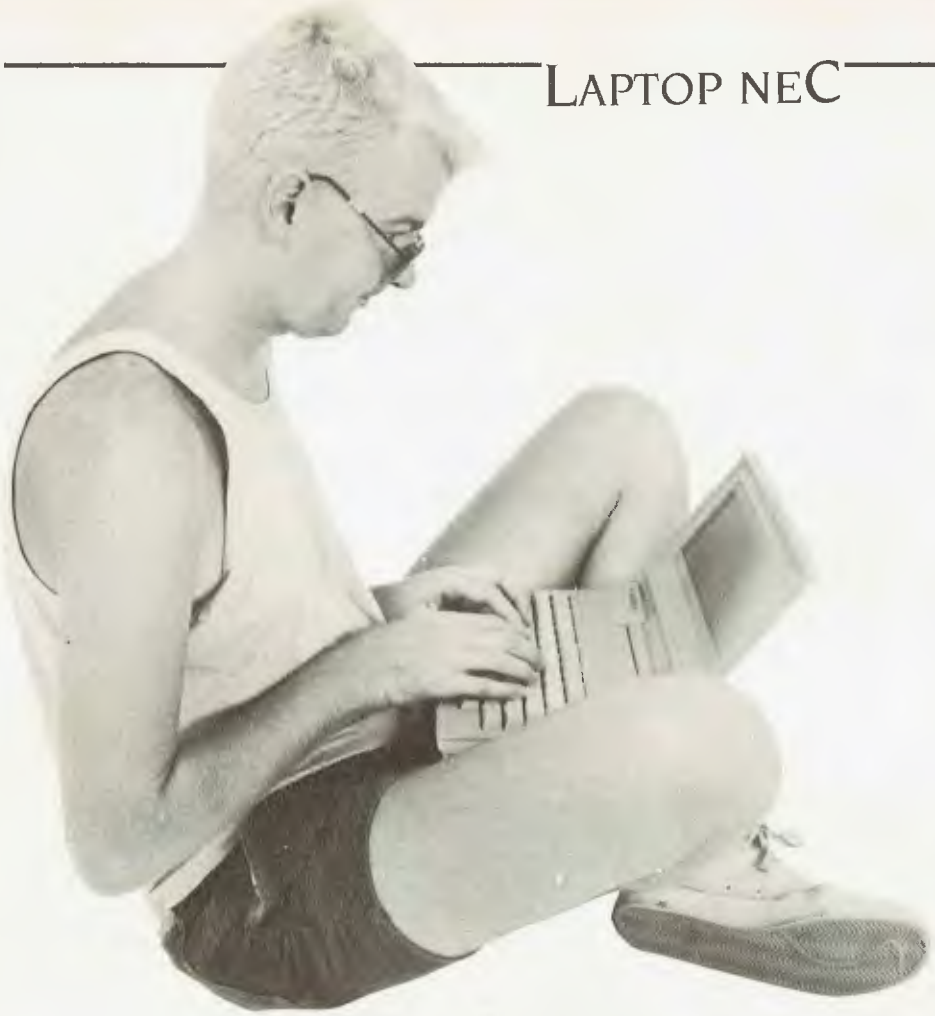
Compatibility

In the past, entry-level laptops didn't offer a true upgrade path as the user's needs grew, and didn't have true software compatibility with the office-style machines used by many users. The NEC solves both upgrade problems.

The word processor in ROM is Wordstar-To-Go, a slightly cut-down version of standard Wordstar. It creates files which can be transferred to any other computer using Wordstar for further processing. Personal Filer is a simple database with quite advanced search and report-generation capabilities. It can, among other things, create mailing labels from a file of names and addresses.

Calc-To-Go is a simple spreadsheet. Any user of Lotus or Multiplan will quickly feel comfortable with it. Calc-To-Go normally saves files in its own format, but can also save them in DIF format, which enables the user to upload the spreadsheets created with the PC-8401 to Visicalc, Lotus 1-2-3, Multiplan, and so on. As always, only the values are transferred — the DIF format (devised by Visicalc) makes no provision for transferring formulae.

It's unfortunate that BASIC isn't pro-



vided in ROM. To run some benchmarks I loaded the Bondwell version of MBASIC-.COM. It ran successfully, though some I/O customisation would be required for optimum performance. Eight out of nine benchmarks (including the Sieve of Eratosthenes) ran as fast as they do on the IBM PC, while the ninth (involving trigonometric and logarithmic functions) took double the time of the IBM. Other CP/M software should also run, though the usual customisation will be needed.

CP/M is also used for cassette I/O at 600 and 1200 baud, and cassette files each include a header with filename (but no directory). Wildcard file transfers to and from tape are possible. At 600 baud, text files created on NEC's older laptop (the PC8201) can also be read.

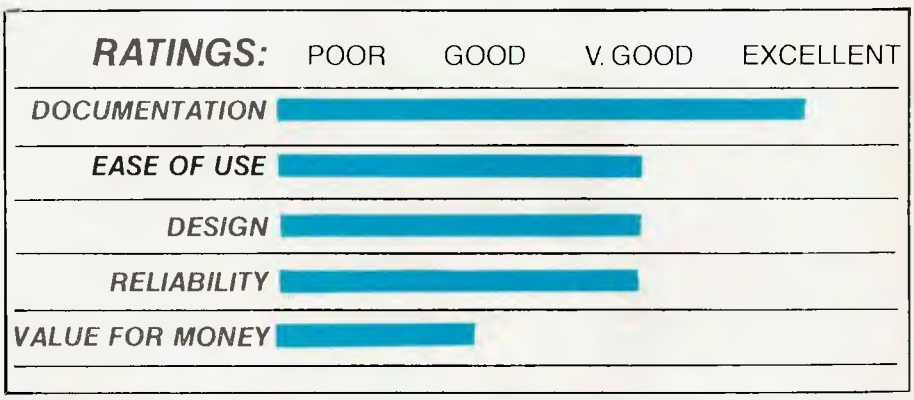
Communications

The PC-8401 provides a superb built-in communications program. Fully menu-driven, it offers baud rates up to 19200, optional Xmodem error correction protocol, optional stripping of Wordstar Hibit while uploading, and so on. The excellent manuals and spiral-bound quick-reference guide detail upload/download procedures for a variety of host machines, including IBM PC, Apple and VAX.

File transfers from an IBM PC to the PC-8401 RAM disk using Xmodem were flawless up to the 9600 baud maximum offered by the PC's software. File transfers to the PC-8401 conventional disk were slowed by its disk speed limitations, and with Xmodem every second block had to be re-sent when running at any speed over 2400 baud, but the error-checking Xmodem protocol again ensured integrity of the transferred file. There was absolutely no problem using it to transfer files to and from bulletin boards.

Overall

Built-in Wordstar-To-Go, Telcom and Xmodem are clearly this machine's strongest points, with Calc-To-Go a close second. The addition of BASIC in ROM would make it the perfect first computer, which could later be either the portable companion to a desktop or expanded with disk drives. While I had the PC-840, I found I was doing most of my writing on it and not on my IBM or my PC8201. This has to be the true indication of how useful such portable machines can be. I really hated giving it back! □



PRODUCT DETAILS

Distributor:	NEC Information Systems, 99 Nicholson Street, St Leonards 2065; (02) 438 3544.	
Prices:	PC-8401B	$1275
	Microfloppy drive	850
	Expansion drive	330
	Disk drive/CRT adaptor	385
Best points:	CP/M Wordstar in ROM, superb communications.	
Worst points:	Low contrast on the screen, no BASIC in ROM, the system as a whole is a bit pricey (the machine itself is well priced).	

IS DATA QPRO 4 ME?

Intriguing advertising from across the Pacific had our database fanciers looking for Qpro-4 some years ago; when it failed to arrive here we gave it up as a failure. That was a long way from the truth, as Matt Whelan discovered when Mitsui launched the package late last year.

ABOUT THE time I started to run into dBase II's limitations, I spotted an intriguing ad in one of the American computer magazines. It came back to haunt me month after month while I struggled to get through a major project in dBase.

"Qpro-4 blows dBase II away," it screamed, at a time when only a few database packages were challenging 'the king'. It listed features which sounded like just what I wanted.

Testimonials from former dBase users were convincing enough to make me start looking around for a local supplier, but there was none to be found. And when two years passed with the product still unsighted on these shores, I assumed Qpro wasn't up to scratch — after all, anything worthwhile would have been grabbed by a local distributor early in the piece.

I'm still not sure why Qpro was bypassed in the rush by local distributors to pick up alternative databases, especially considering the quality of some of the packages they did acquire. Perhaps it was spoken for by one of the several outfits which have visited the American shows with great stories of their grand plans, signed up for local marketing rights and then returned home to discover they didn't have the money or business sense to set up an office, let alone a software distributorship.

If you read the same ads and wondered, you'll be happy to hear Mitsui Computer Systems has taken the product on, and is now giving it the big push it should have had two years ago.

dBase Users Beware

I'm glad it took two years to get here. Had it arrived while I was tackling that big dBase project, I might have been tempted to use it — and found myself out of my depth.

Along with the extra power comes an extra level of difficulty, especially if you're already a dBase user — like Dataflex, it's different enough conceptually from dBase to be a real handful at first. It does what was claimed for it in those early ads, but can also blow dBase II *users* away.

The problem for those familiar with dBase's interactive 'dot prompt' commands is the fact that Qpro, like Dataflex, is a screen-design-based programming language. You can't begin to look at any data without writing a program, as there is no interactive mode.

For example, dBase II newcomers have to learn only two commands to get themselves started: create, and append. In Qpro they need to create the database, decide what key fields they will want to search on, write the data entry program, and run it.

To go further and extract/examine/change the data, our dBase II users need another two commands — list and edit — while the Qpro group has to write another program which will find the information (by the keys previously selected) and present it on the screen.

Easier Done Than Said

Of course, things aren't as bad as they might sound. For starters, our dBase users aren't as well off as it may seem. There are lots of variations on those dBase commands mentioned, with plenty of chances to get the syntax wrong, especially if they're using the dBase manual as their only training aid.

And the Qpro buyers don't have to be first-up programmers, either, because they'll have to go to a lot of trouble to get the package without menu-driven applications and report generators (called Quic-N-Easi AG and RG) which do all the programming work for them.

You can buy Qpro-4 on its own without the generators, but a package which includes the lot is so attractively priced (compared to separate purchase, at least) that only experienced programmers who know exactly what they want to do with Qpro will bother buying it without the others.

While AG and RG will be of limited use in bigger systems, they can be used to automate the early stages of development before switching to Qpro to write the full-scale programs.

Qpro was actually designed as the follow-on package for the applications generators, which are a complete (if limited) database package in themselves. It was named Qpro because it is meant to be the 'pro' version of the Quic-N-Easi products.

Quick And Easy

Generation of a system using AG and RG is quick and easy, but limited — you can work on only one file at a time, and you have no programming language available to you.

The generators write Qpro-style programs, which are then run by the same QNE run-time module used by Qpro-4: thus the package has the ability to run user-written programs, but the user is not given the means to write them.

A session with AG is a straightforward, menu-driven process, though it's not so simple you'd do it without reading the manual. At this level the documentation is adequate to get you going — the first thing it does after covering disk copying and system configuration is walk you through a sample application, developing a 'personal phone directory'.

After starting up (by typing AG at your system prompt) you are presented with a

main menu of the major functions of the system: naming an application, defining menus, building input screens, defining data files, printing documentation, updating the disk files, generating the runtime program, menu, and data files, and running the application. The main menu also has a Help selection, as do most of the AG menus — the assistance provided is basic, but useful.

Defining a menu is simply a matter of giving it a name, entering appropriate headings (two lines), and selecting the Build Menu Lines option. At that stage you are presented with a screen of 10 possible menu selections where you fill in the user prompt, the application screen or program name, whether the application to be run is another menu, an AG program, or an external program (.COM/.CMD), and any parameters to be passed when chaining to the program. You can also define and type in help screens which will be shown when the user hits the help function key.

You can define a single menu, or a series of menus, and AG uses this information to build a main program tying your application together. All the menus will be included in this file, while other screens in your application will become separate programs chained to form the menu system. Individual screen programs can be run directly, or from the menu system if one is created.

Individual programs (application screens in AG terminology) consist of a screen design and a matching set of procedures — you provide the screen design, AG provides the procedures. When you select the Build Application Screens option you can define one or a series of screens. You are presented with a menu which allows you to add, delete or find a particular screen, lay out a screen background, define its fields, assign the meanings of function keys, or edit help screens.

Laying out a screen background is a simple 'paint-the- picture' exercise, where you put prompts, borders, messages and so on where you want them to appear. On any screen which supports basic graphics (IBM-style PCs, of course, but also a reasonable selection of serial terminals) you have function keys which draw graphic borders/boxes and turn highlighting on and off.

Once you have laid out the background you move on to defining fields. In this mode you move around the screen to where you want fields: once you are positioned at the field start you hit any function key to switch to the field definition (size, type, name, validation expression and other parameters) screen. Once the field definition is done, the save key returns you to the screen, where defined fields are marked by the appropriate number of hash characters. In this mode you can see your screen design but can't change it — a real nuisance, as once you start placing fields you invariably find you want to change the prompts or borders. To do that you have to exit to the menu and re-select the screen background layout option.

Along with the extra power comes an extra level of difficulty, especially if you're already a dBase user — like Dataflex, it's different enough conceptually from dBase to be a real handful at first. It does what was claimed for it in those early ads, but can also blow dBase II users away.

Each field has a field descriptor which allows you to force input to upper case, alphabetic, alphabetic and upper case, alphanumeric, alphanumeric and upper case, numeric, integer or digit. Field functions allow you to carry over data from the last record entered ('autoduplicate'), lock the field after entry, add 1 to the field and lock it, and subtract 1 from the field and lock it.

Logical operators allowed in field validation expressions and in the report generator include the usual *and, or, equal, not equal, less than*, and so on, plus extras not usually seen — *not less than, not greater than* and *not less than or equal to*. While this might seem like a bonus, it in fact highlights an omission — the *not* modifier. The only combination you miss out on, thanks to the extra specific operators included, is a *not less than or equal to*.

Selecting the function key definition option does more than simply allow reconfiguration of your machine's keys, as is the case in some packages. You can select definitions from a menu, and AG will write the appropriate piece of code to do the job and place it in the program. Available definitions include positioning in the database (search for a match, next record, previous record, first record and so on), clearing the screen of data, toggling automatic field calculation and automatic key searching, unlocking fields, printing the screen, deleting records, moving to the next form, and providing help.

Once you get into Qpro itself, and can look at the generated program, you discover there is no code to handle the actual data entry. That part of it is inbuilt in the way QNE works — it need know only the field names and positions to obtain data from the operator. However, after each field is entered it is able to chain to a field procedure written by the user

God Save The QNE

There are a number of other 'automated' features of QNE. For example, the function key procedures mentioned above are called automatically when a function key is hit. If you hit F3 at any stage during data entry, QNE will look for *proc key3* in the program file and execute it. If no such procedure exists it will issue an error message, then continue with the program. You can have up to 21 function keys configured in your installation.

At startup, QNE looks for *proc load* and executes the code in it before going on to its automated data entry. Once the save key is pressed, it executes *proc entry*. Execution of *proc error* is also automatic if no other error trapping exists, which means you have the equivalent of an ON ERROR GOTO command.

QNE is the run-time module for both AG and Qpro-4, so it contains a whole lot more than the basics used by AG/RG alone. It contains the most important module of the package, the programming language interpreter.

It contains most commands and features found in other packages, many of the uncommon but useful extras like the ability to run external programs, and several rare gems like an excellent debugging facility and a powerful assembler interface.

Field descriptors are the same as for AG, but field functions include the ability to specify invisible data entry — useful for ▶

INTRODUCING IBM Compatible Hi-Res Monitors from QUBIE

The HR 39 and HR 134 Monochrome Monitors are direct replacements for the IBM Model 5151 Monochrome Display. The HR 39 features a GREEN phosphor screen, while the HR 134 an AMBER screen. Both monitors plug into the IBM Monochrome Display and Printer Adaptor (or compatible) card.

The HR31 200 Colour Monitor is a direct replacement for the IBM Colour Display. It plugs into the IBM Colour/Graphics Adaptor (or compatible) card. The HR31 200 features **0.31mm dot pitch and a black matrix picture tube.** This special tube reduces glare and enhances RGB colour to ensure superb picture quality.

All three monitors include a tilt and swivel base. Use your Qubie' monitor as you would the IBM ; it will in no way affect the normal use or function of your Personal Computer.

Technical Data - HR31 200

CRT Size:	14" Diagonal (34cm)
Tube:	Black Matrix
Sync-H. Scan Frequency:	15.7kHz
V. Scan Frequency:	60Hz
Signal Type:	RGB I: TTL Level Positive Sync H/V: TTL Level Positive
Display Size (H x V):	245mm x 170mm
Retrace Time (H x V):	0.5Ms x 0.4msec
Resolution:	640 x 200 lines
Input Terminals:	9 pin "D" type connector
Dimensions:	11"(H) x 15 (W) x 13"(D) 266(H) x 367(W) x 318(D)mm
Shipping Weight:	15.9kg

Model HR31 200

Models HR 39 & HR 134

(All models Right-hand controls only.)

Technical Data - HR 39 & HR 134

CRT Size:	12" Diagonal (29cm)
Phosphor:	HR 39 (Green); HR 134 (Amber)
Sync-H. Scan Frequency:	18.432kHz
V. Scan Frequency:	50/60Hz
Signal Input:	Video - TTL Level Positive Sync. H - TTL Level Positive Sync. V - TTL Level Negative
Video Response:	20MHz
Display Size (H x V):	203mm x 135mm
Display Time (H x V):	44Ms x 18.99msec
Resolution:	Centre 1,000 lines Corner 800 lines
Display Formats:	9 x 14 matrix, 2000 characters in 80 x 25 format
Input Terminals:	9 pin "D" type connector
Dimensions:	10.5"(H) x 15 (W) x 12"(D) 257(H) x 367(W) x 294(D)mm
Shipping Weight:	11.36kg

All models: 240V AC/50Hz

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password security systems and the entry of sensitive data.

QNE maintains a number of internal registers, and also provides three sets of registers for the programmer's use. These registers are like 'permanent' variables, and are maintained when chaining to different programs. Normal variables exist (they must be defined before use by the *vrbl* statement), but are lost when chaining, while arrays are also provided both in variable and field form. dBase II users eat your hearts out ...

The only pity in all this is that the registers can't be given a more 'memorable' name by the user — they are fixed as #N0 to #N9 (numeric registers), #S0 to #S9 (string registers) and #B0 to #B9 (Boolean registers). The Boolean registers are made 'true' or 'false' by the *set* and *reset* commands; another nuisance is the fact they can't be compared to true or false, but must be tested as set or reset

The internally maintained registers include #P (current printer page number), #L (printer line), #F (current field number), #E (most recent error), and #K (the key used to exit the last field entered).

Literals can be quoted strings, numerics, or control characters — specified by the decimal value preceded by an at (@) sign.

The Programming Language

A quick rundown of some of the commands available in Qpro will give experienced users an idea of just how powerful the system can be:

File-handling commands include backspace, close, copy, erase (kills the file), fcbaddr, fcopy (file copy), filetype, free (deletes a record), fsear (file search, designed for table-style lookup rather than key searching), get, put, key (changes indexes), lretry (sets the retry count on multi-user versions), make/open, posn, rclear, read, write, rename, restart, rlock (record lock), runlock, and secure (flushes the file buffers to disk without closing the file).

Data formatting commands include edit, center, currency, ljust, rjust, size, ucase and unedit. The edit command lets you format a data item using a picture, unedit returns it to its raw state.

Mathematical commands include accuracy, add, calc, div, mathlib/nomathlib (for 8-bit systems only), mul, round and sub. The usual mathematical operators for plus, minus, multiply and divide are there — the add, sub, mul and div commands operate on a field or data item rather than within a mathematical expression.

FB provided me with my first major objection to Qpro: the fact you have to use the inbuilt editor to write or modify your programs, rather than being able to use your favourite word processor.

Control transfer commands are rich with a begin/else/endbegin that can use while, until or if as its modifier, and a for/endfor. Others include call (either a procedure or an indexed entry in a table), chain, goto and return. Broff and bron enable/disable the current *proc break* (another automatically executed procedure, run when the user hits the break key) if it exists. Conditional statements include if and on. On makes use of the Boolean registers (for example, *on* #B0 *reset chain* "BACKUP.QNE".

Screen control commands include cursor (moves it to the specified position), bell, buffer, clear, fill, print, help, home, homeclear, hon (turns highlighting on at the current cursor position) and hoff, lock, next (resumes entry at nominated field), resume (resumes at previously entered field) and unlock.

Data can be moved with the move and concat commands, tsear provides table searching, asear array searching, and dates can be handled with setdate, getdate, jdpack and jdunpack. The operating system interface is covered with host, run, system, lpdetach, formload and noformload (formload sets an internal flag which allows chaining to the Qpro Format Builder — FB — at the end of the current program's execution).

Miscellaneous commands include printscn, instr, trace, notrace, debug, defseg, memend, load, peek, poke and exec.

Build Your Format, FID ...

The two key components of Qpro missing from the basic AG/RG package are FB, the Format Builder, and FID, the File Item Descriptor.

You use FID to set up a file descriptor from which your data files are created, nominating field definitions and index keys.

FB is like an expanded AG, allowing you the same methods for screen definition and so on (but with more power), plus providing the screen editor to write/edit your program 'paragraphs'.

FB provided me with my first major objection to Qpro: the fact you have to use the inbuilt editor to write or modify your programs, rather than being able to use your favourite word processor. The FB editor is paragraph-oriented, so you can't easily scroll through your program, it has no block-read or block-write facility, and is generally more difficult to use than, say, Wordstar for programming.

There are two potential outs if you can't live with this method: a supplied utility enables the conversion of a text file to the Qpro program format, while an optional utility allows splitting a program file into screen and (text) program portions for editing, then re-combining them into a program file. The first method is tedious, and useless in a situation where you develop the application using AG first, because you don't have the basic text file to work from. The second method is okay, but has its own pricetag.

The next drawback is the screen orientation, a factor which also happens to be an advantage in some situations. The basic singular screen-file-program relationship established in AG and continued in FB makes multi-file operation a more daunting task than necessary, yet it also makes the simple jobs very simple indeed.

Other major disadvantages are the documentation and Qpro's complete lack of assistance in the crucial element of relational database design — relating files.

The Qpro manuals are abysmal once you get past the basic self-teaching guides. The information is in there, but is splattered around the book in a haphazard manner — thank goodness it has reasonable indexing. I also get the feeling there's even more power to Qpro than is apparent from the manual, but you would have to experiment for some time with each command to confirm the feeling. A more organised layout and documented examples would do wonders — let's hope Mitsui, which is currently revamping the manuals locally (the new ones should be done by the time you read this), gets it right.

Relating files is a decidedly manual task in Qpro-4, which puts a dent in its claimed ▶

```
1000: * OPEN APPLICATION DATA FILES
****************************** P R O C   L O A D ***********************
1000:      PROC LOAD
1000:      FILL ' '
1000: * #B0 = AUTO-CALC ENABLED FLAG
1000:      RESET #B0
1000: * #B1 = RECORD KEY ENTERED FLAG
1000:      RESET #B1
1000: * #B2 = AUTO-KEY SEARCH ENABLED FLAG
1000:      RESET #B2
1000: * #B3 = ENTERABLE-ONCE FIELDS LOCKED
1000:      RESET #B3
1000: * #B4 = KEYSEARCH FAILED FLAG
1000:      RESET #B4
1000:      OPEN "TEST.DAT" USING "TEST.FID",1 UNLOCKED :1


1010:      CALL CLREC
1010:      ON #B2 SET NEXT NAME
1010:      END
1010: 1:   MAKE "TEST.DAT" USING "TEST.FID",1 UNLOCKED :2
1010:      CALL CLREC
1010:      ON #B2 SET NEXT NAME
1010:      END
1010: 2:   ERROR 'UNABLE TO OPEN OR CREATE DATA FILE'
1010:      FILL ' '
1010: 10:  CHAIN "TEST" :3
1010: 3:   ERROR 'MISSING SYSTEM MENU FILE'
1010:      SYSTEM
1010:      END

1020: * CALCULATE FIELDS AND UPDATE FILE
****************************** P R O C   E N T E R ********************
1020:      PROC ENTER
1020:      CALL CALC
1020:      COPY * TO 1
1020:      WRITE 1 :9999
1020:      RUNLOCK 1
1020:      CALL CLREC
1020:      CALL INCREMENT
1020:      CALL CLEAR
1020:      CALL LOCK
1020:      RESET #B1
1020:      ON #B2 RESET END
1020:      CLEAR *
1020:      NEXT NAME
1030:      END


1040: * ERROR HANDLERS
1040: 9999: ERROR 'DISK IO ERROR'
1040:      END
1040: 9998: ERROR 'END OF FILE'
1040:      END
1040:
****************************** P R O C   E R R O R ********************
1040:      PROC ERROR
1040:      ERROR #S0
1040:      END


1050: * LOCK RECORD
****************************** P R O C   L O C K I T ******************
1050:      PROC LOCKIT
1050:      RLOCK 1 :6
1050:      RETURN
1050: 6:   ERROR 'RECORD IN USE'
1050:      RESUME
1050:      END


1060: * SEARCH FOR KEY DURING DATA ENTRY
****************************** P R O C   K E Y S E A R ****************
1060:      PROC KEYSEAR
1060:      SET #B1
1060:      CALL BUILD
1060:      CALL CLEAR
1060:      POSN 1 TO #S0 :9999
1060:      CALL LOCKIT
1060:      READ 1 :5
1060:      COPY 1 TO *
1060:      ON #B0 SET CALL CALC
1060:      RESET #B4
1060:      RETURN
1060: 5:   POSN 1 TO #S0 RELATIVE :9999
1060:      CALL CLREC


1070:      SET #B4
1070:      RETURN
1070:      END


1080: * CLEAR ALL NON-ENTERABLE, NON-DUP FIELDS
****************************** P R O C   C L E A R ********************
1080:      PROC CLEAR
1080:      RETURN
1080:      END


1090: * LOCK ALL ENTERABLE-ONCE FIELDS
****************************** P R O C   L O C K ***********************
1090:      PROC LOCK
1090:      SET #B3
1090:      RETURN
1090:      END


1100: * INCREMENT (OR DECREMENT) APPROPRIATE FIELDS
****************************** P R O C   I N C R E M E N T *************
1100:      PROC INCREMENT
1100:      RETURN
1100:      END


1110: * BUILD KEY IN #S0
****************************** P R O C   B U I L D *********************
1110:      PROC BUILD
1110:      MOVE '' TO #S0
1110:      MOVE NAME TO #S0[*]
1110:      RETURN
1110:      END


1120: * CALCULATE FIELDS
****************************** P R O C   C A L C ***********************
```

ability to "dramatically reduce development time". As the manual says, programmers are "free to set up the databases in any way, heirarchical, relational ...". I'd prefer to be forced to accept relational organisation, and with it the sort of automated relating of files found in standard-setters like Knowledgeman and Dataflex. In Dataflex, for example, you simply have to nominate the relationship in the file description, and from then the package handles it for you. If you position on a transaction record, it will automatically position the customer file on the matching customer; if you update customer details in a related field, it will automatically update both files. That's the sort of feature you'll use extensively in any system which uses more than one file.

The Good News

There's plenty of good news to balance the bad, much of it in the extensive command set and associated features. A lot more can be found in Qpro's specifications: there is no restriction on number of fields or record size, files can be 8 bytes, and 255 files can be open at the same time.

It works with a number of file formats: multi-key index sequential, random, and several forms of sequential file including those generated by other systems. Applications are fully portable across the wide range of operating systems Qpro runs on — PC- and MS-DOS, PC-Net, all versions of CP/M, MP/M and Concurrent CP/M, TurboDOS, Muse, Mmost, Network OS, Maximos and DNA. Applications can be set up with multi-user record and file locking: the extra commands will be ignored if not implemented under that system.

Also impressive is the automated handling of data entry and the availability of procedures executed immediately the specified field is completed. The use of on-screen graphics is not nearly as noteworthy as its portability — if you have graphics installed it will work right on your machine, if not it will leave those sections of the screen blank.

The automated handling of function

```
1120:      PROC CALC
1120:      RETURN
1120:      END


1130: * CLEAR OUT NEW INDEXED DATA RECORD
****************************** P R O C   C L R E C **********************
1130:      PROC CLREC
1130:      RCLEAR 1
1130:      RETURN
1130:      END


****************************** P R O C   K E Y 0 **********************
1140:      PROC KEY0
1140: * RETURN TO PREVIOUS MENU
1140:      FILL ' '
1140:      CLOSE 1 :10
1140:      GOTO 10
1140:      END

****************************** P R O C   K E Y 1 **********************
1150:      PROC KEY1
1150: * LOCATE DESIRED RECORD
1150:      CALL KEYSEAR
1150:      ON #B4 RESET END
1150:      ERROR 'RECORD NOT FOUND'
1150:      END


****************************** P R O C   K E Y 2 **********************
1160:      PROC KEY2
1160: * DUMP SCREEN TO PRINTER
1160:      ERROR 'MAKE PRINTER READY, THEN PRESS ESCAPE'
1160:      PRINTSCN
1160:      END


****************************** P R O C   K E Y 3 **********************
1170:      PROC KEY3
1170: * READ NEXT RECORD
1170:      CALL LOCKIT
1170:      READ 1 :9998
1170:      CALL CLEAR
1170:      COPY 1 TO *
1170:      ON #B0 SET CALL CALC
1170:      SET #B1
1170:      END


****************************** P R O C   K E Y 4 **********************
1180:      PROC KEY4
1180: * READ PREVIOUS RECORD
1180:      BACKSPACE 1 :9998
1180:      BACKSPACE 1 :9998
1180:      CALL LOCKIT
1180:      READ 1 :9998
1180:      CALL CLEAR
1180:      COPY 1 TO *
1180:      ON #B0 SET CALL CALC
1180:      SET #B1
1180:      END

****************************** P R O C   K E Y 5 **********************
1190:      PROC KEY5
1190: * DELETE A RECORD
1190:      CALL BUILD
1190:      POSN 1 TO #S0
1190:      CALL LOCKIT
1190:      READ 1 :9
1190:      FREE 1 :9999
1190:      RUNLOCK 1
1190:      CALL CLREC
1190:      CALL CLEAR
1190:      RESET #B1
1190:      HOMECLEAR
1190: 9:   ERROR 'RECORD NOT FOUND'
1190:      END


****************************** P R O C   K E Y 6 **********************
1200:      PROC KEY6
1200: * CLEAR THE SCREEN
1200:      RUNLOCK 1
1200:      CALL CLEAR
1200:      CALL CLREC
1200:      RESET #B1
1200:      HOMECLEAR
1200:      END


****************************** P R O C   K E Y 7 **********************
1210:      PROC KEY7
1210: * TOGGLE AUTO/MANUAL CALC
1210:      ON #B0 RESET GOTO 8
1210:      RESET #B0
1210:      END
1210: 8:   SET #B0
1210:      BELL
1210:      CALL CALC
1210:      END


****************************** P R O C   K E Y 8 **********************
1220:      PROC KEY8
1220: * FORCE CALC
1220:      CALL CALC
1220:      END


****************************** P R O C   K E Y 9 **********************
1230:      PROC KEY9
1230: * DISPLAY HELP SCREEN
1230:      ERROR 'NO HELP SCREEN AVAILABLE'
1230:      END


****************************** P R O C   N A M E P ********************
1240:      PROC NAMEP
1240:      ON #B0 SET CALL CALC
1240:      ON #B2 RESET GOTO 1000
1240:      ON #B1 SET GOTO 1000
1240:      CALL KEYSEAR
1240: 1000: * SEARCH DISABLED OR ALREADY DONE
1240:      END
```

keys is excellent, as are features like registers, arrays, array fields and so on.

And Qpro's late arrival in Australia has given it a distinct advantage over other new products — comprehensive support for the package existed the day it was launched. An excellent example is the suite of optional utilities, supplied by third-party vendors, available through Mitsui. These utilities solved most of my criticisms of Qpro as fast as I could come up with them.

The packages include Qsplit and Qcomb which, as mentioned above, separate the screen and program portions of a file so they can be edited with your favourite word processor; Qlint, a syntax checker which will report on program errors, orphaned code, unused variables and so on; Qxref, a nice cross-referencing utility; plus others like a source code librarian, file query utility, and several file packers (they remove spaces, shorten variable names, delete comments and so on to provide faster execution). These options sell for around $70 each.

Qpro's pricing is hefty for the end-user, but quite attractive for the software developer. A single-user package costs $1080, multi-user $1400, and a demo version can be had for $170 (credited against the final purchase). An author's lock-up package, which gives code encryption plus 10 licenced run-times, costs $1430. Additional run-times cost $70 each, or $290 for a pack of 10 — a much more sensible proposition than the ridiculous amounts being asked for run-time versions of many other database packages.

An operating system change costs $145, while upgrade from single-user to multi-user costs $290.

Overall, Qpro-4 is a powerful, feature-laden system. Its complexity and pricing may favour the professional programmer or software developer, but it still has a position in the user marketplace, thanks to AG and RG.

Had its pricing been lower and its handling of multiple and related files better, it could have been a Great Database Search winner. □

PLAYING AT MANAGEMENT

The Strategic Management Game shakes the foundations of Frank Lee's usually calm demeanor when it describes him as financially incompetent. It seems the world of simulated big business is no place for our tame tycoon.

IN THE MID 1970s, business-simulation games were all the rage. The idea was to juggle the selling price of a product, how many units you would make or buy, and how much you would invest in advertising. Using a formula based on fixed and variable costs, and some inspired guesswork about the effect of advertising expenditure on sales, the game would work out your net profit (or loss). There were versions running under Unix on large systems, others designed for minicomputers and, a little later, a rather nice one, complete with graphics and appropriate music, for the Apple II. The Apple program used the scenario of a lemonade stall, and dealt in cents.

In contrast, SMG's game runs with big bickies. Its official home is the IBM PC or Compaq, and it uses either colour or monochrome screens, though it certainly looks best with colour. It runs without any problems on Ron, my tame President PC compatible. Quite simply, this is an outstanding piece of educational software — and I can conscientiously recommend it for use in conjunction with courses on business studies. It is the most flexible and helpful such simulation I have yet encountered — and it's so much fun, it's addictive. Be warned. Besides all that, the folks who programmed it did a great job. The graphics are neat, the menus are well designed and presented, and the textual material is first class. At $390 for the Individual Learning Edition, it's not cheap, but it's excellent value for money.

There is also a Corporate Training Edition (CTE), which enables managers to participate in teams of five members (a maximum of 30 participants) who compete against each other in business management. Most educational bodies would prefer the CTE because of its suitability for classroom use. Both games were developed by staff at the Wharton School of Business in the United States. The aim is to provide a basis for developing management skills in conjunction with an organised training program. The CTE version may be licensed to organisations for in-house use, while the Individual Learning Edition (ILE) is purchased on a one-off basis.

The CTE simulates a variety of business-related environments, including manufacturing, service, wholesale/distribution, utility and health. It's also compatible with Lotus 1-2-3, so students can perform 'what-if' tests on the side. The program is to be the basis of a workshop conducted by the Australian Society of Accountants at their congress in March. There will be a seminar/workshop in Melbourne on April 10-11, and in Sydney on April 21-22. If you are interested in attending, contact Bill Donnelly of Econsult, on (02) 929-4799. Econsult has the sole Australasian and South East Asian rights to these courses and software.

The ILE runs on any PC or compatible with at least two floppy disk drives. A single floppy and a hard disk is even better. A simple installation process, which takes about 15 minutes to run, transfers files to the hard disk. After completing the exercise, you'll find a new subdirectory called SMG, which holds a mass of text files, and another subdirectory, TUTCON, for tutorial data.

Before getting into the real game, I inserted an undocumented disk labelled DEMO and typed DEMO. I got the expected demonstration (it takes about half an hour) and thereafter found little need to refer to the manual, though the quality of the documentation is excellent, both in presentation and content. There's not much documentation, but then decent software shouldn't be burdened with tomes of reading matter — the ILE's help facility is extensive. The program also has 'consulting' and 'analytic' modes.

To run the actual game, you must reboot your system using DOS 2.0 (or higher) from a floppy disk — without a CONFIG.SYS file or an AUTOEXEC.BAT. You then load the copy-protected system disk into drive A and give the command SMG — and that's it. If you don't have a hard disk, you'll have to load the tutorial disk into drive B. The package includes a backup copy of the system disk.

The ILE is definitely tailored to the PC architecture. It makes full use of multiple video pages, and at times is presented almost like a video game.

The opening menu invites you to start a new game, play a saved game, get help (the F1 key) or quit. Help is always context sensitive.

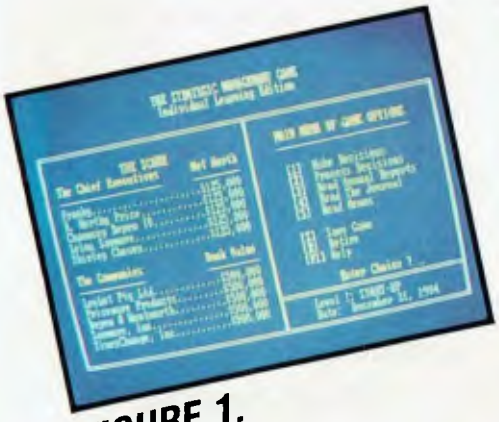

FIGURE 1.

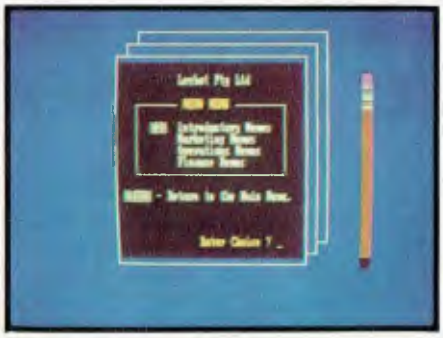

FIGURE 2.

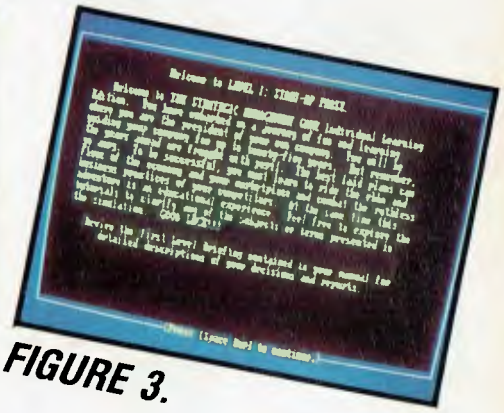

FIGURE 3.

FIGURE 4.

FIGURE 5.

FIGURE 6.

FIGURE 7.

FIGURE 8.

FIGURE 9.

You as a Pet-Bots Spinoff

If you start a new game, you are told you've been appointed CEO (Chief Executive Officer) of a new business. Your original employer (Divide & Devour) was so impressed with your ideas for marketing Pet-Bots that the boss agreed to spin you off as an independent business unit. The parent company will hold 75 per cent of the equity — you have the balance. D & D will also help you get started by manufacturing the product (until you're established), and you'll have access to its market research and sales force.

The total invested capital is initially $500,000, consisting of 1,000,000 shares with a book value of 50 cents each. The product is to be sold through retail and department stores throughout the Eastern United States.

Your competition is from four other companies which have also licensed the Pet-Bot product line. The manual gives a detailed profile of each company and its respective CEO. One (Savmore Inc) will aim for low prices and high-budget adver- ▶

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STRATEGIC MANAGEMENT GAME

tising. Another (Depew & Wentworth) will be more up-market, charging higher prices and taking out less mass advertising.

What's a Pet-Bot? Well, most of the simulations we've seen so far market Widgets. I never did find out what a Widget was. But a Pet-Bot is a children's toy robot, which mimics a live pet without the associated inconveniences. It's an abbreviation for Personal Electronic Tetrapod roBOT — sounds ghastly, but it's bound to happen.

After reading the introductory information on the screen, you must decide whether there are one or two (human) players. I entered '1', then the name of my company (Leebot Pty Ltd), the name of the CEO (Franky) and my stock symbol (FL). The level I main menu (see Figure 1) is then displayed.

Accepting option 5 (memoranda) at this point results in the display shown in Figure 2 — a menu of the electronic mail box. Accepting option 1 here produces the memo in Figure 3. This is actually a briefing on the process of making decisions at level I of the game. Escape takes you back to the main menu, where we next take option 1 to start making some business decisions.

Figure 4 shows the screen after selecting a (slightly high) selling price of $23.50 and budgeting $85,000 for advertising. The next screen (Figure 5) shows our decision to buy 25,000 units from D & D for the next calendar year.

Returning to the main menu, we next accepted option 2 to commence processing our decisions. This takes about 15 seconds. The main menu reappears, but this time reflecting the situation at the end of the 1985 trading year. We see Leebot had dropped to third in the list of competitors. Franky's net worth had dropped to $86,000 — not too good. Pressing option 3 generates a set of annual reports. The Sales and Inventory report (Figure 6) was not encouraging. We sold the entire stock, and therefore probably underpriced the product and spent too much on advertising. The next report (Figure 7) showed we had generated a net loss of $149,000. I comforted myself with the thought that it's normal to make a loss in the first year.

I should have done some sums. I had created a slight cash crisis and all hell broke loose. A rather terse memo from the finance department on the electronic mail exchange complained that, because of my financial incompetence, we had been forced to sell off all our inventory at 70 cents on the dollar!

More detail is available by pressing A (for Analysis). You arrive quickly at the breakdown shown in Figure 8. The advertising budget was not too blame — it was really quite low. We simply should have bought more stock and/or raised our price.

Figure 9 shows the balance sheet. The Escape key returns us to the main menu for another round.

At the start of round 2, I read the Business Journal (very bullish) and scanned the industry statistics to see what my competi-

PRODUCT DETAILS

Distributor:	Econsult, 13/98 Alfred Street, Milson's Point 2061, (02) 929 4799.
Price:	$390 for the Individual Learning Edition, and the price of the Corporate Training Edition is available on application.
Best Points:	Superb design.
Worst Points:	It's far too engrossing, and quite nerve-racking.

STRATEGIC MANAGEMENT GAME

tors were up to. It seemed we had a healthy 22 per cent of the market. The analysis mode shows this as a coloured pie chart in low-resolution graphics mode. After consulting with the online experts, I decided to set a new price of $26, set the new advertising budget at $90,000 and order 45,000 units from D & D. After processing, things looked somewhat healthier — we'd just about broken even. At the end of 1986 we were still third in the ranking, with a book value of $342,000. All our stock was sold, there were 1000 units on back order and we sustained a net loss of $3000.

Round 3 was more promising still. The price went up to $29, we sank $95,000 into advertising, and ordered 65,000 units. The simulation thought our performance was so good we were moved into the next level of play — the growth phase. Although we had dropped to fourth position, we made a net profit of $178,000. Again, all our stock was sold.

... As a Producer of Pet-Bots

In level 2, D & D decided to stop manufacturing — we were on our own and had to build and operate a factory. We also went public, by selling common stock. The Industry Journal noted sales had surged by 57 per cent and profits were escalating — so things had begun to look encouraging ..

In round 4, I bumped the price to $35, put $100,000 into advertising, purchased 95,000 units and sank $100,000 into factory construction. I should have done some sums. I had created a slight cash crisis and all hell broke loose. Leebot shot to the top of the company rankings with a market value in excess of $2,000,000, my net worth sank to $156,000. A rather terse memo from the finance department on the electronic mail exchange complained that, because of my financial incompetence, we had been forced to sell off all our inventory at 70 cents on the dollar! We also had to go cap-in-hand to D & D for more money. Yet another memo warned of potential bankruptcy. I retired gracefully, vowing to return with a calculator. A computer game shouldn't give you the shakes.

This is a neat game for learning about business operations and terminology. The help system really explains every detail, and most players will come out much wiser after a few sessions. A great deal of emphasis is placed on strategic planning, and examples are given in the manual.

... As a Developer of New-Bots

Level II has been explained briefly already. Level III is the independence phase, in which D & D has sold off all its common stock holdings in your company and has left you completely on your own. You must now add your own sales force, and set a commission policy and a customer credit policy. You also establish an R & D department for proposed new products. Your goal here is to develop new products while managing a growing company.

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DESIGN				
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Instruction Set

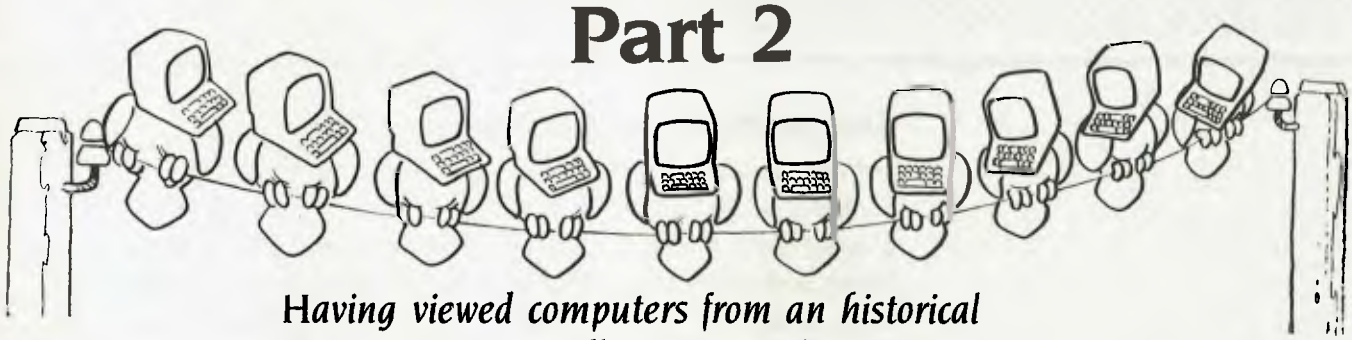
Computing for Birdwatchers **94**

Getting the gist of things? Well, this month's topic is computer hardware — you know, the machinery. To really understand the processor part of it, you have to lop off your fingers, pop them in the freezer, and only count on your thumbs. Then you put on a football jersey (make sure it's got a number on it), crawl into a pigeonhole and wait for Les to call your number. Would we lie to you?

C for Smarties **100**

*We wouldn't try to con you like we did the Birdwatchers, no way. To C the light, you should go down to "stdio.h" (you know, that trendy music shop on the corner?), pull out your no—of—items++ (that's hip for 'shopping list'), check out the total—to—date situation of your purse or wallet, and simply walk up to the counter and say you want to get—next—record. If the salesperson tries to lay some conditions on you, just statement. If that doesn't work, try getobject(); (use force). The rotten little so- and-so is just as likely to say *p++=*1++;. Show your superiority in the face of such foul language, and just tell them they're /*WRONG!/* and to take a running—average. Okay?*

COMPUTING FOR BIRDWATCHERS Part 2



Having viewed computers from an historical perspective, Les Bell now turns his attention to computer hardware, starting with the processor ...

WHILE THE appearance of modern computers (particularly PCs) may have changed since they were first developed more than 40 years ago, the basic principles of operation remain the same.

When examining any computer system, the first thing to do is distinguish the hardware from the software. The physical components of the computer — the metal, plastic and silicon bits you can see — are the hardware. The software, on the other hand, is the set of programs which the computer can run. Without suitable software, a computer is just a heap of junk, as some purchasers have discovered.

You see, the hardware is capable of doing anything a programmer can program it to do — a fact not lost on computer salesmen: "Yes Sir, this machine can balance your accounts, send out the invoices, forecast your bank balance a year into the future, graph your sales curves and, using expert system software, conduct job interviews."

Any computer can be programmed to do all these things; the question is, can you buy all the required software and hardware add-ons for this machine? Having programs custom-written is very expensive. We'll look at programming later; for now, let's see how the hardware works.

Hardware is the machine itself: this may be a screen, system unit and keyboard, as is the case with most personal computers, or it may be a roomful of cabinets, as with mainframe systems. Also included in hardware are items like printers, modems, plotters and external disk drives — in short, hardware is anything physical, usually electronic, which is an identifiable part of the computer system.

Software, on the other hand, is the collection of programs either used on the system or available to it. This includes system software — programs, such as the operating system, used to make the computer work, and applications software — and programs which actually solve problems or do something else useful.

System software is used purely to make the computer work; it contributes nothing else and in business terms could be considered administrative overhead. Applications software actually solves the problems to which the computer is applied.

Computer people (particularly American computer people) seem to enjoy mangling our language, and have come up with some other '-wares'. For example, 'liveware' is a term occasionally used to refer to the people who work on computers, while 'vapourware' applies to software (or indeed hardware) which is promoted before it actually exists. More seriously, 'firmware' is software which is permanently cast into hardware: for example, the programs inside a pocket calculator which make it add and subtract are actually part of its hardware, so they're properly termed 'firmware'.

In summary, the hardware is the bit you can kick when it goes wrong, while you can only swear at the software.

Hardware — or, Inside the Machine

The computer's hardware is made up of several parts. These may all be in one box, as in a PC, or several cabinets, as in a mainframe. The first and most important part is the circuitry, where calculations are actually performed.

This is usually referred to as the Arithmetic and Logic Unit, or ALU for short. The

ALU has at least one register, called the accumulator, which is where numbers or values are stored while they are being operated on. The accumulator is analogous to the display of a pocket calculator: numbers are held there while calculations are performed.

Unlike pocket calculators, which calculate with decimal numbers, computers calculate using the binary number system. We would use binary numbers if we only had thumbs and no fingers (see last month's C for Smarties article). This means the largest numbers computers can handle aren't usually round numbers like 10,000,000 or 100 billion, but numbers like 32,767 or 65,535. In fact, to a computer, round numbers are numbers like 16, 32 and 4096 — all powers of two.

Doing arithmetic in binary is not a handicap for the computer; in fact it makes it faster and more reliable. It doesn't worry us either, because converting from binary numbers into the sequence of symbols which we would read as a decimal number is a simple mathematical exercise, ideally suitable for execution by the computer itself. So the computer inputs and outputs what we would read as decimal numbers, converting them to and from binary internally.

Computer people (particularly American computer people) seem to enjoy mangling our language, and have come up with some other '-wares'.

The ALU contains circuitry which allows it to add binary numbers, perform various logical operations on numbers, perhaps multiply and divide, and perform testing or comparison of numbers. The question is, how does it know when to do what?

The ALU is part of a larger component called the CPU, or Central Processing Unit. The CPU contains the ALU and its accumulator, together with a number of general-purpose registers or accumulators, which are linked to the ALU and used for temporary storage of frequently required values, such as the addresses of other variables. Typically, these registers are given short names, like A, B, or CX, HL or R4.

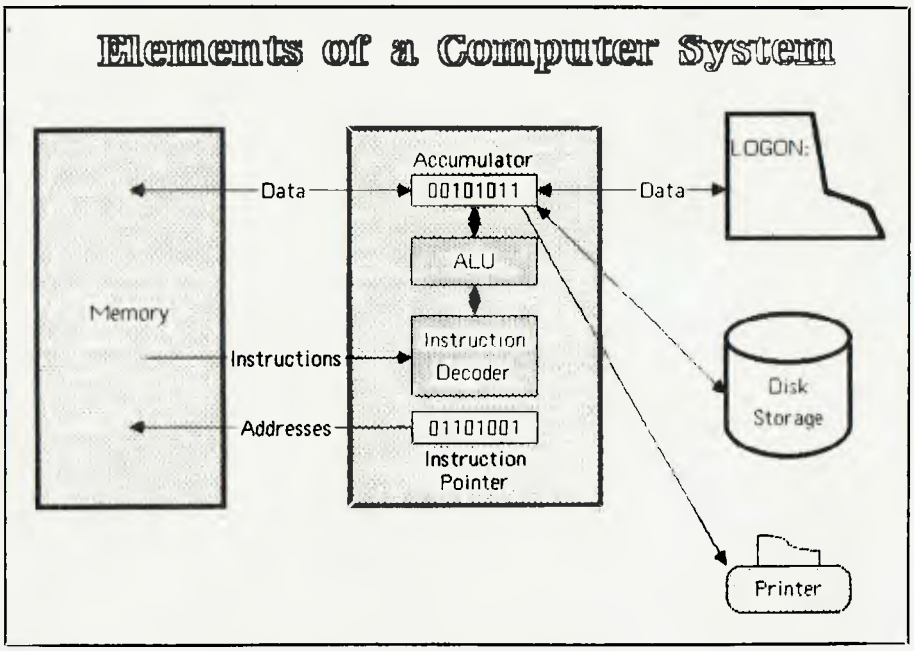
The registers can contain either eight, 12, 16, 32 or some other number of bits. In general, the more bits the registers of the CPU can contain, the more data it can process in one instruction, and the faster it will run programs. Most personal computers have either 8- or 16-bit registers, which makes them considerably smaller than mainframes, but quite appropriate for small systems.

One register performs a key function: it tells the logic of the central processor where to fetch the next instruction from in memory. This register, which is often called the program counter or instruction pointer, usually steps up through memory pointing to successive locations, unless the processor executes a jump or similar instruction.

Each time the program counter increments, the CPU reads that location in memory and feeds it to a circuit called the instruction decoder. This works out what kind of instruction it represents and then co-ordinates the operation of the rest of the processor to execute that instruction.

The instruction could simply move some data from memory into a CPU register, or between CPU registers, or it could be something more complex involving the ALU, like adding a value from memory into a register.

You can think of the memory as being a huge wall covered in pigeonholes, rather like those used by manual mail sorters. Each pigeonhole contains a piece of paper, on which is written either an instruction or a number. Normally, executing a program involves moving along a row of pigeonholes, pulling out the pieces of paper and following instructions. For example, here's a simple program to add two numbers together:




```
Pigeon-hole 1:
     Get the number from pigeon-hole 12 into the accumulator
     Add the number from pigeon-hole 13 into the accumulator
     Store the accumulator into pigeon-hole 14
     Stop
Pigeon-hole 12:
     31
```

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BIRD WATCHING

Unlike pocket calculators, which calculate with decimal numbers, computers calculate using the binary number system. We would use binary numbers if we only had thumbs and no fingers.

```
Pigeon-hole 13:
     45
Pigeon-hole 14:
     (empty)
```

Note the load and add instructions specify where the data is to be found, and the store instruction likewise specifies a pigeonhole. The stop instruction is necessary — without it the CPU would simply fetch the contents of the next pigeonhole and try to execute it as an instruction. The memory (pigeonholes) holds both instructions and data, with no distinction between them, and occasionally (though never in well-designed systems) the processor will try to execute data, causing the system to crash.

This program can be written in binary for the 8080 or Z-80 processor, in which case it looks like this:

```
Pigeon-hole 1:
     00111010
     00000111
     00000000
     01000111
     00111010
     00001111
     00000000
     00000000
     10000000
     00110010
     00010000
     00000000
     00000000
     11000011
     00000000
     00000000
Pigeon-hole 13:
     00011111
Pigeon-hole 14:
     00101101
Pigeon-hole 15:
     00000000
```

However, writing a program in binary is painful (some would say hazardous to your health), so the worst level of programming usually undertaken by humans is in what is called 'assembly language'. Here, we use a short mnemonic to stand for each machine instruction and type in the data in decimal, rather than binary. We don't need to specify addresses (pigeonhole numbers) either, as the assembler program, which translates the program into binary, will work these out for us. Here's that program again, this time in 8080 assembler language:

```
; Program to add together two numbers

        lda     num1    ; load accumulator from num1
        mov     b,a     ; save it in B register
        lda     num2    ; load accumulator from num2
        add     b       ; Add b to a
        sta     result  ; save result
        jmp     0       ; jump back to operating system

num1    db      31      ; first value
num2    db      45      ; second value
result  ds      1       ; one byte of storage for result

        end
```

I've added explanatory comments after semi-colons at the end of each line. You can see this program loads a number into the accumulator, 'a', then stores it in 'b' temporarily while it loads the next number into the accumulator, then performs the addition. The reason for this is the 8080 architecture (the way the CPU is organised) doesn't allow us to directly add a number from memory, so this is the quickest way around it.

Briefly, the CPU steps through memory, one instruction at a time, fetching an instruction, decoding it, then fetching any other data that may be required and executing the instruction. Often, however, we want to vary a set sequence of instructions. How do we do that?

One of the most important instructions the CPU must be able to perform is the JUMP instruction. After a jump instruction, the processor doesn't fetch the next instruction in sequence; instead, it fetches an instruction from the location in memory it was instructed to jump to.

This has the effect of transferring control to a completely different part of the program. Now, most processors have a special register called the flags register, which contains miscellaneous bits of information about the processor status, such as the carry bit (set if the addition of two numbers produces an extra bit at the most significant end), the overflow bit, the negative bit and others. Most processors have conditional jump instructions which will jump if the carry bit is set or not set, if the negative flag is set, and so on. It's thanks to this mechanism that computers are able to 'make decisions' and act differently for different values.

Next month, we'll go on to look at how the CPU communicates with the outside, or 'real' world. □

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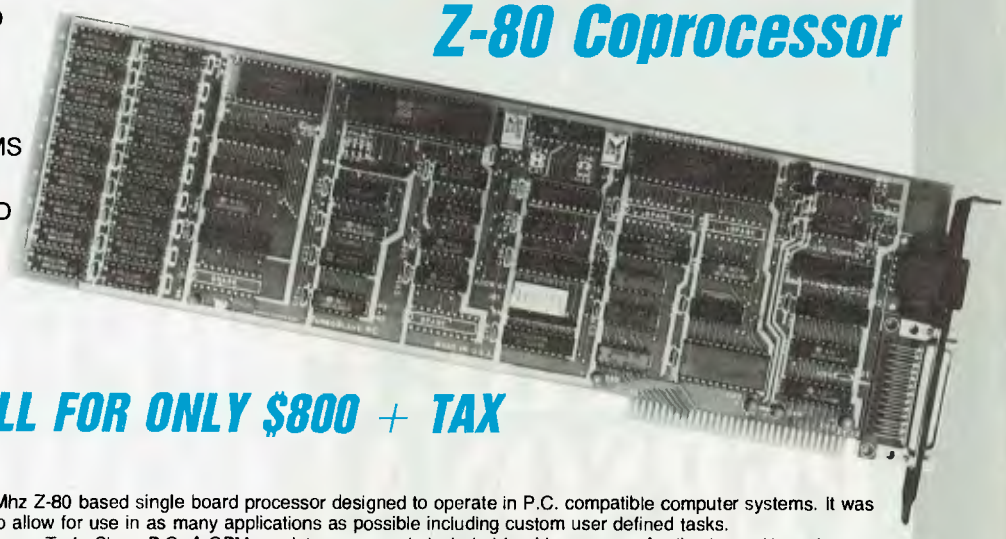

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C FOR SMARTIES

Part 4

BOEHM AND JACOPINI pointed out in their landmark paper that only three structures were required to write any program: sequential flow, if-then-else and while. Naturally, C offers all of these, as well as a number of variations. While these are not required, if used properly they can make programs easier to write and (most importantly) easier to read.

Flow control in C depends on the definition of a statement. In general, a statement is a single, indivisible unit of program structure. If one part of a statement is executed, all of it is.

At its simplest level, a statement consists of a single assignment, function call or similar operation written as one line of code with a terminating semi-colon (;). Typical statements include:

```
printf("%d + %d = %d",x,y,z);
*p++ = *i++;
p = getobject();
x = (pi * (h + v / 6.2)) ^ 1/2;
```

It's important to note statements like

```
#include "stdio.h"
```

and

```
#define PI 3.141592654
```

don't require terminating semi-colons, since they're macro pre-processor directives rather than C statements.

Compound Statements

That's the simplest definition of a statement. C also allows a more sophisticated extension of this idea — the compound statement.

A compound statement consists of two or more statements enclosed in curly braces ({ and }). (Programmers familiar with other block-structured languages such as Algol, PL/I and Pascal might compare this with begin-end blocks.)

This is a particularly powerful idea: it simplifies the flow control statements and eliminates confusion. For example, statements such as 'if' (condition) and 'while' (condition) only control a single statement, but that statement itself can be a compound statement composed of multiple statements.

What separates a computer from a calculator is its ability to make decisions and alter the flow of a program — in particular, to control repetitive looping. C offers a particularly rich set of flow control statements ...

Remember any statement can be a compound statement. That simple rule will keep you straight throughout the following exposition.

IF ... ELSE

The if statement is a key component of most programming languages, and C is no exception. As in most languages, in C it comes in two flavours: plain 'if' and new, improved 'if' with added 'else'. Here's the basic structure of the if statement.

```
if (condition) statement
```

The if . else statement adds a useful refinement:

```
if (condition) statement
else statement
```

WHILE

The while statement is the primary way of controlling a loop. The basic syntax is:

```
while (condition) statement
```

Again, remember that statement can be a compound statement, thus constituting the full body of the loop. So, for example, you could write a very simple while loop like:

```
while (list—item(i) != '0') i++;
```

which has only one statement in the loop. On the other hand, you could write something quite complex, such as:

```
while (!end—of—file) {
 no—of—items++;
 total—to—date = total—to—date +
this—item;
 running—average = total—to—date /
no—of—items;
 get—next—record();
 }
```

which has four statements inside the loop, which are enclosed in curly braces and therefore represent a single compound statement.

We see here an important feature of the compound statement, which makes debugging and maintenance much easier than with languages like BASIC. The compound statement is indivisible, which means there is no way to reach the total—to—date calculation without previously having executed the statement no—of—items++. Likewise, if the no—of—items++ statement is executed, the two which follow in the compound statement must be executed.

This reflects one of the principal concerns of structured programming: in examining a statement the programmer should be able to state with certainty how program execution arrived at that point and what has gone before. 'Where did we come from?' is a much more important question than 'What are we doing now that we are here?'. The most dangerous statement in this regard is the goto, since it allows arbitrary jumps in program flow, which can make debugging and modification increasingly difficult. The compound statement solves the problem neatly.

The while loop is the primary loop construct, but there are times when its use can be awkward. For example, processing a file and testing for end-of-file status requires an awkward while construction. Let's see why:

```
while (!end—of—file) {
```

Listing 1.

```
/* Number guessing game 8/25/84 */
#define LEN 30
#define RANDOM 100
int seed;
main()
{
char    play;   /* Control variable */
char    name[30];
int     number;         /* The number */
int     guess;          /* Your guess */
seed = 0;
printf("Hi, what's your name? ");
scanf("%s",name);
play = getchar();
printf("\nOK, %s, do you want to play a guessing game? ",name);
while ((play = getchar() == 'y') || (play == 'Y')) {
number = (rand() % RANDOM) + 1;
printf("\nI'm thinking of a number between 1 and 100\n");
printf("You've got to try to guess it.\n");
printf("What's your guess? ");
scanf("%d\n",&guess);
while (guess != number) {
if (guess < number)
printf("Too low.\n");
else
printf("Too high.\n");
printf("What's your next guess? ");
scanf("%d\n",&guess);
}
printf("You got it, %s!\n",name);
printf("Do you want to play again? ");
play = getchar();
}
printf("\nBye ... .\n");
}
rand()
{
if (seed == 0)
seed = 2731;
seed = seed * (seed - 3) * 29;
if (seed < 0) return -seed;
else
return seed;
}
```

```
    /* WRONG! */
    get—next—record();
    /* Process it */
    no—of—items++;
    total—to—date = total—to—date + this—items;
    running—average = total—to—date / no—of—items;
    }
```

This program runs into difficulty when it reaches the end of file. It will process the last record correctly, then try to read beyond the end of file and increment no—of—items when it shouldn't, giving incorrect values for total—to—date and running—average. To get around the problem, you have to move the get—next—record() call to the last thing in the loop, as shown in the example above. Then the first time through the loop we haven't yet read a record, so we need to add a preliminary read before the loop, like this:

```
get—next—record();
  while (!end—of—file) {
  /* Process it */
  no—of—items++;
  total—to—date = total—to—date + this—item;
  running—average = total—to—date / no—of—items;
  get—next—record();
  }
```

This is a little awkward, but it's the way you have to do it in most languages, and using this construction frequently reminds you the problem is there. This example also takes care of the case where the input file is empty. The first get—next—record() call sets end—of—file immediately, so the loop never gets executed. In the incorrect example above the loop always executes at least once.

C provides an alternative in the do ... while statement. Its general syntax is:

```
  do statement while (condition);
```

It tackles the file processing problem this way:

```
  go = get—next—record();
  do {
  /* Process it */
  no—of—items++;
  total—to—date = total—to—date + this—item;
  running—average = total—to—date / no—of—items;
  } while ((c = get—next—record) = TRUE);
```

Listing 1 is a sample program. As an exercise, rewrite the program to use the do ... while construct. Compare your result with Listing 2.

A Smooth Switch

The switch statement allows a multi-way

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branch. It is a replacement for the long chain of

```
if (cond1) {
} else if (cond2) {
} else if (cond3) {
} else if (cond4) {
} else {
}
```

-type statements we are forced to have in some other languages. See the example program chmod.c for an example of a long switch statement. Break is used to skip past the remaining irrelevant stubs of a switch statement. It may also be used to prematurely break out of a loop. Continue is related to break; it causes the current iteration of a loop to be suspended and the next started immediately.

The for loop is one of the strongest features of the C language, and should in no way be considered in the same light as its distant relative, the BASIC FOR..NEXT loop. The C for loop can perform more complex tasks.

The for statement consists of the following major parts:

for (start condition ; continuation test ; loop control) {body}

which translates into the following equivalent while loop:

```
start condition;
while (continuation test) {
body;
loop control; }
```

Watch out for some shorthand: for example, the test

```
for (;;) { }
```

is an infinite loop, read as 'do forever'. □

Listing 2.

```
/* Number guessing game 8/25/84 */
#define LEN 30
#define RANDOM 100
int seed;
main()
{
        char    play;   /* Control variable */
        char    name[30];
        int     number;         /* The number */
        int     guess;          /* Your guess */
        seed = 0;
        printf("Hi, what's your name? ");
        scanf("%s",name);
        do {
                number = (rand() % RANDOM) + 1;
                printf("\nI'm thinking of a number between 1 and 100\n");
                printf("You've got to try to guess it.\n");
                printf("What's your guess? ");
                scanf("%d\n",&guess);
                while (guess != number) {
                        if (guess < number)
                                printf("Too low.\n");
                        else
                                printf("Too high.\n");
                        printf("What's your next guess? ");
                        scanf("%d\n",&guess);
                }
                printf("You got it, %s!\n",name);
                printf("Do you want to play again? ");
                play = getchar();
        } while (((play = getchar()) == 'Y') | (play == 'y'));
        printf("\nBye . . .\n");
}
rand()
{
        if (seed == 0)
                seed = 2733;
        seed = seed * (seed - 3) * 29;
        if (seed < 0) return -seed;
        else
                return seed;
}
```

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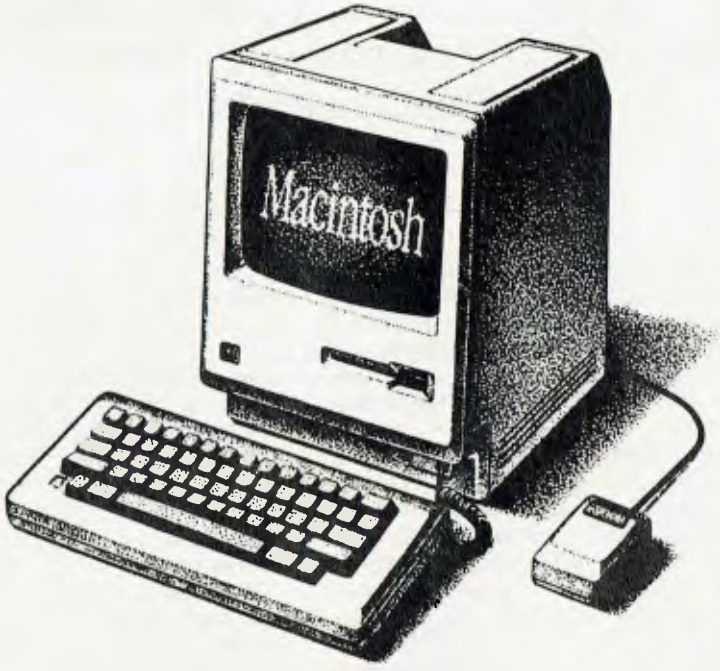

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HOW TO WRITE A STRUCTURED PROGRAM — Part 10

Have you ever had the urge to print out the telephone book, as it appears, page by page, from a sequential file containing all the names, addresses and phone numbers in alphabetical order? Never mind, the exercise happens to illustrate just what Phil Grouse wants to say this month about data structures.

LAST MONTH, I completed the design for handling a common data-processing problem, the sequential file update, and introduced a new approach to its solution — the use of a state-switched algorithm. This month, we turn to a different topic: data structures.

Many programs are linked naturally to a particular set of data structures. An example might be a program which creates a particular report from a sequential file; both the report and the file are data structures, and the job of the program is to transform one into the other. It's long been accepted that the structure of such a program bears a close similarity to its data structures. In fact, the so-called Jackson Methodology builds on that relationship as a program-design approach.

It so happens that you can use the flowblock format to specify data structures as well as procedural structures. Transforming such a data structure into a related program becomes very straightforward.

Printing Out the Phone Book

The example I have chosen here is mundane in the extreme, yet surprisingly tricky. The data structure is a telephone book, and the program is required to print it from a sequential file containing all the names, addresses and phone numbers in alphabetical order. The problem arises because the printer creates one line at a time, but the names are arranged in vertical columns, of which there are more than one to a page. Before lurching into a solution, let's spend some time drawing up a set of flowblock data specifications for our phone book. The 'mainline', or starting point, is shown in Figure 1. Remember, we're writing data structures — not programs or procedures.

The individual entries in Figure 1 are themselves data structures with corresponding flowblock representations. Thus 'FrontCover' and 'BackCover' are literally the front and back covers — not programs to print them. We will presume these are to be provided separately in the binding process.

Page(Pg) is the page numbered Pg. LastPage is a special case because it will probably contain fewer lines. It is given its page number as a parameter in the same way as the structure Page.

The 'FOR loop' is not a processing loop. It simply says there is a sequence of Page structures numbered from one to the second-last page. The 'metavariable' Pg defines the actual page number used.

A Small Digression

Before writing out the data structures for Page and LastPage, let's digress a little. We have used the value LastPageNumber twice. Its value is dependent upon a num-

Identifier	Meaning
N	Number of entries in the book
LinesPerPage	Maximum number of lines on a page
ColsPerLine	Maximum columns in a line
LastPageNumber	Number of the last page
LinesOnLastPage	Number of lines on the last page
ColsInLastLine	Columns in last line of last page
Entry(i)	The ith name entry in the file.

Table 1. *Values used in the data specifications.*

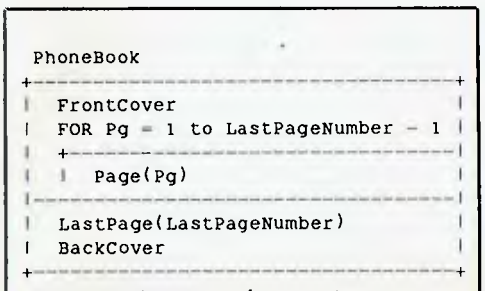

Figure 1. *The primary data structure specifying a telephone book.*

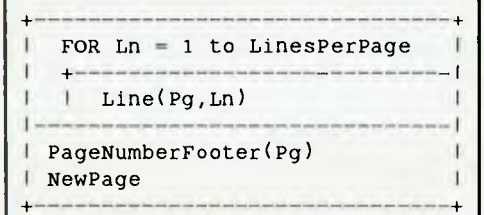

Figure 2. *Data structure for a complete page. Line is defined in Figure 4.*

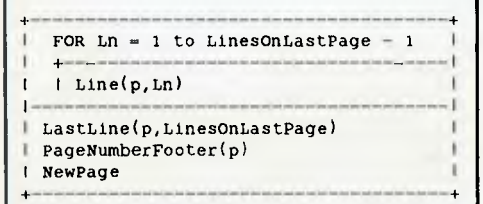

Figure 3. *This module specifies the structure of the final page of the phone book. The calling reference sets the parameter p to LastPageNumber.*

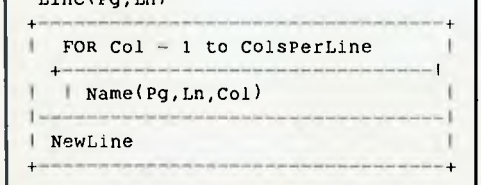

Figure 4. *Specification of the Line data structure. The Name reference defines a particular name, address and phone number entry through its three parameters.*

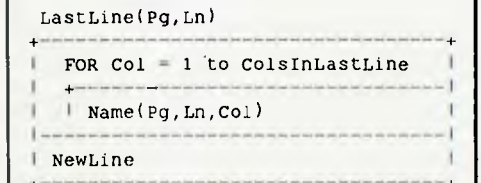

Figure 5. *LastLine defines the structure of the very last line on the very last page.*

We have used a variant of the flowblock notation to specify a nonprocedural data specification. The generality of this notation is sufficient to cover the most complex of data structures. Unfortunately, most programming languages are heavily restricted in their ability to utilise complex data structure specifications.

ber of other values, in particular the number of entries in the entire book, the maximum number of lines per page, and the number of columns per page. We will eventually also need to know how many lines are on the last page, and how many columns are used in the last line of the last page.

Table 1 defines the value identifiers and their meanings. In contrast, Pg is a metavariable because it is used as a control or parameter within the specification, rather than as part of the definition of the book.

Given the values of N, LinesPerPage and ColsPerLine, the computations of LastPageNumber, LinesOnLastPage and ColsInLastLine are straightforward. We make the assumption that the last page has at least one (possibly incomplete) line, and that therefore the file has at least one entry. If you insist on a structure which will work with an empty file, you may need to make changes to the solution shown here.

On any complete page there will be LinesPerPage * ColsPerLine name entries. We'll call this product PageCount. If you now divide N by PageCount and ignore the remainder, you'll get the number of complete pages; add one to that and you have LastPageNumber. The number of names on the last page will be N minus the product of PageCount and the number of complete pages. Divide that result by ColsPerLine and ignore the remainder. Add one to the quotient to give LinesOnLastPage. The remainder (which you just ignored) is the value of ColsInLastLine.

The above COBOL-like description could, of course, be reworked as a set of BASIC assignment statements — but these are *not* program statements in the sense that we are telling the computer to do something. We are specifying actual values (which may be computed later). In addition, we should make a small refinement to those calculations: if either of the above remainders is zero, decrement the quotient and add the divisor to the remainder. In this way, we avoid empty last pages and empty last lines.

Note the definition of the FOR construct in Figure 1 here means there will be no 'normal' pages if LastPageNumber is 1 — simply one LastPage. It doesn't mean 'do something so many times'. In the context of a data specification, it says there are so many things — in an ordered sequence. The other constructs (WHILE, UNTIL, CASE and IF) must be similarly interpreted. I'll give you more examples as we go along.

Defining the Abstract

In creating the primary data structure, we 'abstracted' the problem of the Page and LastPage. These must now be defined. Remember, Page defines a 'complete' page. It has LinesPerPage lines, and each line has ColsPerLine name entries. The names run in order down the columns. In our local community phone book, LinesPerPage is 125 and ColsPerLine is 4. The total number of entries (N) is roughly 141,061. Assuming these values, LastPageNumber becomes 283. The number of names on the last page is then 141,061 minus 282*125*4, or 61. There are therefore 15 complete lines on the last page, and the last line has a single name entry in the first column.

Figure 2 specifies the Page data structure. The parameter Pg is the page number and is used as a 'footer' at the bottom of the page. The page consists of the full number of lines (LinesPerPage) followed by the footer. The 'NewPage' entry simply indicates the end of a physical page; the program equivalent will be a suitable 'page throw' instruction. Because each Line consists of ColsPerLine name entries drawn from different parts of the name array, we recognise the complexity of the problem by once more 'abstracting' it to another flowblock.

Incidentally, we have neatly sidestepped a rather nasty issue here. The en-

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tries in each line do come from scattered names — albeit not too far apart in the file. When writing the printing program, we could make the (unrealistic) assumption that the file is first read holus bolus into a massive internal array. In practice, one only needs to read enough file data for a page at a time — but that's a programming problem, not a data structure problem.

The reference to Line(Pg,Ln) in Figure 2 is a kind of subroutine call. More correctly, it's a reference to another data structure specification. Line needs the page number Pg and the line number Ln in order to know which name entries to use.

The LastPage flowblock (Figure 3) is slightly more complex than the specification for a complete page. If we had chosen to, we could have made the one flowblock do the work of these two by going for more generality — and that's usually a good move. The Page module can only process complete pages; LastPage has enough generality to do the work of Page, but would need some minor alterations to Figure 1.

The module Line defines the simple structure of a complete line. It is shown in Figure 4. The metavariable Col indicates the column in which the name entry is printed. The reference to Name(Pg,Ln,Col) describes the particular name to be printed. The Name flowblock (in Figure 6) uses the three parameters to specify which entry in the array of names is to be used.

LastLine (in Figure 5) is just a special case of Line. Here, ColsPerLine is replaced with ColsInLastLine. Again, the Name module is required to specify which entries are to appear. A more elegant solution would have used a single, more general module to do the work of both Line and LastLine.

The Name module is generalised. The metavariables i and j are correctors which apply on the last page. Note although many lines in this flowblock look like regular assignment statements, they should be regarded here as statements of equality. This structure illustrates the proximity between a data structure and a related program. The value of 'index' is the subscript of the required element from the name and address array. The generality of the index does not necessarily force us to load the entire file — as I'll show you next time, there are many ways to skin a cat.

Summary

We have used a variant of the flowblock notation to specify a non-procedural data specification. The generality of this notation is sufficient to cover the most complex of data structures. Unfortunately, most programming languages are heavily restricted in their ability to utilise complex data structure specifications. It is tempting to design an expansion for existing languages to allow such specifications to be included. Think about it — I certainly will.

Next month we'll transform this data specification into a set of corresponding program flowblocks. The resulting program will print the phone book from a simple sequential file. In the meantime, why not try your hand at a solution. □

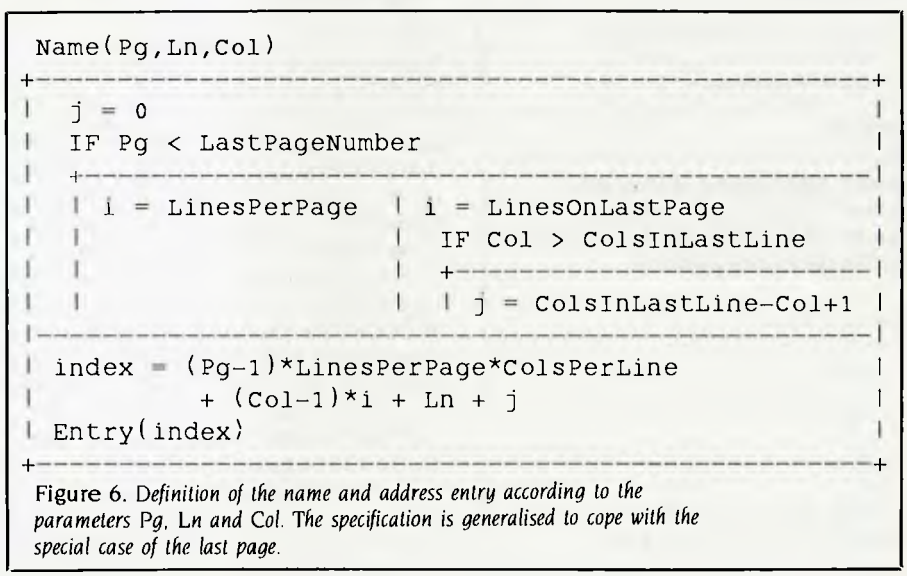

Figure 6. *Definition of the name and address entry according to the parameters Pg, Ln and Col. The specification is generalised to cope with the special case of the last page.*

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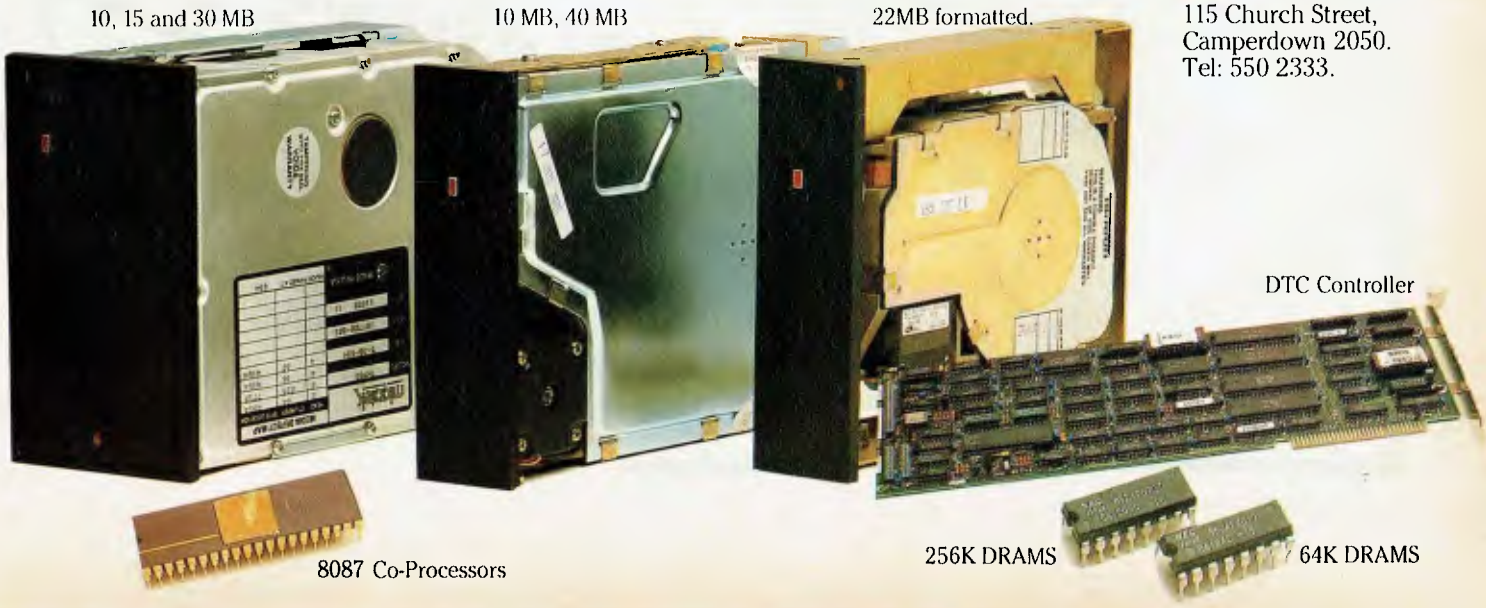

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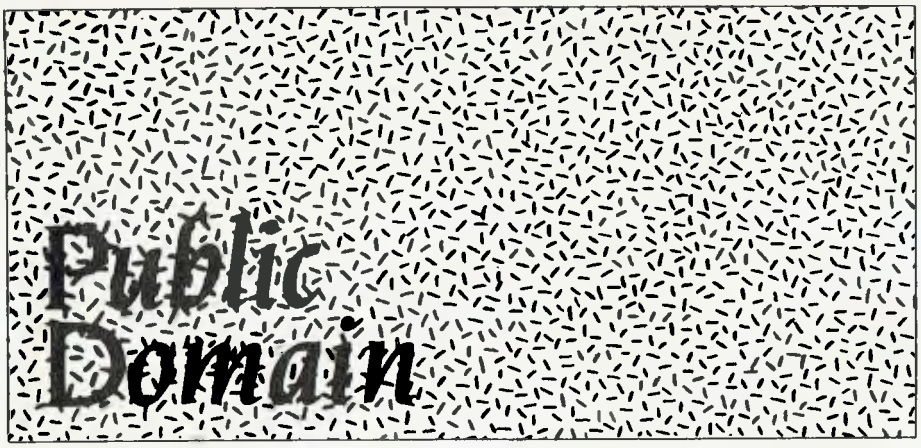

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We have a strong case of a boy named Sue, this month, with a package which allows people with no programming experience to create their own in-house training programmes — it's called Combat.

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Your Bondwell **122**
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Murphy's no match for our John.

Your Microbee **126**
Ouch! Ooff! Thump! Whack! Boing! Colin lets the editor have it.

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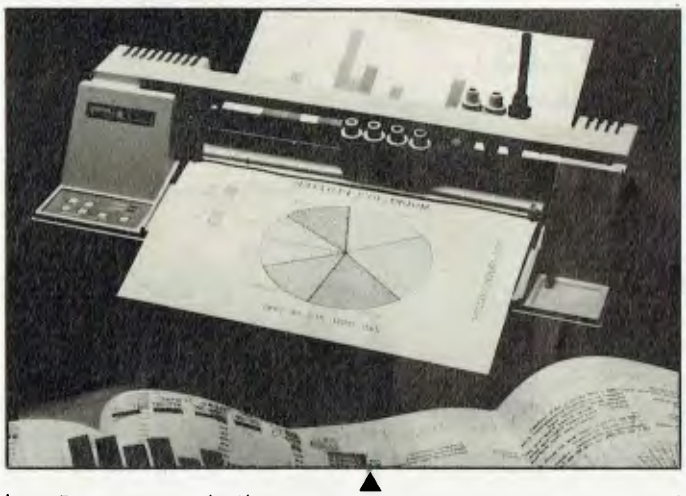
Price: $7500
The SP incorporates a 360 Kbyte floppy, 640 Kbytes of RAM, a 20 Mbyte hard disk, a monitor and an Intel 8086 processor running at 10 MHz. It runs programs at almost three times the speed of the IBM PC and is aimed at the user who wants high performance in spreadsheet and database work.

Quattro Microcomputers
ICL, (02) 452 9900
Price: Around $5000 for the Model 19
Quattro is a range of multi-user, multi-tasking small business computers: the M19, M39 and M49. The machines are based on an 8 MHz Intel 8086 running under a version of Concurrent CP/M-86. They can also operate in PC mode to run certain MS-DOS software. Communications capabilities are built-in, and each

model can support four terminals running four tasks. The Model 19 comes with two 782 Kbyte floppy drives, the other models have hard disks. All have a full year's warranty.

Wang Advanced Professional Computer
Wang, (02) 925 5665
Price: $10,500
This computer from Wang is available separately or as an upgrade from the Professional Computer. It is based on the Intel 80286 processor and runs MS-DOS, Xenix and Wang's In/Ix. Using the Unix-based operating systems, the computer can handle four users. Most PC-DOS applications will run, and three types of IBM emulation are available. The price above is for a system with 512 Kbytes of RAM, screen, keyboard, 1.2 Mbyte floppy, 20 Mbyte hard disk and MS-DOS 2.1.



Peripherals and Extensions

Backup Tape Module for NGEN Workstations
Sigma Data, (02) 436 3777
Price: $6400
The Convergent HB-001 Quarter-Inch Cartridge Streaming Tape module provides a practical way of backing up the NGEN family of workstations. It has 60 Mbyte capacity and uses read-after-write technology to ensure data integrity. Supporting software enables selected files to be written to tape or restored from tape, and an incremental backup option allows the program to select and write only those files modified since the previous backup.

Nectarring
Quanta Electronics, (02) 698 3588
Price: $550 per unit
A new approach to networking which avoids the need for costly cabling, Nectarring makes it easy to move any node (or all nodes) of the network. A Nectarring unit sits beside each node, plugging into the node and the mains. The unit passes information in both directions at speeds up to 4800 bps. Data communications go through the normal mains system: a relatively low-voltage, high-frequency signal is superimposed on the normal supply, and the signal is modulated according to the data being transmitted. The ring can be supplied to work on any of four different channels, and it is dual-insulated to prevent interference. Nectarring will work with any micros and peripherals with RS232 ports.

Hitachi Model 672 Graphics Plotter
The TCG Group, (02) 699 8300
Price: Around $1400
The 672 will plot graphs on any type of paper or overhead transparency material, can produce diagrams, charts and other computer-aided designs, and has a drawing speed of up to 200 mm/sec. The plotter is able to make a hatched portion, draw dotted lines or connect respective dotted lines with solid lines at high speed. It supports software such as Lotus 1-2-3 and Graphwriter, and has parallel and serial ports.

EXP 800 Daisywheel Printer
Silver Reed, (02) 452 2022;
(03) 417 2633
Price: $1895
The EXP 800 has an output of 40 characters per second and has 10-, 12- and 15-pitch printing and proportional spacing as standard. Three interface boards are provided (serial, parallel and IEEE-488), allowing connection to a wide range of equipment. Matching dip-switch units control a comprehensive selection of print options, including a choice of 16 languages and page lengths, two line spaces, auto linefeed, print hammer pressure and baud rate. The standard 3 Kbyte buffer can be expanded to 40 Kbytes.

Corvus Transporter
Horizon, (02) 498 6611;
(03) 662 1611
Price: Around $900
With the Corvus Transporter, a wide variety of microcomputers can be linked to the Corvus Omninet. The network card connects to the modem port via a 25.4 cm flat-ribbon cable, or to the printer port. Using the Transporter, IBMs, Apple IIs and Macintoshes can all be linked.

DTX 2000 Monitor
DTX, (09) 322 7800
Price: $499
A medium-resolution colour monitor which supports the Australian PAL standard, the DTX 2000 is compatible with a wide range of computers including the Apple II, IIc and IIe, the Atari 800 and XL, Commodore 64, VIC-20, TI 99/4a, Osborne and other CP/M machines. It is suited to Videotex and compatible with the DTX Modem Decoder.

DTX 2001 Monitor
DTX, (09) 322 7800
Price: $499
An RGB/video composite monitor for use with IBMs and compatibles, the DTX 2001 has a 36 cm screen, 640- by 200-pixel resolution and a switch which provides a green or amber text mode. It is specially suited for Videotex.

Pulsar 6016 CPU Card
Pulsar Electronics, (03) 330 2555
Price: $1820
A CPU card designed for the multi-user environment and capable of running TurboDOS, CP/M-86 and MS-DOS, the Pulsar 6016 has an 80186 processor running at 8 MHz and is available with either 256 Kbytes or 1 Mbyte of DRAM (Dynamic Random Access Memory) on board. It can be used as either a master or slave in a network environment, and has full communications facilities. The card meets all STD bus electrical specifications, with bus speed of 12 Mbits per second.

SPL-430 Plotter
Magraths, (03) 663 1122
Price: $1575
The SPL-430 is a six-pen, multi-colour paper-roll plotter de-

signed for sophisticated CAD applications. The plotter uses a powerful HP-GL-compatible graphics language and can utilise a wide range of commercial software. Pen speed is 40 cm/s in the axial direction and 56.5 cm/s at an angle of 45 degrees to the axial direction. The unit can plot in steps as fine as 0.025 mm. Automatic pen-changing is supported and ANSI A and ANSI B paper is supported.

Voicemaster
Waltons and Grace Bros
Price: Around $149
The Voicemaster is a speech-recording and reproduction package. It can be used to digitise voice input (through the supplied microphone) and play it back, using a close approximation of the voice used. A voice file recorded by the Voicemaster can be played by a computer which doesn't have a Voicemaster attached. The unit can also be used for speech recognition (you can program the computer to obey your spoken commands), and to convert a melody, input through the mike, into notation for editing.

Votalker IB
Mike Boorne Electronics,
(02) 46 3015
Price: $590
The Votrax Votalker IB is a speech synthesiser for the IBM and compatibles. It incorporates an advanced phonetic speech chip claimed to offer a limitless vocabulary with accurate pronunciation. The IB uses a sophisticated set of text-to-speech rules which appear transparent to the user. It can be used with almost any MS-DOS software, including dBase II and III, Lotus, Wordstar and most programming languages.

Services

High-Resolution Slide Transfer Service
Penta, (02) 957 2155
Price: About $8 per slide
Users of the Mirage business-graphics software can now create 2000- or 4000-line high-resolution slides by sending their images, stored on floppies, to Penta. Penta transfers the Mirage images using a high-resolution film recorder attached to a PC, producing 35 mm slides. Costs are reduced because users create the images themselves, although Penta can also supply advice on colour combination, type style and layout, and assist with the arrangement of major presentations.

Furniture

Fleximax Computer Table
Sylex, (02) 647 2888
Price: $850
The Fleximax Computer Table has independent height adjustment of keyboard and monitor platforms, using easy-to-reach handles beneath the workstation. Height adjustments range from 580 mm to 680 mm for the keyboard and 710 mm to 860 mm for the monitor. It is made from timber and powder-coated steel with rounded corners and plastic edge stripping.

Space Saver PC Stand
NEC, (02) 438 3544
Price: $470 excluding tax
The Space Saver PC stand allows the user to stack a personal computer, printer, paper and other accessories vertically on the one piece of furniture. At the end of the day, the computer system can be rolled out of the way. Constructed from lightweight steel panels and tubing, the stand is 550 mm wide, easily fitting through a standard doorway. It suits most makes of PC and has an optional document holder.

Stacker Stand
Sylex, (02) 647 2888
Price: $89
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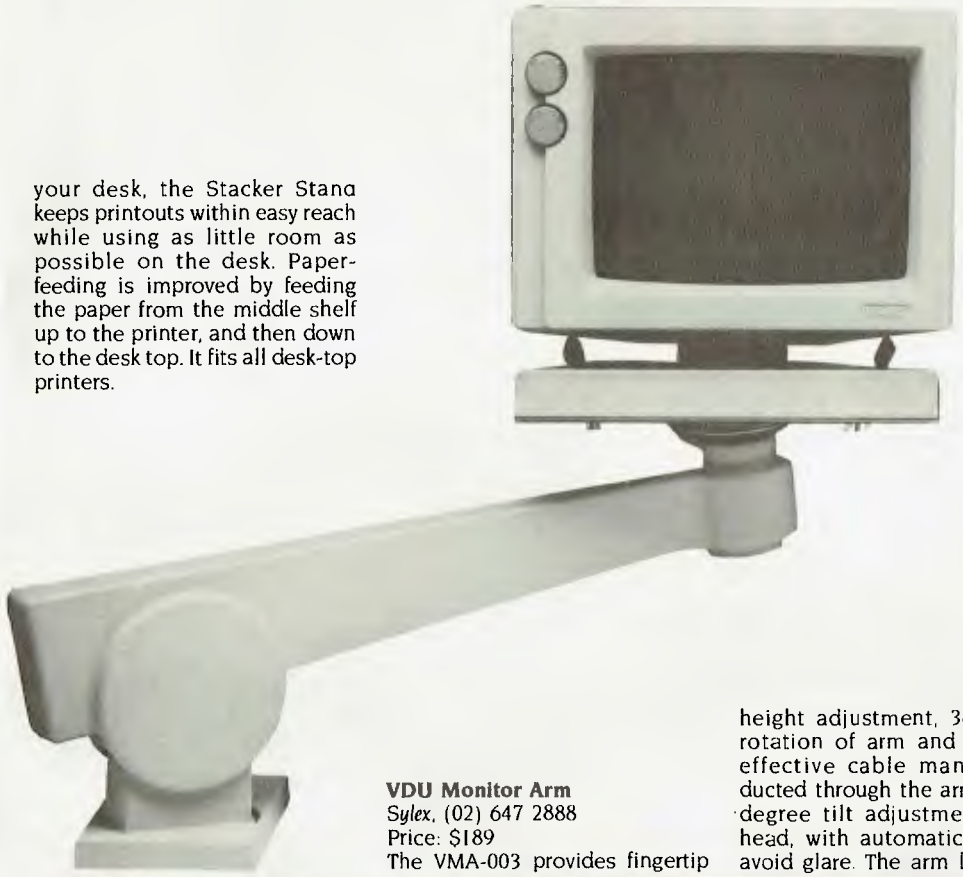
your desk, the Stacker Stand keeps printouts within easy reach while using as little room as possible on the desk. Paper-feeding is improved by feeding the paper from the middle shelf up to the printer, and then down to the desk top. It fits all desk-top printers.



VDU Monitor Arm
Sylex, (02) 647 2888
Price: $189
The VMA-003 provides fingertip height adjustment, 360-degree rotation of arm and platform, effective cable management ducted through the arm and 20-degree tilt adjustment at the head, with automatic fixing to avoid glare. The arm leaves the desk space completely clear.

Miscellaneous

Secondhand Computer Supplies
Computer Second, (03) 537 2267
Computer Second carries a range of manufacturers' surplus stock and other secondhand computer-related equipment. The store will also buy secondhand equipment outright or sell on consignment.

Handmine
Lincoln House, (02) 818 1063
Price: About $7
The Handmine is a knobbly wooden sphere which can be rolled in the hands to alleviate tension. It makes contact with reflexology points on the palms and fingers, helping to ease strain for typists and computer operators. If your worry beads are a little the worse for wear, consider trading them in on a Handmine! □

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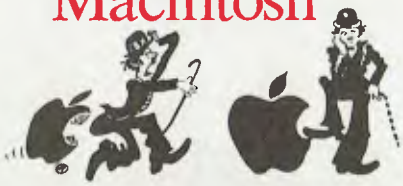

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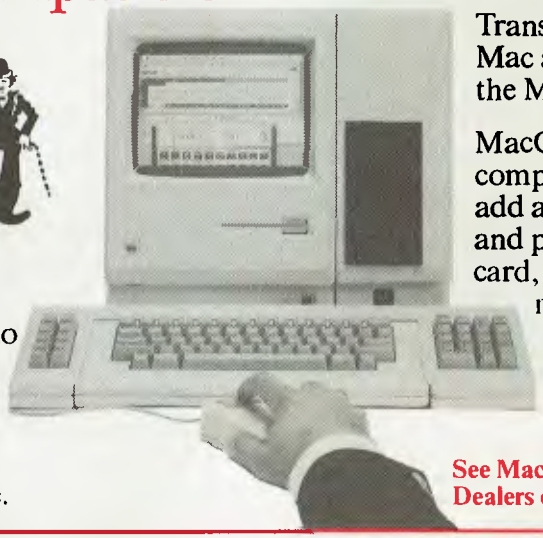

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BY NORMAN KEMP

VIATEL GRAPEVINE

Viatel Needs Stimulus for 1986

There was a tremor of uncertainty in the Viatel camp during the closing months of 1985, but after a shaky start the Telecom venture has chalked up good figures as word about the new service spread.

As it gathered pace in mid 1985, more than 125 service providers were supplying information for the system and the target of 10,000 registered users was within reach, but the database cupboards still looked a little bare. To its credit, Viatel got off to a better start in Australia than similar Prestel-type services in other countries.

But Viatel still isn't fulfilling its major role as an information source for business and professional users, and there have been substantially fewer of these hooking on to the service than the browsers or 'residential' users. Telecom assumed Viatel would appeal to the business classes, following the pattern in the United Kingdom, where Prestel proved a dismal failure as a home medium.

On the basis of a mid-year survey of registrations, Viatel concluded about 60 per cent of its users were enthusiasts with their own personal computers, who had sufficient knowledge to run the Viatel programs with comparative ease. This high incidence of personal computers surprised Viatel's marketers, as well as some commercial vendors, who had been expecting strong demand from novices for specially-adapted modems and keyboards.

Telecom has outlined three priorities for Viatel for the opening months of 1986: to start a campaign to encourage more business and professional people to use the service, to have more informative databases (preferably interactive with the user) and to sort the residential users from those who should be paying higher business and professional fees (which will be in force from March). Many users may have forgotten Viatel was launched with an introductory connecting fee of $12.50 for all users. this March the fees become $2.50 a month for residential users and $12.50 for business, professional, government, industrial and other users who don't fall into the lower rate category.

After discovering almost 20 per cent of users who signed on last year as residential should have been under business classifications, Viatel has re-drafted the registration form, so new applicants have to state the address from which they will be using their computer and where they are to be billed. If they give a business address they will almost certainly be logged on as users who qualify for the higher monthly rate, unless they can prove otherwise.

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Viatel also has plans to provide more gateways during 1986. Last April, shortly after the service opened, Viatel had 304 user ports, which were boosted to 448 in October — some six months ahead of schedule. In March '86 this will be raised to 624, and there will be 96 additional ports for service providers putting information directly into Viatel databases and a further 32 to enable them to update it. "There is a lot of room for improvement in databases," commented Gordon Niven, one of Viatel's marketing executives in Melbourne. "Probably about half of those on line now are of good quality or are improving steadily. Others need a lot of work, and a few have not been listed because there is so little information on them."

Telecom runs a two-day training course for new providers, but has no control over the subsequent editing of databases, said Niven. He added that it is often advisable for service providers to work with consultants who can arrange screen layouts and assist with the editing of frames until users are accustomed to the electronic medium.

Of the services which have shown a real growth, the leader has been home telebanking, with facilities provided through the Commonwealth Bank and Money Watch (a financial news service started by John Fairfax and Company). The Commonwealth Bank's Telebank has exceeded expectations, with more than 2500 subscribers at the end of 1985. The electronic mailbox service shows signs of growth and the software program downloading facility for user groups is expanding.

"In the first months of 1986," said Niven, "Viatel will be trying to create an awareness of the service in a more public sense and provide encouragement for people to use it. Viatel has established its marketing objectives and identified the main areas for public videotex in banking and other forms of finance, travel, tourism and leisure activities, education, rural and agricultural information, electronic publishing of bulletins and magazines and computer services, such as software downloading."

Opposition

But even while Viatel is in the throes of its next planning stage, more private databases are becoming established in specialised areas throughout Australia, and many of them offer services in opposition to Viatel. Architecture, local government planning, farming, travel, real estate and a wide range of business databases are among the numerous services either in preparation or available to closed user groups around Australia, and some are working towards either limited or general public access, depending on their present load.

Telecom has promised to make Viatel a viable profit centre over about three years, but even after a promising start in 1985, it looks like Viatel will have to run very hard to keep ahead in the race to be the nation's leading provider of public information. □

LOTUS HOTLINE

BY JOHN NICHOLLS

Groups

Probably the single most useful piece of information I can give you is the names of contacts in each area, as there have been some changes and additions since the list was last published.

Melbourne: Robert Taylor, (03) 267 4800
Sydney: Ron Pollak, (02) 290 3655
Brisbane: Bill Savage, (07) 221 2144
Perth: Mark Bitner, (09) 322 7188
Canberra: Zeek Ezra, (062) 49 1299
Hobart: Bryan Threlfall, (002) 34 6077
Auckland: Brian Mayo-Smith, (09) 79 2950
Hong Kong: Nick Heywood-Waddington, 5 21 0421

I can thoroughly recommend joining one of these groups — they're mines of information.

1-2-3 Release 2

In January, I attempted to cover the main features of this new version of 1-2-3. In particular, I mentioned the Softguard copy protection scheme used by Lotus. If you run the DOS command CHKDSK on a hard disk containing 1-2-3, you may come across the following message:

"Errors found, F parameters not specified",

followed by

"x lost clusters found in x chains. Convert lost clusters to files (Y/N)?".

Be careful before you answer 'Yes': these clusters may be part of the Softguard protection scheme. Yet another example of the difficulties caused by copy-protection.

Tips

The Australasian Lotus Users' Association publishes a monthly newsletter, which contains a lot of useful information. Some of the tips listed below are based on examples from that publication.

■ **Numeric keypad:** You can access the numbers on the keypad without using the Num Lock key by holding down one of the Shift keys. Similarly, you can turn off the numbers, if the Num Lock key is on, by holding down one of the shift keys.

■ **Copying formulae:** Set up the required display format before copying formulae to ensure that the cell format is also copied.

■ **Hard disk users:** You can avoid cluttering up the hard disk by saving your file, graph or print to a floppy. Do this by typing the drive prefix before the filename. For example: /FS A:filename. To retrieve from floppy, again type the drive prefix. For example: /FR A:filename.

Probably the single most useful piece of information I can give you is the names of contacts in each area, as there have been some changes and additions since the list was last published.

■ **Finding a macro:** Type /RNC to find where a macro is located. This will identify all macros, and selecting one will display its location.

■ **Balancing worksheets:** When calculating a total, it's good practice to double-check the calculation by recalculating it in another way. If the first total adds down, create another total that adds across. Putting the two totals beside one another will make them easier to check. Alternatively, you can use a third cell which prints out some easily seen message if the two don't agree. For example, the formula in the third cell can read:

@IF (@SUM (C1..C5)= A5+B5+C5, 0, @SUM (C1..C5), ERR)

■ **Converting formulae to current values:** There are several ways to do this. With single cells, you can move the cursor to the cell and press <F2>(Edit), <F9>(Calc) and <Enter>. You can convert a range of cells by copying the worksheet to a new file (as a safeguard, in case you damage the original, or want to go back to it), and using /File Extract and /File Combine. In Release 2, a new command, /Range Value, does the job, and will COPY values to another part of the worksheet. To CONVERT the formulae in a range to values, you specify the same range as the From and To range when using /Range Value. This will erase the formulae.

■ **Graphs:** Note there is a difference between NAMING and SAVING a graph. You must name a completed graph (/GNC), then file the worksheet (/FS). The graph used or created immediately before you save a worksheet (whether the graph has been named or not) becomes the 'current graph' and can be displayed by retrieving the worksheet and pressing the <F10>(graph) key. A graph need only be saved (/GS) when a hard copy is required. However, I always save as a matter of course, so that it's there when I want it.

■ **Hercules boards:** You can use the Hercules Graph 'X' Utility, which is supplied as an optional $50 extra, with the Hercules board. This allows a graph to be printed by pressing the PrtSc key, instead of having to use the Printgraph program. This utility allows you to use long titles and legends: 118 characters for first, second and X-axis titles; 55 characters for Y-axis titles; and 110 characters for legends (in total).

■ **Laserjet or Thinkjet print-screen utility:** This utility enables you to print the contents of an IBM PC or IBM PC/XT to either the Hewlett-Packard Laserjet or Thinkjet printer (it doesn't work with the IBM PC/AT). Once installed, it will be loaded into memory automatically each time your computer is booted up. It's executed by the normal keystrokes <Shift-PrtSc>, followed by pressing 'G' and 'C' immediately. Two versions are provided for each printer, one for the Hercules board and one for other boards.

■ **Moving screen by screen:** Even experienced users sometimes forget to use keys to make large movements of the cursor. Remember, <PgUp> and <PgDn> move up or down one screen, and <Tab> and <ShiftTab> move one screen to the right and left. <Ctrlrgt> (Ctrl and Right arrow> and <Ctrllft> perform the same functions as <Tab> and <ShiftTab>. Lotus introduced new terms for the last two moves: Big Left and Big Right!

■ **Moving while in Edit mode:** <Home> takes you to the first character, <End> takes you to the last character, <Tab> or <Ctrlrgt> takes you five characters to the right, and <ShiftTab> or <Ctrllft> takes you five characters to the left.

■ **Absolute ranges in formulae:** Use the ABS key, <F4> in 1-2-3 or <F3> in Symphony to make it easier to enter absolute or mixed references. Assume you're entering the formula @SUM(B1..B10). After you've typed @SUM(B1..B10, press the ABS key. This will change the entry to read @SUM(B1..B10. Further presses of the ABS key will cycle the formula through @SUM(B$1..B$10, @SUM $B1..$B10, and, finally, back to @SUM(B1..B10. □

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Print Types: ASCII 96 Others 7 language
Character Format: Character Mode Standard 9 x 9 dots NLQ 18 x 20 dots Graphic Mode
Printer Modes: (a) Fixed pitch mode (b) Proportional pitch mode
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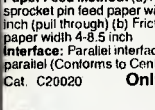

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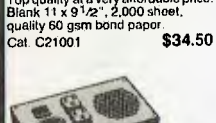

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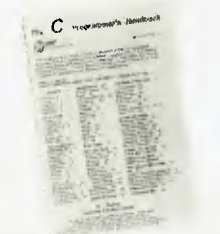

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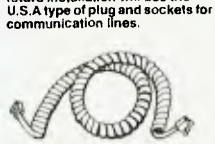

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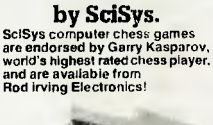

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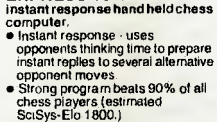

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HUMANS COMMUNICATE with each other using a variety of protocols ranging from the socially acceptable (synergistic beer drinking is one) to the routine exchanges ("Why isn't that work ready?") to those usually only tolerated by consenting communicators in private. The protocol commonly used by consenting micros is 300 baud, along a phone line to which they connect via modems hanging off their RS232 (or RS423) ports.

Ah! The innocence of youthful computer communication . . only the naive believe they need just a phone, modem and RS232 port to get their computers into the mad social whirl of bulletin boards, international databases and electronic mail. There's that little problem of money, and another of software. Unfortunately it's not a matter of gradually building up a series of items, and thus lessening the strain on communication with one's nearest and dearest — you need *all* the components, all at once!

Although Barson Computers has developed a built-in modem for the Beeb, I haven't been able to find out what it costs or whether the company will do retro fittings. An alternative solution to the problem is the Beemodem. Developed by Microbee Systems, it's designed for use with the Microbee and needs a 9-volt, 140 mA power supply, but if you're handy with a soldering iron it's not difficult to wire a female 25-pin D connector to a suitable DIN plug and a plugpack. The whole setup costs less than $200 and provides access to bulletin boards and Viatel. I've been using a Beemodem with my BBC daily for several months and have had no problems whatsoever.

Not surprisingly, the information provided with the Beemodem doesn't say a lot about connecting it to anything except a Microbee, but it didn't take long after opening the case to work out what was required. It's a well-constructed piece of periphery, and the usual 'World' modem chip does all the hard work.

Here are the connections you need to make to the Beemodem's 25-pin plug:

Beemodem		BBC RS423	Plugpack
Pin	2	Pin B	
	3	A	
	7	C	0 volts
	9		+9 volts

(Details of the pin numbering of the BBC's RS423 socket are on page 499 of the BBC user guide.) Although the modem's manual specifies a 10-volt supply, I've fed it as little as six volts without hassles.

Comms Software

As for software, it's hard to go past that old warhorse, the Commstar ROM. At just under $100 it isn't cheap, but it's reliable and very flexible. The bugs in the latest version are minor, and it's limited only by the apparent unavailability of the promised data files for VT100 and similar emulations. Typing *COMM puts you into terminal mode, while typing *COMMP instantly configures the system for Viatel. The function keys perform very useful tricks, depending on which mode you're in: while accessing Viatel they can be used to tag pages for quick retrieval, download programs and reveal hidden text; in terminal mode they change the screen mode and send ESC and BRK characters; they also toggle echo, buffer storage and the printer, and can be used to adjust the real-time clock, which is quietly counting the seconds. (Given Viatel charges, maybe it should be calibrated in dollars and cents rather than minutes and seconds.)

The handbook is pretty thorough and free of unnecessary jargon, lacking only in advice on setting up emulation files, which the publishers claim is "complex". (C'mon, compared with setting up ASCII Express, nothing is difficult!)

If commercial communications software is beyond your means at present, but you have access to a modem, you might like to try expanding the program in Listing 1 to meet your needs. Enhancements could include the ability to toggle a printer while online, switch speeds, change screen modes and so on. Don't expect it to be easily expanded into something capable of coping with Viatel; several characters need to be moved around and some fairly complex protocols must be followed if you're to get any sense from what might appear on the screen.

If and when you get the courage to contact a bulletin board or database, remember your BBC is now just a dumb terminal and can become an extension of just about any machine around, from mainframes down. I've used this program to talk quite happily with larger IBM and VAX machines, as well as Apples, Commodores, Microbees and other BBCs. Don't be surprised if the screen sometimes clears in strange and not very wonderful ways, or if lines begin on the right margin and come back on themselves for the first half-dozen characters. Once you work out the character string which is causing such diversions from the norm, it's easy to trap them by adding a few lines of code to this listing. One thing is certain: you'll have plenty of time to perform lots of tests and checks, given the size of the input and output buffers in the operating system and the speed of BBC BASIC! □

Listing 1.

```
10 REM 300 baud terminal program
20 REM by Greg Taylor
30 REM Qld. BBC User Group
40 *TV0,1
50 MODE 3
60 INPUT "Echo (Y/N)",Y$
70 IF Y$="N" THEN echo%=FALSE ELSE echo%=TRUE
80 INPUT "Printer on (Y/N)",Y$
90 IF Y$="N" THEN prin%=FALSE ELSE prin%=TRUE
100 osbyte=&FFF4:CLS
110 *FX7,3
120 *FX8,3
130 *FX156,20,227
140 *FX4,0
150 *FX229,0
160 A%=138:X%=2:Y%=0:*FX15,0
170 IF prin% THEN VDU2
180 REPEAT
190 *FX2,1
200 IF ADVAL(-2)>0 char%=GET AND
    127:IF char%>31 OR (char%>6
    AND char%<12| OR char%=13
    VDUchar%:IF echo% AND
    (char%=13) THEN VDU10
210 *FX2,2
220 IF ADVAL(-1)>0 Y%=GET:IF
    Y%<>27 CALL osbyte:IF echo%
    THEN VDU Y%:IF Y%=13 VDU10
230 UNTIL Y%=27
240 IF prin% THEN VDU3
250 END
```

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Your BONDWELL

BY JEFF RICHARDS

I'VE HAD lots of requests for graphics routines for the Bondwell, so here's an example which writes individual pixels (see Listing 1). It's primitive, but adequate for simple graphics and diagrams.

The screen is addressed as an array of 160 (horizontal) by 75 (vertical) pixels, starting at (0,0) in the top left corner. The routine will only draw — it can't erase pixels — and in order for it to work correctly, two constraints must be met: first, attempting to write a pixel to a location at which there is any ASCII character other than a space will give strange results; and second, writing over the top of an existing pixel will produce similar erratic characters.

The first problem can be avoided by clearing the screen before creating graphics, and only writing characters to the screen after all graphics are complete. Alternatively, more extensive testing of the current value of the screen location could be carried out, but this would slow down the procedure (which is already slow enough). The second limitation may require some graphics routines to be rewritten, to avoid drawing the same pixel twice.

The program first calculates the position in video memory of the pixel to be drawn. It then retrieves the current character at this position, and if found to be a space it's set to a blank graphics character and the value of the pixel character is calculated. This value is then combined with the current pixel character value, and if the current value is greater than 127 the new value is simply subtracted to give the result, which can be POKEd back to the video RAM.

If the current value is less than 32, a check is needed to see whether the current value plus the new value gives a result greater than 31. If it does, the actual result has to be calculated as the inverse added to the new value plus 128 — otherwise the new value is simply added. In both cases the updated pixel value is POKEd back.

Listing 2 is a routine to draw horizontal or vertical lines, while Listings 3 and 4 are examples of filled and open rectangle drawing procedures, which are suitable for bar graphs. In both cases the rectangle is defined with a starting point (X1,Y1) and a horizontal and vertical size (DX,DY).

Again, the routines are very simple, but will serve the purpose if some care is taken. Note there is no range checking; attempting to draw outside the defined area could cause values to be POKEd into user memory and crash the system.

The routine is in standard Microsoft BASIC-80 and uses some subtle rounding and wrapping effects, which is why I've used the FIX function instead of the more common INT in line 30,000. All variables must be defined as integers.

If you attempt to write ASCII characters over a graphics area the space will be cleared and characters will be printed through the middle of a graph or a chart, apparently making a pathway for themselves. Careful use of this technique can produce very effective mixed character/graphic displays, but the characters must be printed after the graphics are drawn.□

```
Your Bondwell Computer        19.9.85   RICHARDS    3
```

Listing 1: *Draw a pixel at* (X,Y).

```
30000 PX=FIX((X-1)/2-2048)+80*INT(Y/3)
30002 P=PEEK(PX)
30004 P=-P*(P<>32)
30006 PP=2^(1-(X MOD 2)+2*(Y MOD 3))
30008 IF P>127 THEN P=P-PP:POKE PX,P:RETURN
30010 IF P+PP>31 THEN P=(NOT P)+PP+128 ELSE P=P+PP
30012 POKE PX,P:RETURN
```

Listing 2: *Draw a line.*

```
30030 REM PLOT LINE (X1,Y1,X2,Y2)
30032 XST=1:IF X2<X1 THEN XST=-1
30034 YST=1:IF Y2<Y1 THEN YST=-1
30036 IF X1<>X2 GOTO 30040
30038 FOR Y=Y1 TO Y2 STEP YST:X=X1:GOSUB 30000:NEXT:RETURN
30040 FOR X=X1 TO X2 STEP XST:Y=Y1:GOSUB 30000:NEXT:RETURN
```

Listing 3: *Draw a filled rectangle.*

```
30050 REM PLOT RECTANGLE (X1,Y1,DX,DY)
30052 FOR X1=X1 TO X1+DX
30054 X2=X1:Y2=Y1+DY:GOSUB 30030
30056 NEXT X1
30058 RETURN
```

Listing 4: *Draw an open rectangle.*

```
30060 REM PLOT WINDOW (X1,Y1,DX,DY)
30062 X2=X1:Y2=Y1+DY:GOSUB 30030
30064 X2=X1+DX:X1=X2:GOSUB 30030
30066 Y2=Y1:X1=X2-DX+1:X2=X2-1:GOSUB 30030
30068 Y2=Y1+DY:Y1=Y2:GOSUB 30030
30070 RETURN
```

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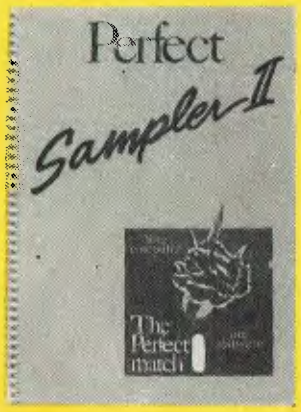

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BY JOHN HEPWORTH

OH MURPHY, inventor of Murphy's Law, where are you? Oh Murphy, wait 'til I get my hands on you. Why did you have to create the law which says "anything that can go wrong will go wrong"?

This column has been written, lost and rewritten. How? It's simple — I started writing, got carried with tide and didn't save the file every few minutes. Disaster struck — a total keyboard failure, with the computer resolutely ignoring every keystroke I tried. I had to turn off the machine without saving any of my work and get a replacement keyboard before continuing. Okay, I thought, I'll have lost some of my work, but Wordstar will have saved some of the early parts of the column in the scratch file it keeps on disk, and I'll be able to use Norton Utilities to recover some of it.

Disaster number two: the column was short enough for Wordstar to hold the complete file in memory, which was lost when the power was turned off. A painful lesson. My New Year's resolution is simple: every five minutes, *without fail*, save the file to disk

A Batch File Menu

Many people find operating a PC from the DOS prompt confusing, tedious or boring. Using hard disks with many applications and hundreds of files only compounds the problem. As a result, all sorts of programs have been created to allow DOS to be driven from a menu. These come with various degrees of complexity, and varying prices.

How about a simple, no frills menu system which is written in the DOS batch language, teaches applications of some of the DOS commands and is free? Such a batch file is R.BAT. The file as written is set up for one combination of subdirectories and one combination of application programs. You should customise it to suit your own setup.

R.BAT assumes the public domain database, PC-File, is in the PC-File subdirectory, and Lotus 1-2-3 and Wordstar are in the Lotus and Wordpro subdirectories. Datamenu (a program written in dBase II) is in the dBase subdirectory, along with a copy of dBase II. Norton Utilities version 3.0, PC-Talk, PC-Alien and Turbo Pascal 3.0 are in the Norton 3, Comms, FBN and Pascal subdirectories.

Nesting Batch Files

The ninth option allows a batch file, SAMPLE.BAT, to be nested within R.BAT. DOS doesn't enable one batch file to call another, and on completion of the second batch file return to the next command in the batch file. Usually, in such cases the next command correctly transfers to the second batch file. When all commands in this second file have been executed, control returns to the prompt.

Using a secondary command processor (IBM's term for a second copy of COMMAND.COM) and running the second batch file under its control achieves the impossible.

The syntax for invoking a secondary copy of COMMAND.COM and running a program called Filename (.BAT, .EXE or .COM) under its control is:

COMMAND /c filename

The /c switch tells DOS the second copy of COMMAND.COM is temporary, and control returns to the first batch file after the second one finishes executing. In this case, R.BAT calls a secondary copy of COMMAND.COM and runs SAMPLE.BAT under its control. Program control reverts to R.BAT when SAMPLE.BAT is finished.

R.BAT — the Options

R.BAT depends on the use of replaceable parameters in order to function. Look at Listing 1. %1 appears in a number of places; a menu of the possible applications which could be run from R.BAT appears at the bottom of the listing; and a number is next to each option. To run an application, type:

C> R option—number

DOS will start to execute R.BAT. As each %1 is encountered DOS will replace it with the option number specified on the command line. For example:

C> R 3

will run Wordstar.

Using replaceable parameters and the DOS IF command also allows the line

IF "%1"=="" goto HELP

which detects if no parameter was specified after R and branches to the HELP label. The DOS IF command includes the quotes in the strings being compared (unlike BASIC), and the quotes around the %1 are essential for correct operation. In this file HELP then immediately branches to the END label, but you may choose to add your own help screens and use the DOS PAUSE command to give the user time to read them. Using '?' or 'HELP' as the parameter will also branch to the HELP label.

As each application finishes, control returns to R.BAT and a jump is made to the END label. So the next response is predictable: the default directory is made the root directory on the C drive, and Path and Smartpath are re-established. Now utility programs and Wordstar are available from any drive or directory.

My own machine has a similar menu (with some variation in the application programs). The convenience of running any program with a minimum of keystrokes is amazing! □

```
echo off
rem
rem R.BAT
rem A batch file menu to operate
rem several applications programs
rem on a hard disk
rem
if "%1"=="" goto HELP
if %1==? goto HELP
if %1==HELP goto HELP
goto %1
:HELP
goto END
:1
c:
cd\pc-file
pc-file
goto END
:2
c:
cd\lotus
lotus
goto END
:3
c:
cd\wordpro
echo Place data disc in drive A
echo Press any key to continue
pause
a:
c:ws
goto END
:4
c:
cd\dbase
dBase DATAMENU
goto END
:5
c:
cd\smartsys
path
goto END
:6
c
cd\comms
pc-talk
goto END
:7
REM file transfer from CPM 80
c:
cd\fbn
alien
goto END
:8
c:
cd\pascal
turbo
goto END
:9
command /c sample
goto END
:0
goto END
:END
rem
path c:\utility;c:\wordpro
cd\
c:
CD\
cls
dir *  /w
echo .
echo . Type "R x", where x is the number
echo . next to the selected application
echo . and press (ENTER) to run it
echo .
echo .  1  PC-File        6  PC-TALK
echo .  2  Lotus 123      7  PC-ALIEN
echo .  3  Wordstar       8  TURBO PASCAL
echo .  4  Norton Ver 3   9  sample.bat
echo .  5  DATAMENU       0  spare
echo .
echo on
```

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Your MICROBEE

BY COLIN TRINGHAM

THANKS TO all those who pointed out the 'error' in the December column — it gives me an idea of how many people read this page. However, the column was correct. The editor thought the English could be improved, so the printout of the program, which should have read '4 Microbees', was changed to 'Microbees' four times, which the program couldn't manage.

This month, I'll discuss some of the many new programs which have just been released for the Microbee. If you didn't get the December issue of *On-line*, hurry down to your closest Microbee Systems shop for a copy of the latest program catalogue — lots of new offerings are listed. I hope to report on the disk game Hoards of the Deep Realm soon; it looks like one of the best games I've seen for a long time.

This month, I'll discuss some of the many new programs which have just been released for the Microbee. If you didn't get the December issue of 'On-line', hurry down to your closest Microbee Systems shop for a copy of the latest program catalogue -n lots of new offerings are listed.

Games 3 is a new disk, available from Microbee Systems, which contains seven games of varying quality. Included are Space Invaders, Chilly Willy (a game of strategy in which you're chased through a series of ice-cube mazes), Chopper Pilot(a game of skill with good sound-effects and a training mode, which allows you to disable the 'crash' facility), Baboon (in which you must dodge barrels, catch and eat cherries, shoot your ape-like opponent and rescue the fair maiden), Lazer Blazer, Space Lanes and Depth Charge (which is suitable for younger players).

At only $29.95 for the disk in either format, Games 3 represents good value-for-money for the first four programs alone.

Wasp-Soft has released its first two programs for the Microbee, and is to be congratulated both for enterprise and quality.

Droids is an arcade game, in which you have to negotiate a series of 12 mazes while being chased by five persistent, but unintelligent droids. The game is much harder than it sounds, and each of the mazes requires some practice before you learn to find your way through to the next maze. The final maze is particularly hard, but I managed to complete the program on two or three occasions. Droid features immediate keyboard response (joysticks are an option) and good sound. The introduction is neat, and the script typeface used gives the program a unique flavour.

Scommand is a game for two players. One combatant is situated at the top and the other at the bottom of the screen, while an assortment of space junk floats in between. Unlike most of the shoot-'em-down type of programs, this one requires a lot of strategy. If you shoot down all the space junk, you have nothing to hide behind, and if you fire too quickly, you don't build up enough strength to reach your opponent.

Both programs are suitable for disk-based machines only, and cost $22 each on 13 cm disk, and $25 on 9 cm disk. Wasp-Soft can be contacted at PO Box 286, Mortdale 2323.

Richard Larkin, who contributes regularly to the 'Pocket Programs' section of *Your Computer*, has a series of programs for sale. The initial offering includes ISBOK, a high-resolution graphics adventure game, with single-key entry commands; Pucker, a Pac-man-style game; Grafit, to help create PCG graphics (see review below); and Patern, to help you make your own low-res title pages. These programs are $12.50 each.

Other titles include Xmaze, a large maze adventure for $10; Cater, a caterpiller graphics game for $9; Course, a horserace game for $6; Hanger, a Hangman-type game for $6; and Atoms, which is also $6.

Grafit is an interesting PCG design-aid program. On the left of the screen are three PCG characters which you can modify, on the right you can select any of 128 characters to modify or copy, and at the top right is a complete scene area, where you can see what the entire PCG area you are designing will look like in your finished picture.

Grafit allows you to copy an existing shape for further modification, such as inverting the character from left to right or top to bottom, or producing the inverse of the character. You can also move individual rows of the character horizontally and vertically, which is particularly helpful if you wish to produce extra PCG characters for intermediate movements.

The most interesting feature of the program is the ability to produce two types of BASIC output file. The first file is the conventional PCG data statement; the second produces a program which, when RUN, writes a machine code routine that can be placed after your BASIC program to produce immediate loading of your PCG characters. Although the instructions could be re-written (and Richard assures me he's doing this), Grafit is good value for money.

Grafit is only available on tape. Write to Richard Larkin, 18/69 Lynwood Avenue, Dee Why, 2099. If there is sufficient interest, disk versions will be made available. Write to Richard, enclosing a stamped, self-addressed envelope for details.

The third program I received is the excellent Car Rally from Goodison Software. This is intended as an educational program for schools, but many users would also enjoy using it at home.

Car Rally comes with a comprehensive 18-page booklet which describes the concepts behind the program, as well as ways to use the ideas in a classroom situation. The booklet offers suggestions for class projects, and indicates a range of subjects which can be introduced, including map-reading (a very good, large, colour map of Australia is supplied with the package) and topography.

The graphics and use of colour in Car Rally are outstanding, and this package undoubtedly deserves the excellent Goodison image.

At $25, complete with the book, Car Rally is incredible value for money. Write to Goodison Software, Monument Road, Kilmore, 3764, for a copy. □

SOMEWHERE IN the space/time continuum is a black hole of information, called the 'Universe of Lost Thoughts'. Nothing sent there has ever returned. If you could find a way to tap into it you'd recover a goldmine of poetic concepts, brilliant ideas and fantastic calculations, lost to their original creators forever.

Each day, thousands of computer users contribute to this universe, consigning entire computer loads of information, either by accident or design.

Your Commodore 64 uses dynamic memory to store its programs, graphics and data. As long as it receives a 'hit' of power every sixteenth of a second it will hold your precious jewels. Failure to comprehend this simple reality can have tragic consequences. Every user has a horror story — mine was particularly painful. After 10 solid hours of hacking I created the world's greatest Pontoon game. Not content to savour it alone I thought I'd show it to someone. As I stood up I bumped the power point and the plug fell out. Zap! Just like that! Ten hours! Somewhere in a small corner of the universe of lost thoughts ..

Aesop Would Agree

The moral of this tale is computers are quite limited unless they can remember things. Devices like disk drives and cassettes can record information and then replay it. They use the more permanent method of magnetic fields to store and retrieve data.

Most people use their tapes or disks as a means of loading or saving programs, but they can also be used to store pure information or data. This is how a word processor or database writes and retrieves its information. The principles aren't difficult to grasp, and with a little thought you can write BASIC routines which will enable you to store and read your own data files.

All information stored on cassette or disk is stored as a file. There are several different types of files, including the type which stores programs, but the simplest and most commonly used is the sequential file. As the name implies, sequential files store information in sequence, and you must always start reading or writing from the beginning. If you want to change just one item in the data you need to rewrite the entire file. Most of the Commodore word processors use sequential files for storing text. The information is stored in CBM ASCII, which is similar to standard ASCII, but has Commodore keyboard graphics as well. The file consists of a stream of bytes which contain the ASCII values of the characters they represent.

This is fine for word processors, but if we're going to store data we'll need some way of knowing where one item ends and the next begins. This is especially true of numeric values. In your program you might have two variables, A and B. Each contains a number which will be written to tape or disk as its ASCII digits. If we read this data back we'll find a stream of digits, but how do we know which belong to A and which belong to B?

There is a way, but more of that in a moment. Let's get started.

The first thing we have to do is make sure all sprites are turned off. For some reason they seem to interfere with sequential file operations. To turn them all off POKE 53269,0. Next we open the file with a line like OPEN 8,8,8,"FILE,S,W"; FILE is the name we've chosen and S,W tells the drive it's a sequential file and we intend writing to it. In a running program this statement will make the drive do a quick check to see if this filename already exists so we don't overwrite something. If there is a problem the red light will flash and your program will crash unless you've used ST or polled the drive error channel to detect errors.

If all is well the drive will create a new file called 'FILE'. So far it has no contents, but at least it has a name and an address where the DOS can find it. You'll note that although the drive has stopped whirring, the red light remains on; this is because the file is OPEN.

To write information we use the PRINT# statement. This works exactly like PRINT, but instead of writing to the screen it writes to the channel whose number follows it. Because we OPENed the file using channel 8, we'll use PRINT#8 to write our variables.

Here we must be careful to write our data so we can differentiate between different parts of it when we read them back. This is done by including separators. BASIC recognises the comma, semi-colon and carriage return as separators, so our task is simplified. Just as PRINT A would print the value of A and then print a carriage return, so does PRINT#. If we used a separate PRINT# for each item we would have no problems, but it's wasteful of program code space. We can print more than one variable per statement by printing the ASCII code for one of the separators between variables. For example:

```
10 R#=CHR$(13)REM R$= A CARRIAGE RETURN
20 PRINT#8,A;R$;B;R$;C
```

Note it isn't necessary to put semi-colons between R$ and the variables (I only included them for clarity). Also note you shouldn't use commas in print statements (except inside quotes ",").

In this example we've used numeric variables, but the same method applies if you use strings. When we've written all our data we issue a PRINT#8 to clear the channel and then we can CLOSE the file. It's vital to CLOSE the file — if you don't you won't be able to read it later, and you may even damage other files on the disk. CLOSE8 and we're done.

Reading the Data

If you're curious and want to see what your data looks like you can try loading it with Easyscript. You should see a series of numbers, each on a new line.

But let's be more constructive — we need a routine to read our data. First we must tell the drive what we want to read: OPEN8,8,8,"FILE,S,R" will do the trick. Notice this time we use S,R for 'sequential' and 'read'. Again the disk will whirr for a while to make sure the file actually exists. Include an error check routine to avoid mishap.

Now for the data. We know we must read it in the same order in which we wrote it, and we have a choice of reading methods; we can use INPUT#8, which will read all the characters up to the next separator or we can use GET#8, which retrieves one character at a time (in which case we'd have to build up a data string and test for separators ourselves). GET# can be made practically bulletproof, but it takes more work! Let's be lazy and use INPUT#.

We should be careful when reading numeric data. You can use INPUT#8,A, but it means your program is expecting numbers. If for any reason the incoming data contains a non-numeric character you're in trouble. It's better to read data as a string, then convert the string to a number. We'd write something like:

```
60 INPUT#8,A$,B$,C$
70 A=VAL(A$):B=VAL(B$):C=VAL(C$)
```

If any of these strings contains non-numeric characters (other than plus or minus or a space), the value returned will be zero.

For large volumes of data you'll probably find yourself using arrays and FOR.. NEXT loops, but the principles for disk/tape read and write remain the same no matter how complex your data. Cassette users don't have to worry about the 'S,W' business when opening files. They should use OPEN 8,1,0,"FILE" when reading and OPEN 8,1,1,"FILE" when writing. □

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Although it is policy to check all material used in *Your Computer* for accuracy, usefulness and suitability, no warranty, either expressed or implied, is offered for any losses due to the use of any material in this magazine.

EDITORIAL CONTRIBUTIONS

Contributions to *Your Computer* are welcomed and will be given every consideration*
Please read these notes carefully to get an idea of the style and format we prefer.

All Contributions: should include your name, address, and home and office phone numbers (in case we need to check details). Each page of your submission, and any material sent with it, should also carry your name.

Contributions by Telephone: Contributors who have modems and suitable software (in the MODEM7/YAM mould — see our stories on Christensen Protocols in the May and June 1983 issues) can arrange direct transfer to our computers through our Bulletin Board system, which is on-line 24 hours a day, seven days a week. Contact our office by phone for details on transferring material in this way.

Contributions on Disk: Contributions can be accepted in most disk formats, although some have to be converted outside our offices, which will add to the (often lengthy) delay between receipt and acknowledgement. The preferred medium is IBM standard format single-sided, single-density, 20 cm CP/M disks or IBM PC-DOS minifloppies. We can also handle, in-office, most soft-sectored 13 cm disks, thanks to PC-Alien — so unless you have a particularly strange format, send it on disk straight from your machine. Please pack them extremely carefully if posting and label all disks with your name, address and phone number.

Listings: Unless it is absolutely impossible, we want listings produced on the computer. This reduces the risk of error - if the computer typed it, the computer probably accepted it. Print listings with a dark — preferably new — ribbon on white paper, and try to format the output to a narrow (40-characters) width. If they can't be produced on a printer, borrow a good typewriter — hand-written material is likely to sit around the office for a year before someone can find time to type it all out for you! Please provide an account of what the program does, how it works and so on. Any comments on the program should refer to the address, line number or label rather than to a page number. Any comments on modifying the program to work on other machines will be appreciated. Try to include a printout of at least part of a sample run if possible.

Style: All items should be typed (or printed) and double-spaced on plain white paper. We will only accept original copies - no photostats. Include your name, address, telephone number and the date on the first page of your manuscript (all manuscript pages should have your surname and page number in the top right-hand corner). Be clear and concise, and keep jargon and adjectives to a minimum.

*Although the greatest care will be exercised with contributions, no responsibility can be accepted for the safety or return of any letters, manuscripts, photographs or other materials supplied to *Your Computer* magazine. If return is desired, you should include a stamped, self-addressed envelope. If return is critical — say it's something you can't afford to lose — then don't send it; we *are* careful, but we're not perfect. □

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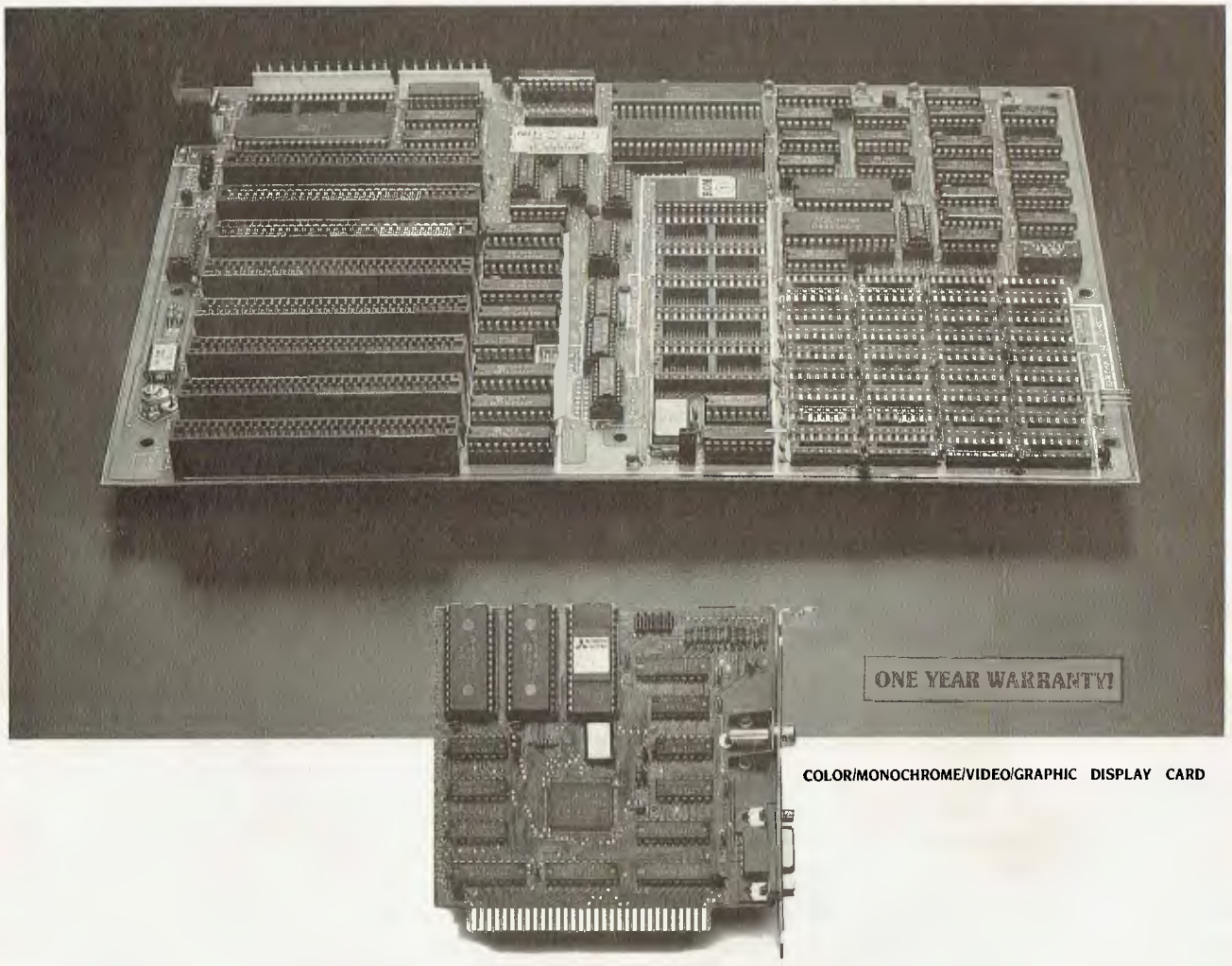

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your computer

WE CAN'T WIN!

IT'S INFURIATING! We finally found an island, the day after we promised you we'd stick around for a while. Hell, did that cause some arguing around the office ...

"We'll just tell them we lied", Natalie said between mouthfuls. "Let's go. Now! Before the guards wake up".

"Not a chance" said Matt. "A promise is a promise. We're sticking around at least until winter."

Damien spat out his chile sandwich and hissed that Matt hadn't ever kept a promise, and Andrea took her mouth out of a glass long enough to comment that there was no point in leaving yet.

"We still have two cases of champagne — I'm not moving!"

It all started when we received a postcard from Kangaroo Island. The message was: "Your reservations are confirmed."

What finally settled the arguments was the discovery that Kangaroo Island is in South Australia — that doesn't sound at all tropical. And the fact the postcard reached us was a bad sign, because it means the island has a postal service. If that's so, then it probably has telephones too. Not a chance ...

THE LONG MARCH

MARCH! March, march, march right into your newsagent and reserve yourselves a copy of *Your Computer* March, otherwise you might amble in a day after publication to find you're march too late — don't blame us.

What's the word on next month? PCOTY ... That's the most intriguing word. Go on, turn it over in your mind, examine it, test it, use it. Who's going to win it? That's the question. Our judges are pondering it.

In March you'll read about all the contenders for the *Your Computer* PC of the Year awards, even though we're not letting the March hare out of the bag until we start taking our April showers. Oh, how I wish I could tell you more ... it's so ... tantalising.

Never mind, march on March, put your best foot forward, because we'll also be talking about *Best Buys*. While the PCOTY awards take stock of machines released in the last calendar year, we want to let you know which computers, of all those on the market at the moment, represent great buys. Matt will be looking at five categories — home, low-cost personal, entry-level business, business and hot-rod — and ferreting out the computer deals his bargain hunter's eye finds too good to miss.

Your next step will be to put your socks back on and fold your hands neatly in your lap. You won't need your fingers and toes anymore, at least not for keeping track of your accounts. We're going to stop hogging the accounting packages that have been obscuring our office views of the car park for the past few months. YC's reluctant (remember what happened last time?) accounting expert has taken on the task of sorting through the pile, outlining the most outstanding points of each package and passing constructive comment. We ring him every hour, on the hour, and sing "Accounting we will go, accounting we will go ..." just to keep his spirits up. Our popularity is deeply in debit.

Reviews? Greedy aren't you? Given the wealth of review-type information there'll be in our features this month, we're most likely to devote the remaining space to tutorials — a healthy slab of how-to. (Or are you afraid to get your hands dirty?) We're hoping Les will clamber back into the *Marketing* saddle — C-ing is believing, we always say — Phil will be instructuring you in tidy programming, and the Birdwatchers won't be disappointed.

You'll also be able to stroll into another of Tim Hartnell's eyecooddothatrightaway-type articles. In March he'll be *Feeling Out of Sorts*, having sorted the good sorts from the bad sorts and worked sorta hard on providing you with some useful sorting tips.

And you know we'll have all the columns and other regular bits you've come to look forward to ... march, march, left, right, left ...

WHAT'S A PEACOATEY?

April will stop you in your tracks (partly because it's going to be at least as big as the *Yearbook*, which means you won't be able to step over it) ... when we tell you what won PCOTY (if you were a computer manufacturer, wouldn't you wanna win an award called Peecoatey?).

Well, that's all we can say about April without spilling our chickens or counting our beans before they've been.

But, May I tell you about the month after that? You'll notice it's the fifth month of the year, that you have five fingers on your left hand and five toes on your right foot (the one that once Marched, but which will have been idle for quite some time by May), and that if you start counting, after you reach the number five, it will appear at least once in every tenth number after that. Well, we think this is all quite significant, and our May issue will celebrate the above truths ... Whoops! Our space is all, our cup runneth over ... we'll have to tell you another time.

Answers to the thirteen most asked questions about Sony's new Model 10.

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